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SISHEN MINE

Sishen Iron Ore Company (Pty) Ltd

Basic Assessment Report and Environmental Management Programme Report: Western Dewatering Infrastructure Project

2018-11-12

DRAFT FOR PUBLIC COMMENT

DMR Ref: TBA

AngloAmerican

SOLUTIONS | PROGRESS | PARTNERS

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Company Reg: 2014/189068/07

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

BASIC ASSESSMENT REPORT

and

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Sishen Iron Ore Company (Pty) Ltd (SIOC)

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PART A

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1. CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 Details and expertise of the EAP

Name of The Practitioner: EXM Advisory Services (Pty) Ltd

Tel No.: 010 007 3617

Fax No.: 086 616 0443

e-mail address: kerry@exm.co.za

TABLE 1: EXPERTISE OF THE EAP

EAP	Qualification	Years' experience
Kerry Fairley	BSc Honours (Botany) Pr.Sci.Nat.	19 Years

CV with experience is attached as Appendix B1.

2. LOCATION OF THE OVERALL ACTIVITY.

A description of the property on which the proposed project is located is provided in Table 2 and shown in Figure 1.

TABLE 2: LOCALITY OF THE ACTIVITY

Farm Name:	The following farms will be affected by the development of new infrastructure as part of the Western Dewatering Infrastructure Project: <u>Backbone Extension Pipeline</u> Sacha 468 Portion 4 Sacha 468 Portion 2 Sacha 468 Portion 3 Gamagara 541 Portion 4 <u>Dewatering Curtain Pipeline</u> Gamagara 541 Portion 2 Sishen 543 Portion 19 Sishen 543 Portion 2 Sishen 543 Portion 1
Application area (Ha)	Sishen Mine has a mining right area of approximately 26 000 ha, of which the area to be affected by the two pipeline developments as part of the Western Dewatering Infrastructure Project are:

	Backbone Extension Pipeline 4 000 m x 50 m (20 ha) Dewatering Curtain Pipeline 1 200 m x 50 m (6 ha)
Magisterial district:	Hay District
Distance and direction from nearest town	Backbone Extension Pipeline: The pipeline will be in the Sishen Mining Right area, approximately 4 km west south west of Sesheng and 9 km west south west of Kathu. Dewatering Curtain Pipeline: The pipeline will be in the Sishen Mining Right area, approximately 13 km south south west of Sesheng and 14 km south south west of Kathu.
21-digit Surveyor General Code for each farm portion	Backbone Extension Pipeline Sacha 468 Portion 4 - C04100000000046800004 Sacha 468 Portion 2 - C04100000000046800002 Sacha 468 Portion 3 - C04100000000046800003 Gamagara 541 Portion 4 - C04100000000054100004 Dewatering Curtain Pipeline Gamagara 541 Portion 2 - C04100000000054100002 Sishen 543 Portion 19 - C04100000000054300019 Sishen 543 Portion 2 - C04100000000054300002 Sishen 543 Portion 1 - C04100000000054300001

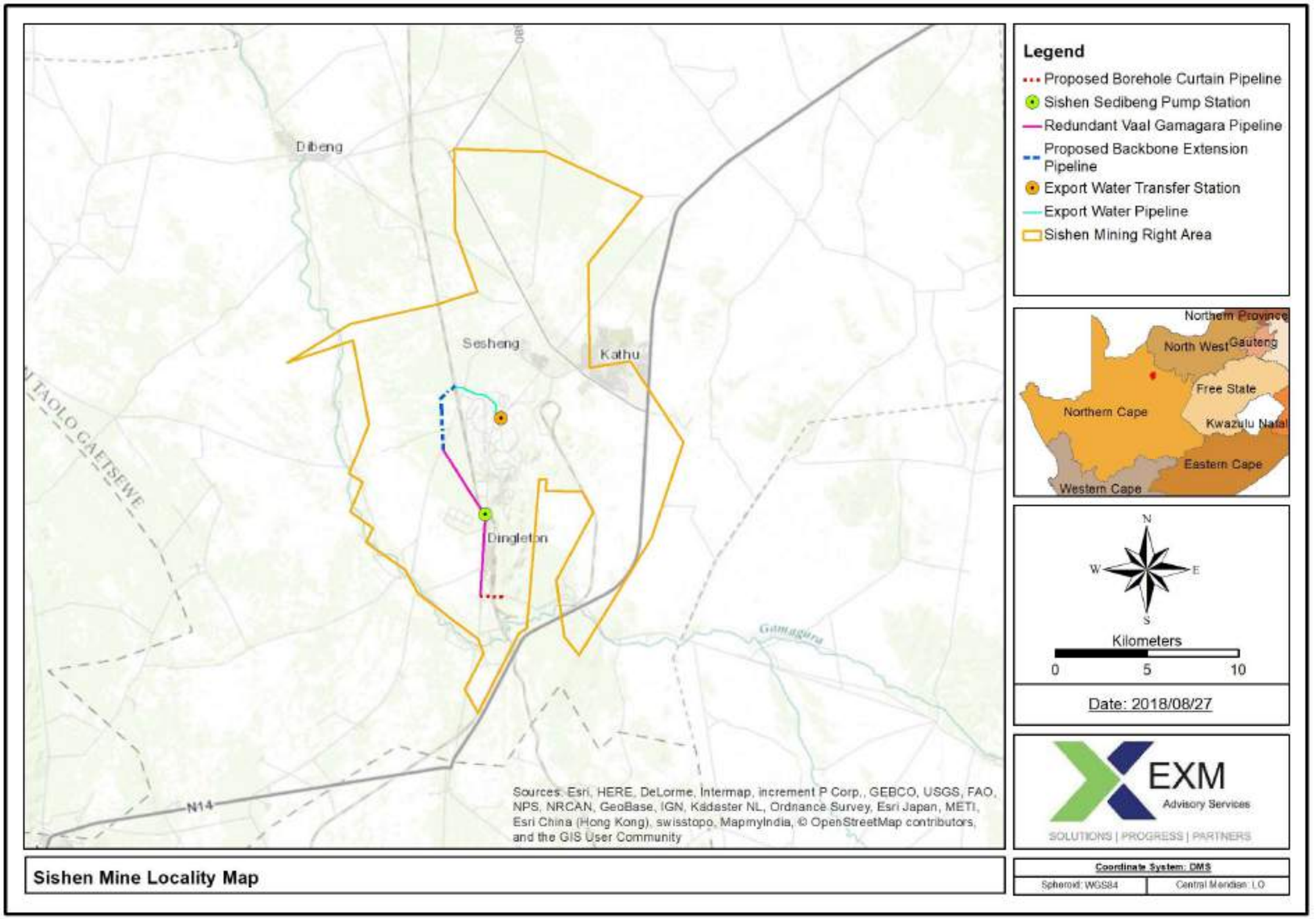

FIGURE 1: LOCALITY MAP OF THE WESTERN DEWATERING INFRASTRUCTURE PROJECT

3. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

3.1 Plan showing activities and associated infrastructure

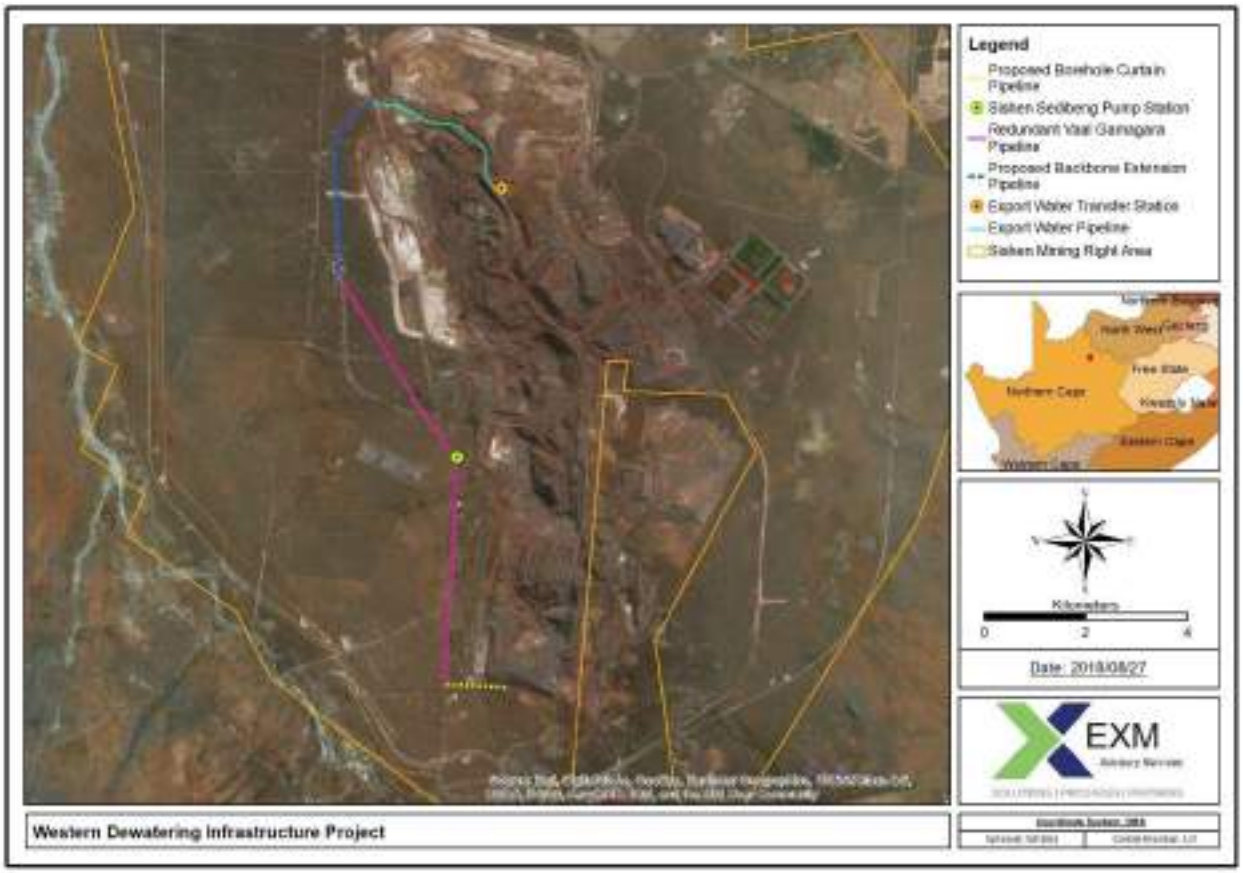

FIGURE 2: LAYOUT OF THE WESTERN DEWATERING INFRASTRUCTURE PROJECT

3.2 Listed and specified activities

TABLE 3: LISTED AND SPECIFIED ACTIVITIES

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY HA OR M²	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
Borehole Curtain Pipeline A 250 mm diameter HDPE above ground pipeline with a maximum throughput of 600 m^3/hr (167 l/s).	1 200 m x 50 m (6 ha)	**X**	**GNR 983 - Activity 9** The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water – (i) With an internal diameter of 0.36 metres or more; or (ii) With a peak throughput of 120 litres per second or more
Backbone Extension Pipeline	4 000 m x 50 m (20 ha)	**X**	**GNR 983-Activity 9**

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY HA OR M²	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
A 350 mm diameter steel above ground pipeline with a maximum throughput of 650 m^3/hr (180 l/s)			The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water – (i) With an internal diameter of 0.36 metres or more; or (ii) With a peak throughput of 120 litres per second or more
Recommissioning of redundant Vaal-Gamagara Pipeline The extension of a 700 mm diameter underground pipeline with a maximum throughput of 650 throughput of 650 m^3/hr (180 l/s). The pipeline will be extended by the Borehole Curtain Section and the Backbone Sections described above.	9 000 m x 10 m (9 ha)		**GNR 983 – Activity 45** The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure- (i) has an internal diameter of 0.36 metres or more; or (ii) has a throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more

3.3 Description of activities to be undertaken

Sishen Mine is in the process of expanding its mining activities towards the western side of the mining pit area. This involves expansion of the pit boundaries, construction of new western waste rock dumps, and relocation of services such as railway lines and groundwater dewatering infrastructure. New dewatering boreholes and pipe infrastructure are required in line with these expansions to be able to continue with safe mining activities.

The Western Dewatering Pipeline infrastructure is required to convey water from the expanded pit areas at Sishen Mine. Furthermore, since the groundwater aquifer on which Sishen Mine is located flows from south to north, the infrastructure provides for the conveyance of water from new boreholes to be located to the south of the pits.

To reduce the number of boreholes needed on site to dewater the pits, dewatering boreholes

are being established along the southern end of the mine to dewater the aquifer upstream from the mining pits, thereby reducing the need for new boreholes inside the pits. The proposed pipelines are required to convey water from the new dewatering boreholes to the Vaal Gamagara pipeline.

A proposed new Borehole Curtain Pipeline (a 250 mm diameter HDPE above ground pipeline) will be constructed south of the D3333 road to convey water from the boreholes to a redundant section of the old Vaal-Gamagara pipeline (an existing 700 mm underground pipeline) which runs parallel to the D328 road. It is proposed that the pipeline passes through an existing road culvert to allow for the crossing of the D328.

The water will be pumped northwards via the existing Sishen Sedibeng pump station to a proposed Backbone Extension Pipeline (a 350 mm above ground steel pipeline) which will join with the existing pipeline network within Sishen Mine for export to the Vaal-Gamagara pipeline at the Kathu Reservoir located north of Sishen Mine.

The integrity of the old Vaal-Gamagara pipeline will be checked and where required the necessary refurbishments carried out, if required. The Sishen-Sedibeng pump station which is currently used by Sishen to pump water from some of the southern sections of the mining area, may need to be upgraded to allow the pumping of additional water as a result of the implementation of the new infrastructure.

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4. POLICY AND LEGISLATIVE CONTEXT

TABLE 4: POLICY AND LEGISLATIVE CONTACT OF THE PROPOSED PROJECT.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process	**REFERENCE WHERE APPLIED**	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT?** (E.g. In terms of the National Water Act a Water Use License has/ has not been applied for)
Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA)	The BAR and draft EMPr are submitted in support of the Section 102 application.	In terms of **Section 102 of the MPRDA**, an amendment of the Sishen Mine Environmental Management Programme (EMPr) as amended to include the construction of the dewatering boreholes and pipeline infrastructure at Sishen Mine has been applied for.
National Environmental Management Act 107 of 1998 (NEMA) Environmental Impact Assessment Regulations, 2014 (EIA Regulations) (GNR 982 in GG 38282 of 4 December 2014)	The BAR and EMPr have been structured to ensure compliance with the requirements of the EIA Regulations.	In terms of Regulation 31 of Part 2 of Chapter 5 of the EIA Regulations under **NEMA**, an amendment of the Sishen Mine EMPr as amended, has been applied for
EIA Regulations: Listing Notice 1 of 2014 (GNR 983 in GG 38282 of 4 December 2014)	See Section 3.2	In terms of **NEMA** environmental authorisation for Listed activity 9 and 45 triggered in listing Notice 1 has been applied for
Northern Cape Nature Conservation Act 9 of 2009 (NCNCA)	See Section 7.9.1.4 for description of protected species. Also see Appendix D	In terms of Section 50 of NCNA a permit is required for the removal of TOPS, including *Lessertia frutescens subsp. Frutescens* and *Boscia albitrunca*
National Forest Act 94 of 1998	See Section 7.9.1.4 Also See Appendix C	Three tree species, *Vachellia erioloba, Vachellia haematoxylon, Boscia albitrunca* which is listed as Protected in Section 15 (1) of the NFA was observed within the study area. All relevant permits pertaining to these species are to be acquired prior to onsite activities.
National Heritage Resources Act 25 of 1999	See Section 7.1.9.6 Also See Appendix C	Phase 1 Heritage Impact Assessment Completed including a Palaeontological Impact Assessment completed in terms of Section 38(3) of the Act. No heritage artefacts identified.
National Water Act 36 of 1998 and Regulations for the use of water for mining and related activities aimed at protected water resources (GNR. 704, June 1999	See Section 7.9.1.2	Section 21 of the Act provides for listed activities. The project will trigger Section 21(c)& (i) water uses and the Backbone Extension Pipeline crosses wetland pans. This disturbance is already included in the Sishen Water Use Licence

5. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

Sishen Mine is in the process of expanding its mining activities towards the western side of the mining pit area. This involves expansion of the pit boundaries, construction of new western waste rock dumps, and relocation of services such as railway lines and groundwater dewatering infrastructure. The Western Dewatering Pipeline infrastructure Project is required to convey water in this area. The western expansion at Sishen Mine cannot be realised if the dewatering infrastructure is relocated to support the such activities.

Furthermore, the pipeline is required to convey water from new boreholes (borehole curtain) to be drilled to the south of the pit areas. The groundwater aquifer on which Sishen Mine is located flows from south to north. To reduce the number of boreholes needed on site to dewater the pits, dewatering boreholes are being established along the southern end of the mine within the same dewatering compartment as the existing pit boreholes but aimed at dewatering the aquifer upstream from the mining pits. This reduces the need for new boreholes inside the pits. This means that boreholes are not destroyed by mining activities, thus not requiring the need for new boreholes to constantly be created within the active mining area.

6. MOTIVATION FOR THE OVERALL PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVE.

Three alternative routes were considered for the Backbone Extension section of the proposed pipeline (see Section 7.1).

Alternative Route 1 (see Figure 3) was selected as the preferred alternatives based on the following:

- The wetland pans to be traversed by the pipeline have already been impacted on due to the development of extensive linear infrastructure developed for the mine.
- The destruction of wetland pans to be traversed by Alternative Route 1 are authorised under Section 21 (c & i) of the National Water Act (Licence No. 10/D41J/BCGI/2643).
- Alternative Route 1 will follow the route of existing linear infrastructure and will not result in any new disturbance areas.
- The route allows for the western pit expansion and the development of the authorised Western Waste Rock Dump.
- The route has allowed sufficient space to allow for the ongoing rehabilitation of the Western Waste Rock Dump.

Based on the above there is no environmental reason of sufficient significance to prevent the implementation of SIOC's preferred alternative.

7. DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED ALTERNATIVES

7.1 Details of the development footprint alternatives considered.

Three alternatives routes have been considered for the Backbone Extension Pipeline section of this project (see Figure 3):

- Alternative Route 1 (preferred) presents the shortest distance of the alternatives to connect the old Vaal-Gamagara section of the pipeline to the existing export dewatering pipeline infrastructure at the mine.

  This is the original route proposed by SIOC. This route distance of the Backbone Extension is approximately 3.8 km. This alternative has a direct impact on (passes through) two wetland pans and is located within 100 m of three additional wetlands. All these wetland pans have already been significantly disturbed by the development of infrastructure such as the Western Waste Rock Dump and linear infrastructure such as haul roads and pipelines. The route has been planned to allow for the expansion of the Western Waste Rock Dump within the authorised footprint area (including rehabilitation) as well as the western expansion of the pit.

- Alternative Route 2 – presents the route that has the least impact on wetland pans by ensuring that the route is at least 100 m from any wetland pan.

  The route avoids the five wetlands impacted on by Alternative 1. Alternative 2 measures a distance of the Backbone Extension of approximately 4.4 km and is located on previously disturbed land. The route allows for the expansion of the Western Waste Rock Dump within the authorised footprint area and the western pit expansion.

- Alternative Route 3 – presents a route that is diverted around the mining infrastructure in order to allow expansion of the pit and waste rock dumps.

This pipeline alternative is approximately 13.8 km and runs to the west of the approved Western Waste Rock Dump. This alternative will run on land which has not previously been disturbed. This alternative will therefore require the clearance of vegetation and the modification of undisturbed land. Of importance is a high density of the nationally protected tree *Vachellia erioloba* (Camelthorn Trees) along the route, due to a high density of such trees to the west of the Sishen Western Waste Rock Dump footprint area. The area also has high grazing land capability and is currently used for livestock grazing. The route however allows for further expansions of the Western Waste Rock Dump to the east and the pit to the west negating the need for future relocation of the pipeline.

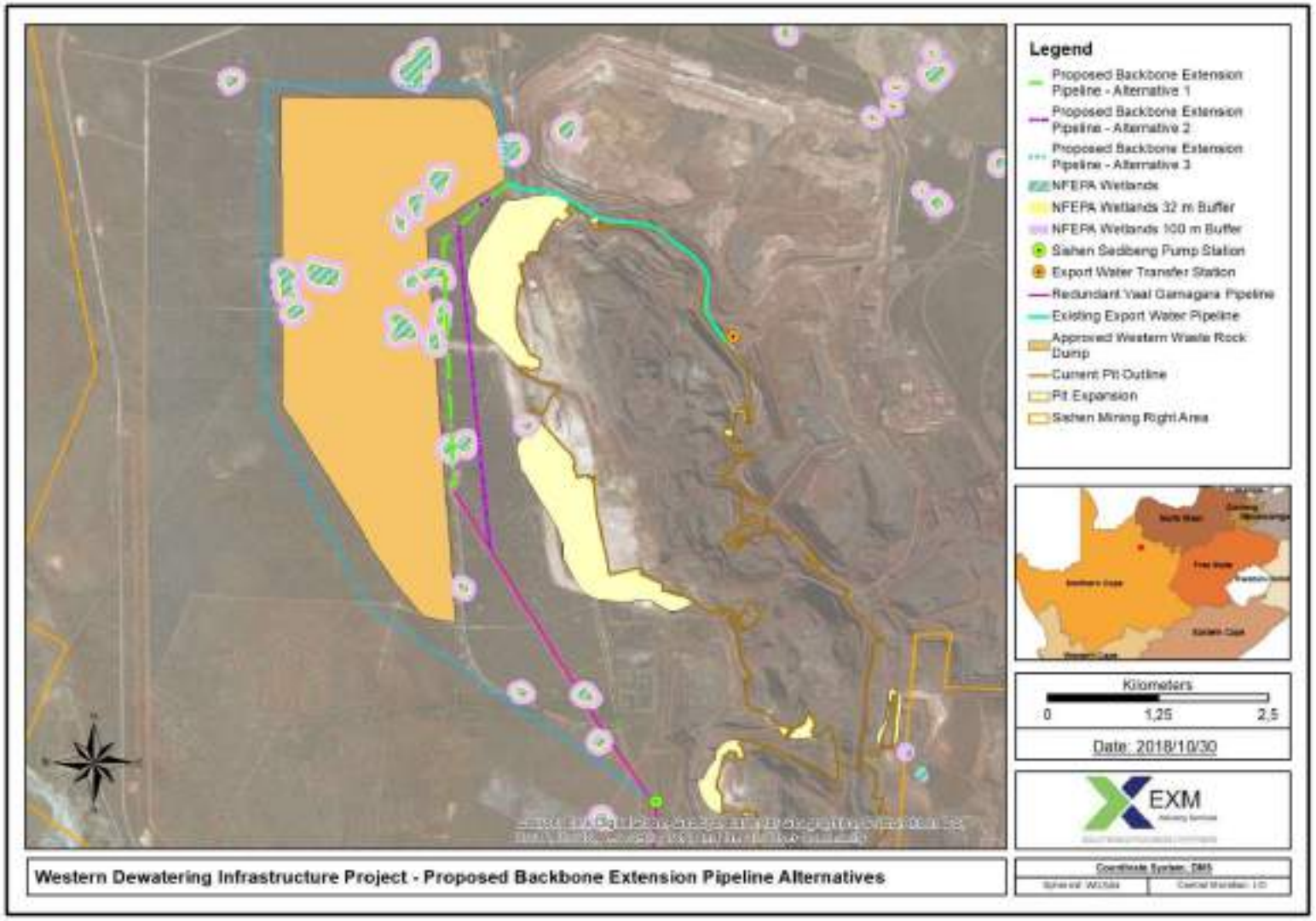


FIGURE 3: WESTERN DEWATERING INFRASTRUCTURE PROJECT PROPOSED BACKBONE EXTENSION ROUTE ALTERNATIVES

7.2 The type of activity to be undertaken

The activity involves the development of a pipeline for the purposes of conveying bulk water resulting from dewatering activities at Sishen Mine. There are no feasible activity alternatives to the development of pipelines.

7.3 The design or layout of the activity

The options available for design include above ground versus underground pipelines. The use of above ground pipelines is more cost effective to construct resulting in less damage to the environment due to excavation activities. The long-term visual impact of the above ground pipeline is however greater than for an underground pipeline. Such pipelines can also present a safety risk if constructed close to a road (i.e. in a road reserve). Underground piping has not been considered for the project except for the recommissioning of the old Vaal-Gamagara pipeline. As part of the mitigation proposed as part of the outcomes of the Basic Assessment, it is recommended that the distance of the Borehole Curtain Pipeline from the road be maximised to minimise the visual impact as well as the safety risks.

7.4 The technology to be used in the activity

The technology/types of materials used for the pipelines are determined based on its primary purpose. In terms of the Backbone Extension Pipeline; a High-density Polyethylene (HDPE) thermoplastic pipeline, with a diameter of 350 mm, will be used and placed aboveground. The Dewatering Curtain Pipeline will be a steel pipeline with a diameter of 350 mm, also placed aboveground. No alternatives have been considered for these materials.

The feasibility of using the redundant Vaal-Gamagara pipeline versus the development of new pipeline infrastructure was assessed. A condition assessment was undertaken of the redundant pipeline to determine the feasibility of its recommissioning. The re-use of the existing underground pipeline presents the best environmental alternative as additional environmental disturbance is prevented and disused infrastructure will be refurbished preventing it from becoming derelict.

7.5 The operational aspects of the activity

The operation of the Western Dewatering Pipeline infrastructure involves the pumping of water within pipelines. There are no alternatives to the proposed operations.

7.6 The option of not implementing the activity

Should the relocation and construction of infrastructure for this project not be approved, it will not allow for the management of water required for the authorised western pit expansion. Safe mining at Sishen Mine will not be possible.

7.7 Details of the public participation process followed

The public participation process was conducted in-line with the requirements of Chapter 6 of the NEMA Environmental Impact Assessment Regulations, Regulation 982.

7.7.1 Identification of interested and affected parties

Existing databases held by Sishen Mine were updated for the purposes of this project. Potential Interested and Affected Parties (IAPs) were identified based on the definition of IAPs in the EIA regulations. This includes:

- Landowners or tenants adjacent to or within 100 m from the proposed study area.

  Since the project occurs within the Sishen Mine fenced-off area, this definition was expanded to include neighbours to the mine.

- Any organisation of ratepayers that represent the community in the area (if applicable).

- Representatives of the local municipality/ward councillor with jurisdiction in the area.

  This definition was expanded for the purposes of the assessment to include the mayor, councillors of the local council as well as members of the district municipality. This included representatives of:

  - Gamagara Municipality
  - Joe Morolong Municipality
  - Ga Segonyana Municipality
  - John Taolo Gaestsewe District Municipality

- Authority or organs of state having jurisdiction in respect of any aspect of the activity, including. The following organs of state have been notified:

  - Department of Water and Sanitation (Northern Cape)
  - Department of Agriculture, Forestry and Fisheries (Northern Cape)
  - Department of Mineral Resources (Northern Cape)
  - Department of Environment and Nature Conservation (Northern Cape)
  - Department of Land Reform and Rural Development (Northern Cape)
  - Department of Economic Development and Tourism (Northern Cape)
  - Department of Roads and Public Works (Northern Cape)
  - Department of Social Development (Northern Cape)
  - South African Heritage Resources Agency

- Persons who responded to the Background Information Document (BID), press advertisements and site posters

- Persons who attended the public meeting during the scoping phase

A list of all parties that have been identified thus far is included as Appendix B1

7.7.2 Notifications

In accordance with Section 41(2)(b) of Chapter 6 of the EIA Regulations (GN. 982 of 4 December 2014, as amended), written notification (including BID document by email or facsimile) has been given to all persons on the IAP database.

Proof of the notification is provided in Appendix B2.

Persons on the IAP database were notified of the project and invited to the public information-sharing meeting by:

- Email including BID (where email addresses are available); and/or
- SMS (where cell phone numbers are available);
- On-site posters; and/or
- Newspaper advertisements.

7.7.3 Media advertisements and site notices

Other forms of notification included the placement of Site Notices (as per the Regulation required size (A2)) at various locations. Two site notices (one in English and one in Afrikaans) were placed at each of the following locations within Kathu:

- Sishen Mine entrance;
- Kathu Spar;
- Kathu Foodzone;
- Next to the road (D3333) near Lylyveld.

The site notices were available whereby IAPs can register to be provided with more information on the project.

Photos of the site notices are provided in Appendix B3.

Press advertisements were placed in the following newspapers:

- The Volksblad on 5 September 2018 in Afrikaans; and
- The Kalahari Bulletin on 6 September 2018 in English.

A copy and proof of the newspaper adverts is provided in Appendix B3.

7.7.4 Public meeting

A public meeting was held on 13 September 2018, at the Kalahari Country Club in Kathu. Minutes of the meeting are provided in Appendix B4.

7.7.5 Gathering Comments, Issues and Concerns from IAPs

IAPs were provided with the opportunity to register as IAPs and raise issues and concerns. All correspondence received is included in Appendix B5 and documented in Section 7.8.

7.7.6 Review and Commenting on the BAR

The BAR will be available for review and comment from 12 November to 12 December 2018. Notification will be made by email and SMS. All IAPs are notified of the availability of the report via email and/or SMS. The report was made available:

- electronically (via email) or flash drive (to commenting authorities and on request);
- hard copy (within the Kathu Public Library, to commenting authorities where requested and on request by IAPs).

7.8 Summary of issues raised by IAPs

Please refer to Appendix B4, for the full comments in minutes and correspondence with IAPs and authorities. Correspondence received to date is included in Appendix B5.

DATE	NAME	CORRESPONDENCE RECEIVED	EAPs RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS (consensus, dispute, not finalised, etc.)
AFFECTED PARTIES				
Landowners/Lawful Occupiers of Adjacent Properties - No comments received to date.				
Local Authorities - No comments received to date.				
Competent Authorities				
9/9/2018	Philani P. Msimango	Good Day Could you please clarify why was this project not included as part of the Sishen Consolidated water use licence application submitted in June 2018? There were a few lengthy discussions held with Sishen Iron Ore Company where it was discussed that all projects which are to be implemented in the nearby future be included in one consolidated application (which was submitted in June 2018). I was under the assumption that all projects have been included in the consolidated water use licence. Your assistance in this regard will be highly appreciated. Regards; Mr. Philani P. Msimango Please see proof of correspondence in Appendix B5.1a	Dear Philani There is no water use licence requirement for this application. You have been notified of the development as a commenting authority. This is only an EA process falling under the responsibility of the DMR to authorise. Please do not hesitate to contact me should you any queries. Kind Regards; Kerry Fairley Please see proof of correspondence in Appendix B5.1a	Consensus
9/9/2018		Good Day I think you are misinterpreting my concern so please allow me to provide clarity. The purpose of alerting the competent authority is for the said competent authority to provide input into whether the proposed project triggers any requirements for authorisation from that said competent authority. This might be a notification, but it is a notification on a water related project and therefore affects the Department of Water and Sanitation. All water related projects should at the very least be included in the IWWMP. Therefore, my concern still stands, why was this project not included with the June 2018 application (on the IWWMP at the very least)? Regards; Mr. Philani P. Msimango Please see proof of correspondence in Appendix B5.1	Dear Philani Your comment is noted. I will confirm what was included in the IWWMP of 2018 and revert soonest with an informed response. Kind regards Kerry Fairley Please see proof of correspondence in Appendix B5.1	

DATE	NAME	CORRESPONDENCE RECEIVED	EAPs RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS (consensus, dispute, not finalised, etc.)
11/09/2018			Good morning All, This project was considered and includes in the IWWMP as follow: 1. The pipeline is part of the western expansion project 2. One new borehole had been included in the IWWMP (SW1100) I phoned Philani this morning and gave him clarity on the objective of this project (take the pipe outside of the WWRD footprint) and confirmed it is not changing the mine's water uses it is merely to ensure completeness of the EA. I also indicated we did update the 21j/a water use table of production boreholes in the IWWMP to reflect the new borehole (SW1100) that might be used this year. All concerns from DWS are resolved. Regards, Divan van der Merwe Please see proof of correspondence in Appendix B5.1	
Traditional Leaders - No comments received.				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.) – no comments received				
INTERESTED PARTIES				
03/09/2018	Judi Bolweg	Dear Delano I wish to thank you for inviting the Kathu Gazette to this very important step in the proposed expansion of Sishen mine and the necessary construction of 2 pipelines in order to facilitate the expansion, however as the local newspaper I would be more interested in a report back of the meeting, detailing some of the objections raised by farmers or interested and affected parties. If you do provide such a report, I would be very interested in receiving such. Regards; Judi Bolweg; EDITOR Please see proof of correspondence in Appendix B5.2	A report with minutes from the public meeting containing objections raised by farmers or interested parties, is available for review in the Basic Assessment Report.	Consensus
04/09/2018	Sakkie van Niekerk	Hi Delano	This application only includes the pipeline. There will be no additional abstraction from boreholes as part of this project.	Consensus

DATE	NAME	CORRESPONDENCE RECEIVED	EAPs RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS (consensus, dispute, not finalised, etc.)
		As interested and affected party I want to understand a bit more. Is this application only for the construction of the pipeline or does it include the extraction of the water from the indicated boreholes? Dewatering in this area may pose a risk as it is in a very sensitive area. Water flow from the south is coming from the Gamagara river which is very sensitive regarding the farming community as well as to the forming of sink structures putting at risk the N14 and rail lines. These boreholes are also on strike with major dyke systems into the lavas and can lead to dewatering on this already very sensitive area. The Parson area is up till now relatively good protected against dewatering but there is a possibility that these new holes may affect this area looking at the Khumani model. My biggest concern is the sink structures already existing relatively close to this area and I never saw any plan to cater for that. You may note this as a concern from my side I will try to come to the meeting. Regards; Sakkie Please see proof of correspondence in Appendix B5.3	The pipeline falls within the same dewatering compartment, and therefore, there will be no additional impacts on dewatering. According to Travis White, the current impacts at the mine will not change.	
10/09/2018	Koos van Zyl	Hallo Delano, Ek kan ongelukkig nie die vergadering bywoon nie. Is dit moontlik om vir my die info per epos deur te stuur, asb? Vriendelike groete; Koos van Zyl; Winton. Please see proof of correspondence in Appendix B5.4	A report containing information from the meeting is available for review in the Basic Assessment Report.	Consensus
13/10/2018	Public Meeting*	Sakkie van Niekerk asks if the infrastructure will be moved or will it be a new system?	Travis White responds that it will be a combination of both: moving of existing pipeline as well as a newly built pipeline.	Consensus
		Sakkie van Niekerk asks if the boreholes will replace current boreholes?	Travis White states that they are only adding to the existing system.	
		Jaap Hoffman asks if their boreholes will be affected?	Travis White confirms that it will not be affected as it is two completely different aquifers and that the water that they are pumping out is not connected to the farmers swallow boreholes	
		Sakkie van Niekerk asks what the current water level in the boreholes is?	Travis White answers: 195m. Ferdi Goussard confirms that it is within the existing dewatering area and states that monitoring will take place in order to determine the impacts.	
		Moses Moalani asks what the water will be used for?	Kerry Fairley confirms that water will go to the mine and will be exported to the Gamagara Municipality and to Sedibeng and that the current situation does not change only the boreholes change. She further confirms that the project doesn't affect the amount of dewatering.	

DATE	NAME	CORRESPONDENCE RECEIVED	EAPs RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS (consensus, dispute, not finalised, etc.)
			Travis White states that they will be pumping within the Water Use Licence (WUL) and that it will only be a smaller area and therefore a more confined impact zone.	
		Attie Du Toit asks if Sishen need to apply for a WUL?	Kerry Fairley responds that the WUL makes provision for changes and accommodates an annual update of boreholes to indicate where the boreholes are located if they have changed. Divan van der Merwe adds that the WUL allow you to change boreholes within the same aquifer compartment and that you will only need a new WUL once you go out of the compartment	
		Divan van der Merwe asks if the impacted areas will be affected by the project?	Travis White responds that it will not be affected and that it may make the impacted area smaller	
		Willie Uys mentions that he attended a meeting for extension of the WUL and that he provided input and that the mine is now starting a new project, while he has not heard anything about the previous project.	Ferdi Goussard confirms that it is two separate applications and that the Artificial Aquifer Project has nothing to do with this project.	
		Willie Uys states that he is worried about the water in the boreholes as there is already problems in the area and asks if the boreholes will be moved to different compartments?	Travis White responds that the boreholes will be in the same compartment, the volumes will be the same, they will pump less water to get more draw down and if will therefore be more effective. Kerry Fairley states that this is a better way of dewatering the required pipeline, there is nothing new, only the pipelines will change and that she doesn't think there is a big issue on the pipelines. Kerry Fairley confirms that they will map the compartments and show how it will change.	
		Moses Moalani asks if Sedibeng has the capacity to handle the volume of water?	Travis White responds that Gamagara and Sedibeng can't take the full capacity and they need to turn off some boreholes but that they are able to send water to Kalahari East to make sure upstream the Vaal Gamagara pipeline is not as full. He states that they will report where the water goes on a monthly basis.	
		Jaap Hoffman asks if the road will be cut off during construction?	Travis White answers: no, they will use existing culvert and that there will be minimal disturbances	
		Moses Moalani raises his concern regarding old graves in the Dingleton Area.	Kerry Fairley states that a Heritage Impact Assessment will be Divan van der Merwe conducted but that they don't expect any disturbances as they will use the old Gamagara pipeline that is already there.	

DATE	NAME	CORRESPONDENCE RECEIVED	EAPs RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	CONSULTATION STATUS (consensus, dispute, not finalised, etc.)
			Mashua Fhatuwani states the project will take place above the ground and therefore there will be limited disturbances.	
14/09/2018	Farmers Forum	Wat is die impak van die suidelike gat op die ontwateringskone sowel as huidige ontwatering en watervlakke?	There will be no additional impacts on groundwater, as the boreholes will be in the same compartment. In fact, the impact area may be reduced.	Consensus
19/09/2018	Transnet	Transnet have no objections to the project but would like the opportunity to re-evaluate their decision when the BAR is available. Please see Appendix B5.5 for a letter from Transnet	Transnet will be notified once the BAR is available for public review, to allow for the opportunity to re-evaluate their decision.	Consensus
28/09/2018	Transnet	Transnet have no objections to the project. A request was made for all future correspondence to be made to Mr Ezekiel Monyamane Please see Appendix B5.6 for a letter from Transnet.	Transnet will be notified once the BAR is available for public review, and further correspondence will be made to Mr Monyamane.	Consensus

*Please see Appendix B4 for the full minutes of the public meeting held on 13 September 2018.

7.9 The environmental attributes associated with the sites

7.9.1 Baseline environment

7.9.1.1 Climate

Figure 4 illustrates the significant difference between the evaporation and rainfall, which is the cause of the semi-arid landscape associated with the site and surrounds.

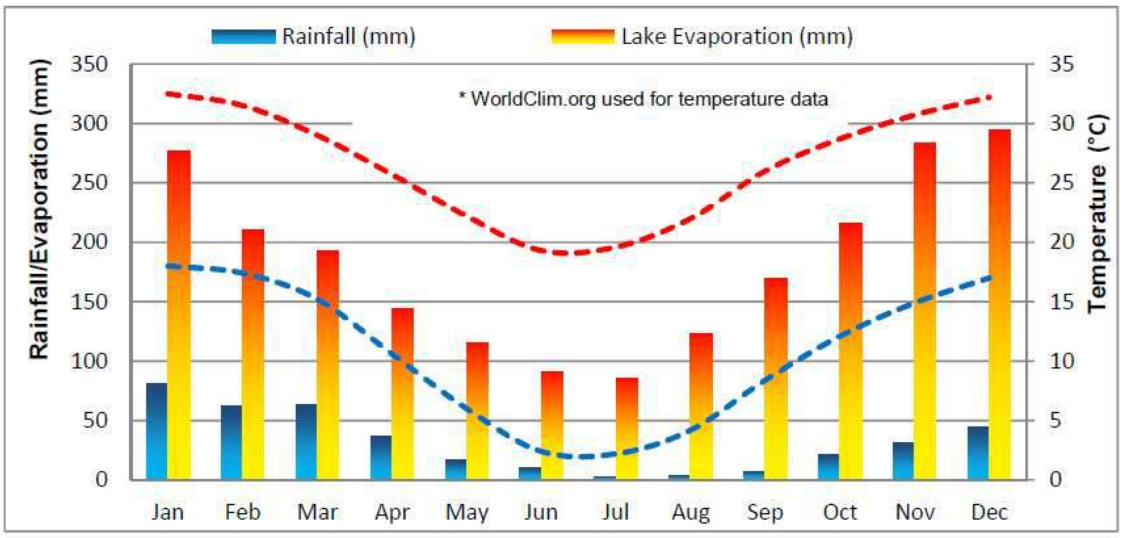
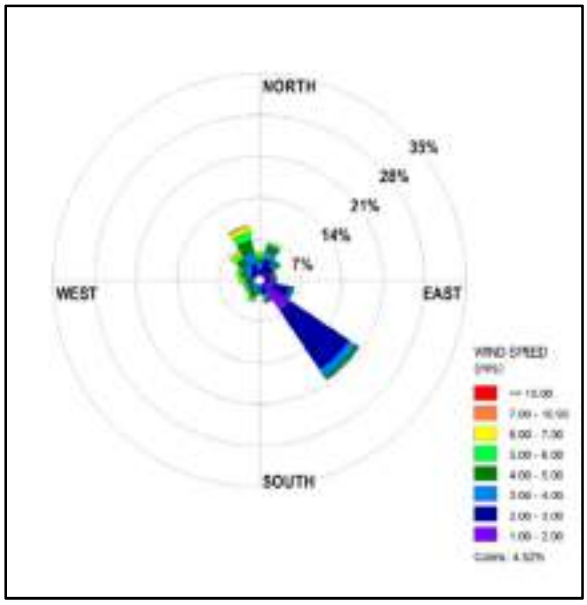


FIGURE 4: AVERAGE MONTHLY CLIMATE FOR SISHEN MINE (DESIGN POINT, 2017)

The wind rose for the period of July 2015 to June 2016 (as provided by Airshed, January 2018) is provided in Figure 5. The wind field is dominated by winds from the north-west and south east with calm conditions occurring only 5% of the time.



Source: Air Quality Impact Assessment (Airshed, January 2018)

FIGURE 5: PERIOD AVERAGE WIND ROSE FOR SISHEN MINE JULY 2015 TO JUNE 2016

7.9.1.2 Surface Water Resources

Sishen Mine and the development area is located within the Lower Vaal Water Management Area (WMA), in the D41J Quaternary Catchment drained by the endorheic Gamagara River. The regional drainage pattern of the area is primarily to the northwest in the direction of the endorheic Gamagara River, but most of the drainage lines in the mining area have historically been impacted on by mining activities. There are several wetland pans in the proximity of the proposed Western Dewatering Infrastructure Project (see Figure 6). The preferred route (Alternative Route 1) will traverse such wetlands. However as indicated in Section 6, such wetlands have already been impacted on due to the development of extensive linear infrastructure developed for the mine. No additional disturbance will be created as the recommissioning of the old Vaal-Gamagara section. No wetlands or drainage lines occur in the vicinity of the Dewatering Curtain Pipeline. The Gamagara River lies 2.2 km north of the Gamagara River.

The destruction of wetland pans to be traversed by Alternative Route 1 are authorised under Section 21 (c & i) of the National Water Act (Licence No. 10/D41J/BCGI/2643). No additional disturbance will occur as result of the pipeline development.

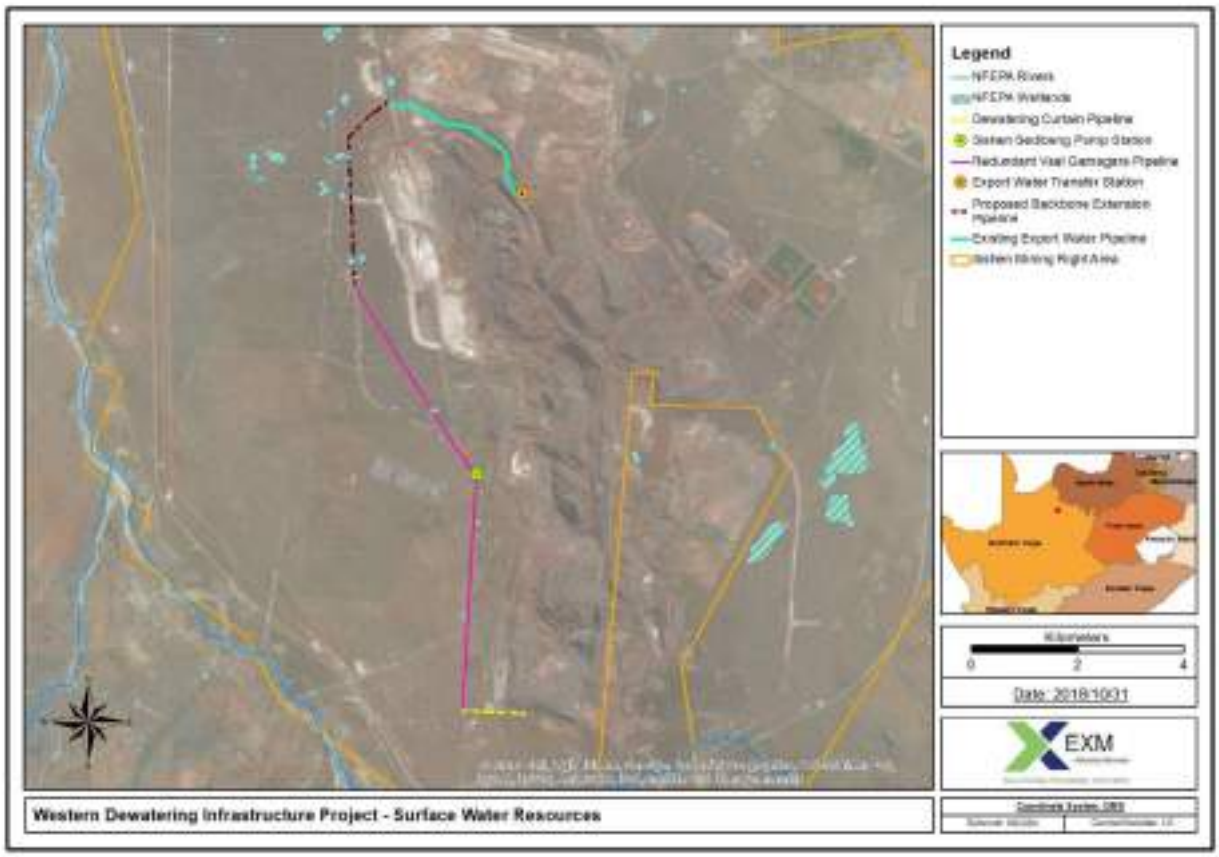


FIGURE 6: SURFACE WATER RESOURCES

7.9.1.3 Groundwater

Sishen Mine is licensed to remove 25 725 543 m^3/annum from the Sishen Aquifer to allow for the safe continuation of mining activities, in terms of Section 21(j) of the NWA. Water supply at Sishen Mine is supplied through mine dewatering activities. Water is also recycled from the municipal sewage treatment plants. The Western Dewatering Pipeline Infrastructure Project does not require any additional dewatering. The Water Use Licence (Licence No. 10/D41J/BCGI/2643), provides for the annual update of the location of boreholes used in dewatering, as boreholes are relocated regularly, where boreholes have to be moved due to mining disturbance. Boreholes are being established along the borehole curtain in accordance with this condition of the licence. The boreholes will also be constructed within the Sishen Western Compartment in line with current dewatering activities (see Figure 7).

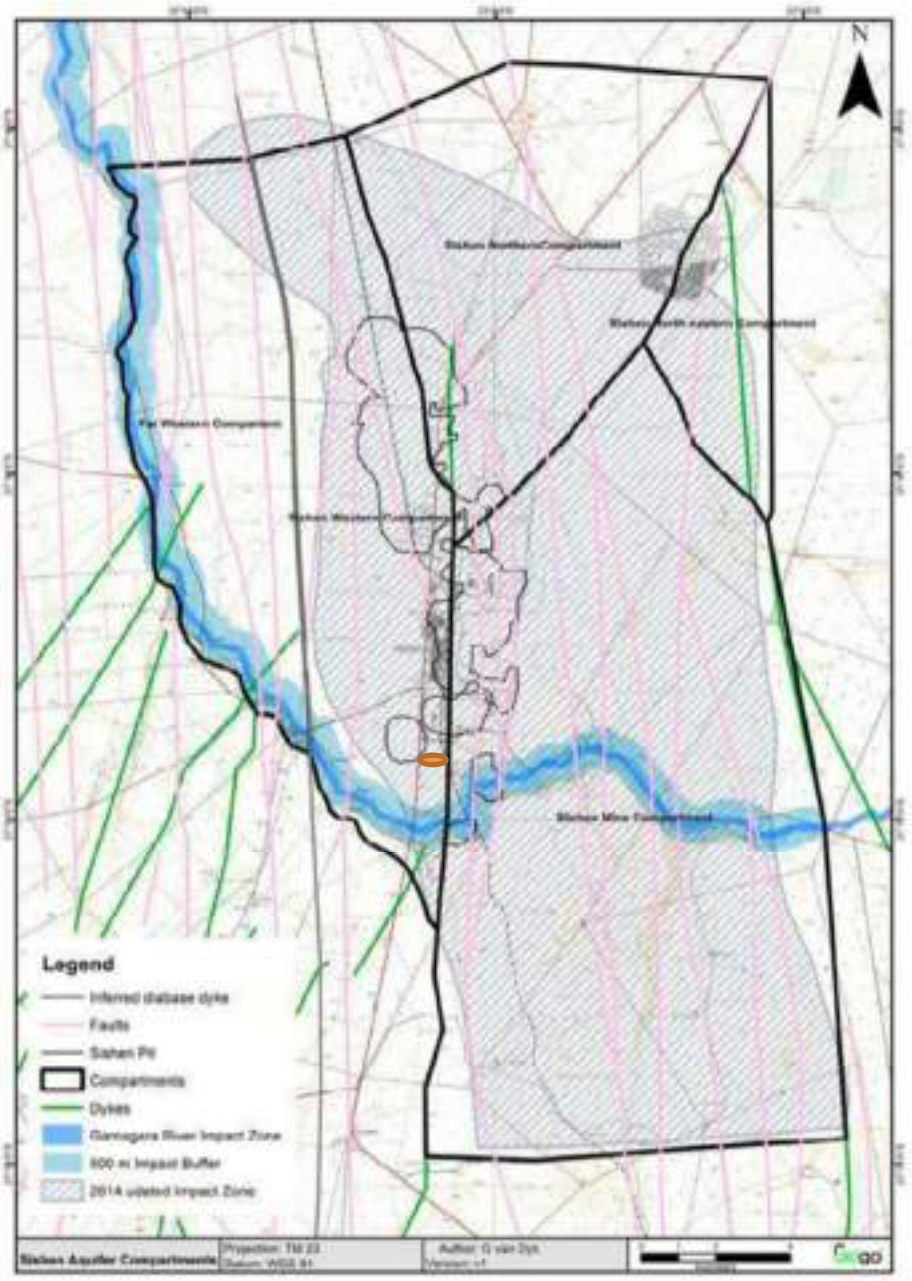


FIGURE 7: GROUNDWATER AQUIFERS

The groundwater monitoring network at Sishen Mine is shown in Figure 8. The quality of primary and shallow groundwater at Sishen Mine has been impacted on by historic pollution, with hydrocarbons being the most important contaminants resulting in pollution at the mine.

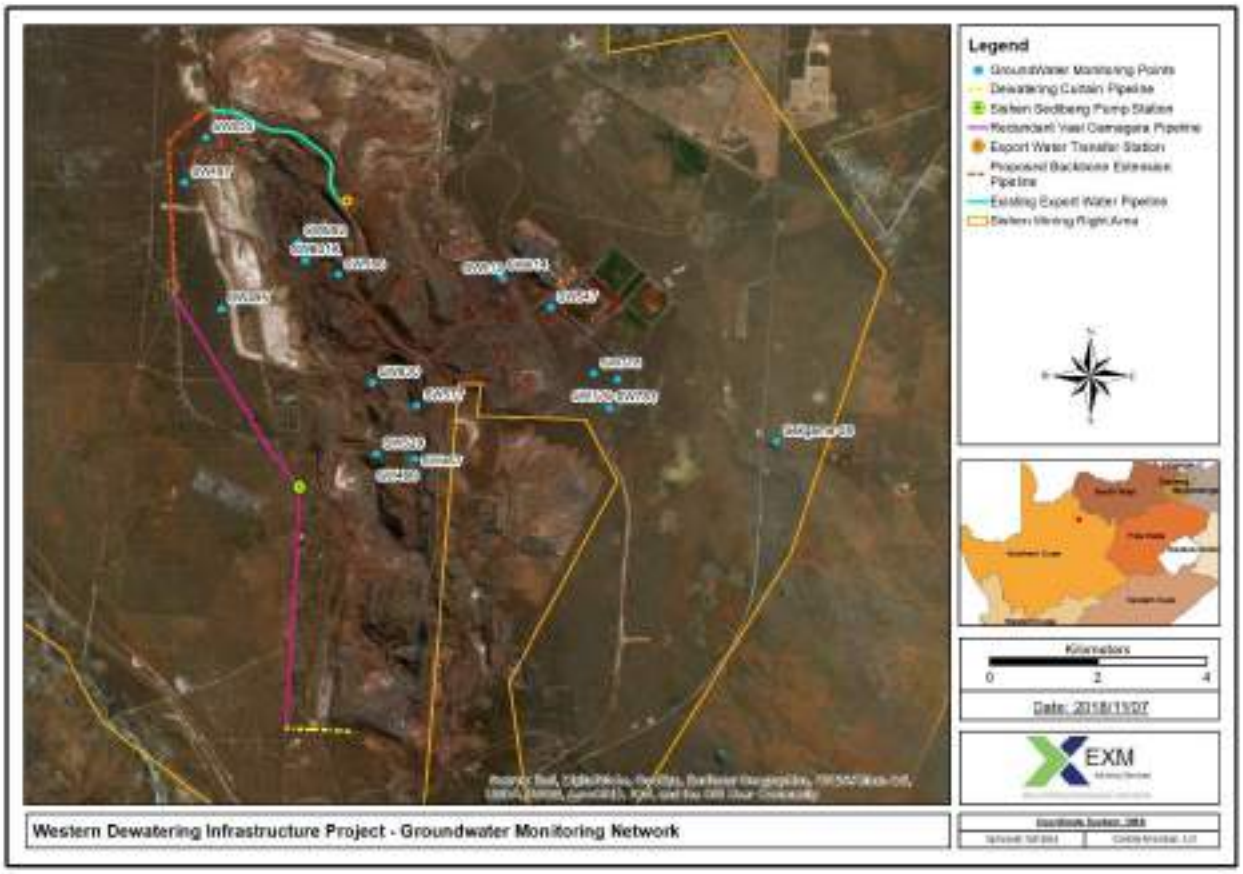


FIGURE 8: GROUNDWATER MONITORING NETWORK AT SISHEN MINE

7.9.1.4 Biodiversity

Sishen Mine including the areas proposed for the pipeline development are located is within Kathu Bushveld/Kuruman Thornveld (Munica & Rutherford, 2006) and is regarded as having moderate sensitivity (Lidwala, 2013). In total, the study area comprises an area of approximately 50 hectares in extent and is characterised by mixed wooded tree and shrub species on a Kalahari Sand substrate (Kalahari Group). The section to be disturbed by the Dewatering Curtain Pipeline falls within an Ecological Support area (associated with the Gamagara River) and is largely undisturbed (see Figure 9). The vegetation along the disused section of the Vaal-Gamagara pipeline has re-established, although there are still signs of disturbance in this area. The section proposed for the establishment of the Backbone Extension Pipeline is severely disturbed as a result of the proximity to current mining activities (see Plate 1).

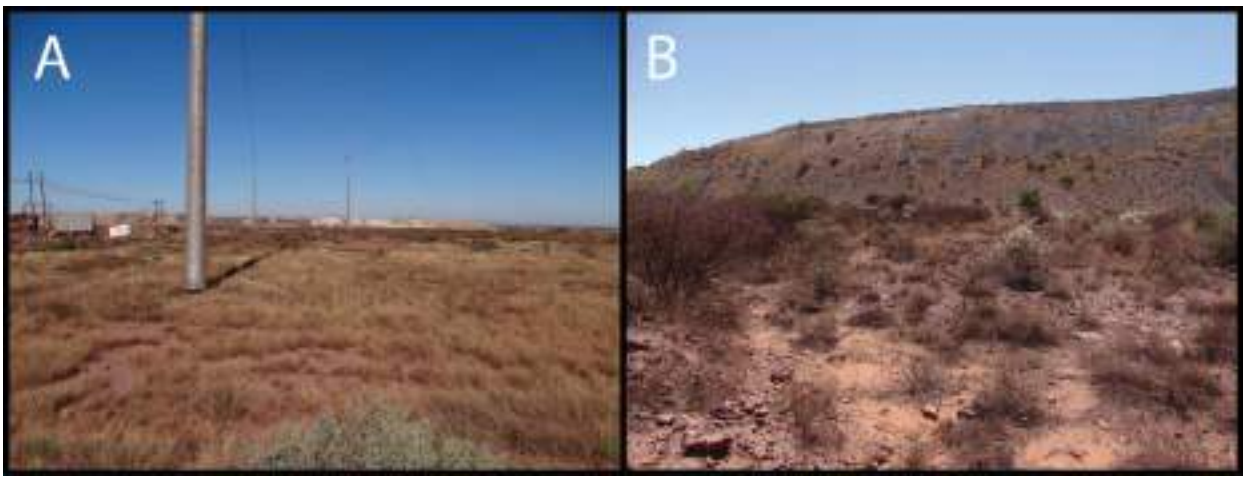


PLATE 1 – GENERAL VIEW OF TYPICAL SCENES FOUND WITHIN THE STUDY AREA. A. BACKBONE EXTENSION PIPELINE B. DEWATERING CURTAIN PIPELINE SECTION. (SOURCE: PGS HERITAGE, 2018).

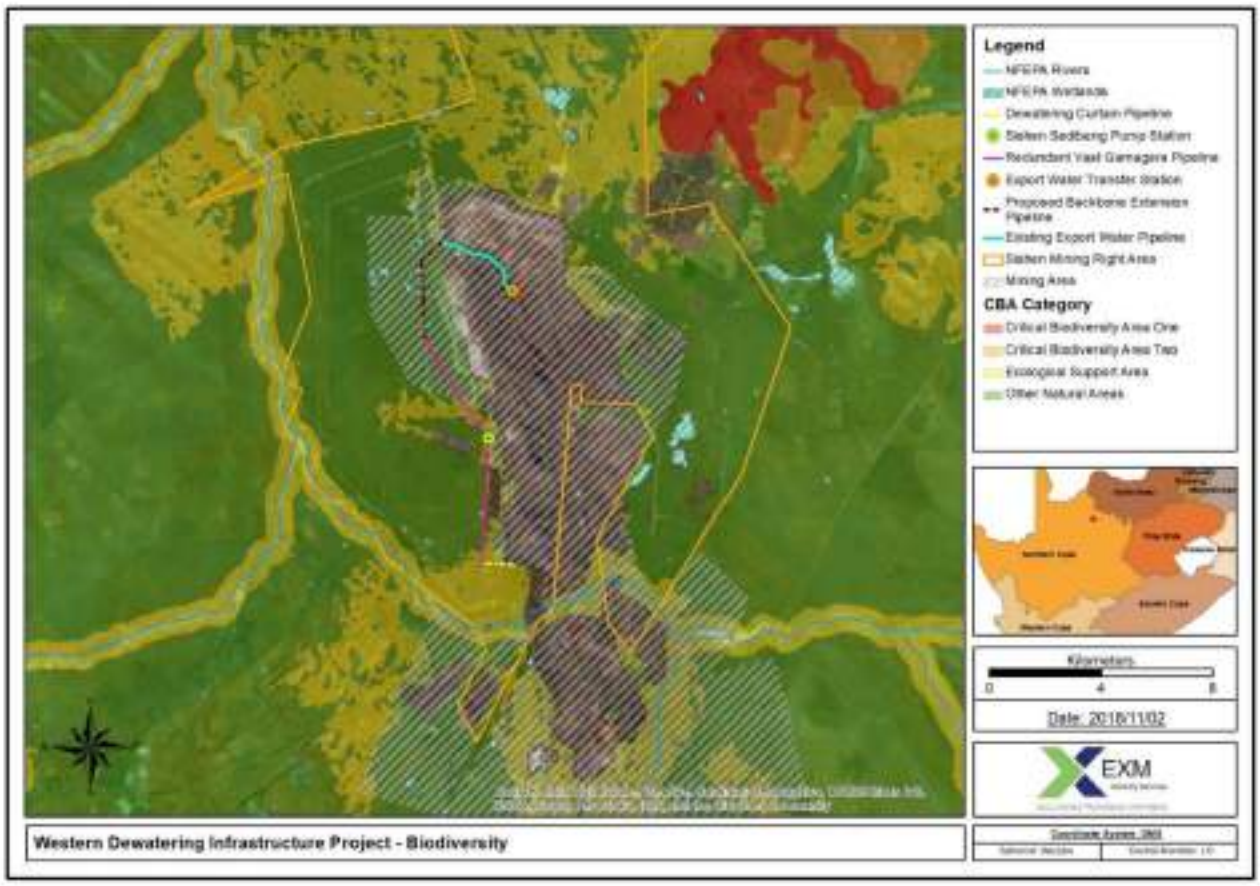


FIGURE 9: SISHEN MINE BIODIVERSITY SENSITIVITY MAP

Scientific Terrestrial Services (SAS) conducted a Protected Plant Survey along Alternative Route 1 (preferred) on 29 - 31 September 2018 (see Appendix D). Three different species Protected in Section 15 (1) of the National Forest Act (1998, as amended in September 2011) were found along the route, namely, *Vachellia erioloba (Camel thorn)* & *Vachellia haematoxylon* (Grey Camel Thorn), and *Boscia albitrunca* (Shepherd's Tree). *Lessertia frutescens subsp. Frutescens* (Cancer Bush) and which is protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) were also found along the route. The protected plants are shown in Plate 2.

The study area was predominantly inhabited by faunal species common to the region, that are widely distributed throughout the surrounding habitat.

The locations of the protected plant species are shown in Figure 10.

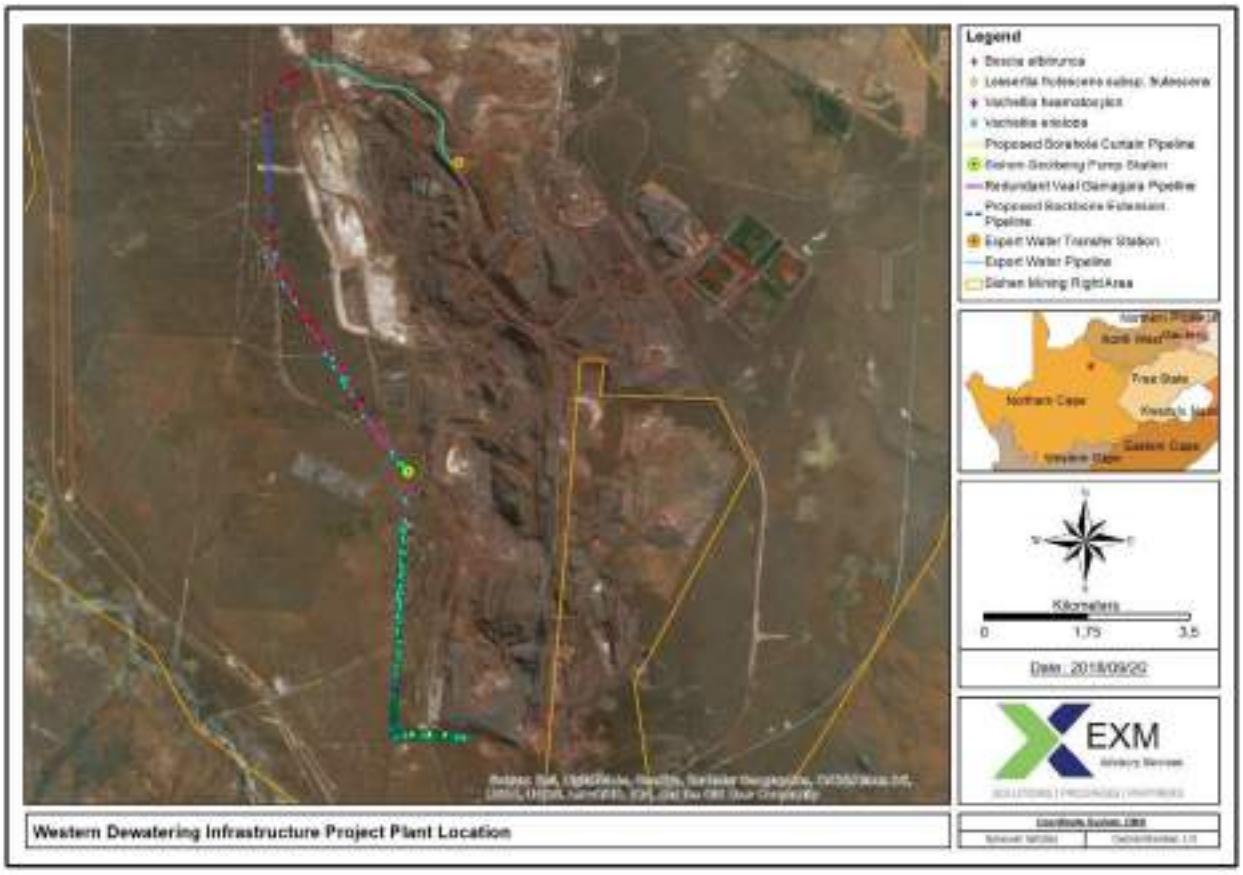


FIGURE 10: LOCATION OF PROTECTED PLANT SPECIES SURROUNDING THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

***Boscia albitrunca* - Shepherds tree**

***Lessertia frutescens subsp. frutescens* - Cancer bush**

***Vachellia erioloba* (left) & *Vachellia haematoxylon* (right) - Camel Thorn**

PLATE 2: PROTECTED PLANT SPECIES SURROUNDING THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

7.9.1.5 Land Tenure

The proposed Western Dewatering Infrastructure Project will be located within the existing Sishen mining right area. The Sishen Mine surface rights and operating assets are owned by the Sishen Iron Ore Company (Pty) Ltd (SIOC). The properties on which the project will be located are provided in Table 5 and shown in Figure 11.

TABLE 5: PROJECT PROPERTY SURFACE RIGHT OWNERSHIP

Infrastructure	Location	Property Ownership*
Backbone Extension Pipeline	Sacha 468 Portion 4 - C04100000000046800004 Sacha 468 Portion 2 - C04100000000046800002 Sacha 468 Portion 3 - C04100000000046800003 Gamagara 541 Portion 4 - C04100000000054100004	Sishen Iron Ore Company (Pty) Ltd
Dewatering Curtain Pipeline	Gamagara 541 Portion 2 - C04100000000054100002 Sishen 543 Portion 19 - C04100000000054300019 Sishen 543 Portion 2 - C04100000000054300002 Sishen 543 Portion 1 - C04100000000054300001	Sishen Iron Ore Company (Pty) Ltd

7.9.1.6 Cultural Heritage and Palaeontology

A heritage impact assessment (HIA) including a palaeontological desktop study was conducted for the development by PGS Heritage (October 2018). The report is attached hereto as Appendix C.

The study found that the proposed development site is completely underlain by sediments of the Early Precambrian, Transvaal Supergroup, Ghaap Group and Campbell Rand Subgroup. The Campbell Rand Subgroup sediments were deposited on the shallow submerged Kaapvaal Craton, approximately 2.6 to 2.5 Ga (billion years ago). Notably, the entire area surveyed for this project was heavily disturbed by past and current mining activities (PGS Heritage, October 2018). The fieldwork conducted on 4 October 2018 found no significant concentrations of archaeological or heritage materials. Further, the landscape was found to be heavily disturbed by previous farming and/or mining activities.

The PalaeoMap (SAHRA website) indicates that the palaeontological significance of the Transvaal Group, Campbell Rand Subgroup is moderate and thus the overall impact of the proposed developments is rated as negative moderate significance. As per the palaeontological desktop assessment the proposed development is unlikely to pose any substantial threat to local fossil heritage and developments should go forward.

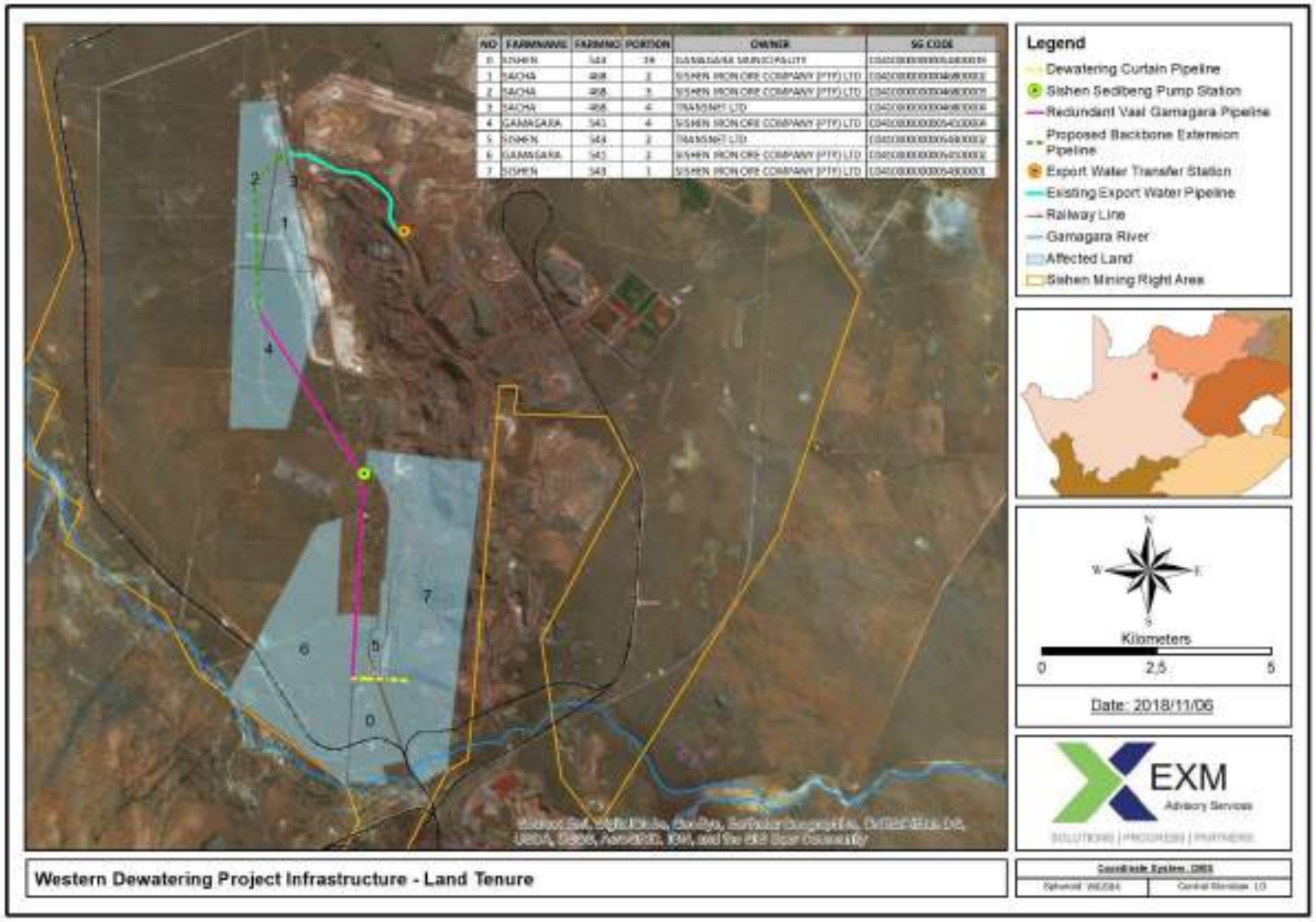


FIGURE 11: LAND TENURE

7.9.1.7 Socio-Economic Environment

Sishen Mine is located in the Gamagara Local Municipality within the John Taolo Gaetsewe District Municipality which includes the towns of Kathu, Dibeng, Sesheng and Olifantshoek. Sending municipalities include Joe Morolong Local Municipality and Ga-Estonians Local Municipality.

Sishen Mine has played a significant role in the establishment and development of the town of Kathu and surrounds since 1953. The district is largely reliant on mining with mining contributing 55.5% to the district and 77.5% to the local municipal economy (Demacon, 2016). The mining sector is also the largest employer in the local economy. According to Demacon (2016) there are approximately 50 000 people living in the Gamagara municipal area of which 65% are economically active and 82.3% are formally employed. The sending municipalities show lower economically active segments with approximately 51% and 26% of persons being economically active in Gamagara Local Municipality and Joe Morolong Local Municipality, respectively. Unemployment in these municipalities is also high at 33% and 39%, respectively. Similarly, the living standards in the sending municipalities are far lower than in Gamagara. Sishen Mine plays a crucial role in both the local and provincial economy. For every employee working at the mine, approximately five other people are affected (Demacon, 2016).

The closest receptors to the project include Dingleton (in the process of being relocated) located to the east of the old Vaal-Gamagara pipeline and north of the Dewatering Curtain Pipeline. The Jan Keyser Caravan Park is located south of the Dewatering Curtain Pipeline section. Users of the D333 will also be subjected to the development.

The Western Dewatering Infrastructure Project will result contract opportunities during the construction phase. No new employment opportunities will be created during the operation phase.

7.9.1.8 Description of current land uses

The proposed Backbone Extension Pipeline will be developed in an existing disturbed section of the mining area (see Plate 3) which has been extensively developed to allow for infrastructure required to support activities in the western sections of Sishen Mine.

PLATE 3: EXISTING ROAD BORDERING THE PROPOSED BACKBONE EXTENSION PIPELINE ROUTE. (SOURCE: PGS HERITAGE, 2018).

The Dewatering Curtain Pipeline will be located to the south of the D3333. This area also shows evidence of disturbance (see Plate 4).

PLATE 4: GENERAL VIEW OF A SECTION OF THE DEWATERING CURTAIN PIPELINE SECTION SHOWING EVIDENCE OF DISTURBANCE (SOURCE: PGS HERITAGE, 2018).

The old Vaal-Gamagara pipeline will be used to connect the Dewatering Curtain Pipeline to the Backbone Extension Pipeline. This existing pipeline runs parallel to the D328 to the west of Dingleton Township, which is in the process of being demolished to be incorporated into the mine.

7.9.2 Description of specific environmental features and infrastructure on the site

The Western Dewatering Infrastructure Project development falls within an area that is currently not protected and that is least threatened. Land uses are given in Figure 12. Protected tree and plant species do however occur along the route and these will be disturbed by the proposed development.

Several wetland pans occur in the proximity of the development and the Preferred Alternative Route 1 will disturb these sites. However as indicated in Section 6, The wetland pans to be traversed by the pipeline have already been impacted on due to the development of extensive linear infrastructure developed for the mine. Furthermore, the destruction of wetland pans to be traversed by Alternative Route 1 are authorised under Section 21 (c & i) of the National Water Act (Licence No. 10/D41J/BCGI/2643).

7.9.3 Environmental and current land-use map

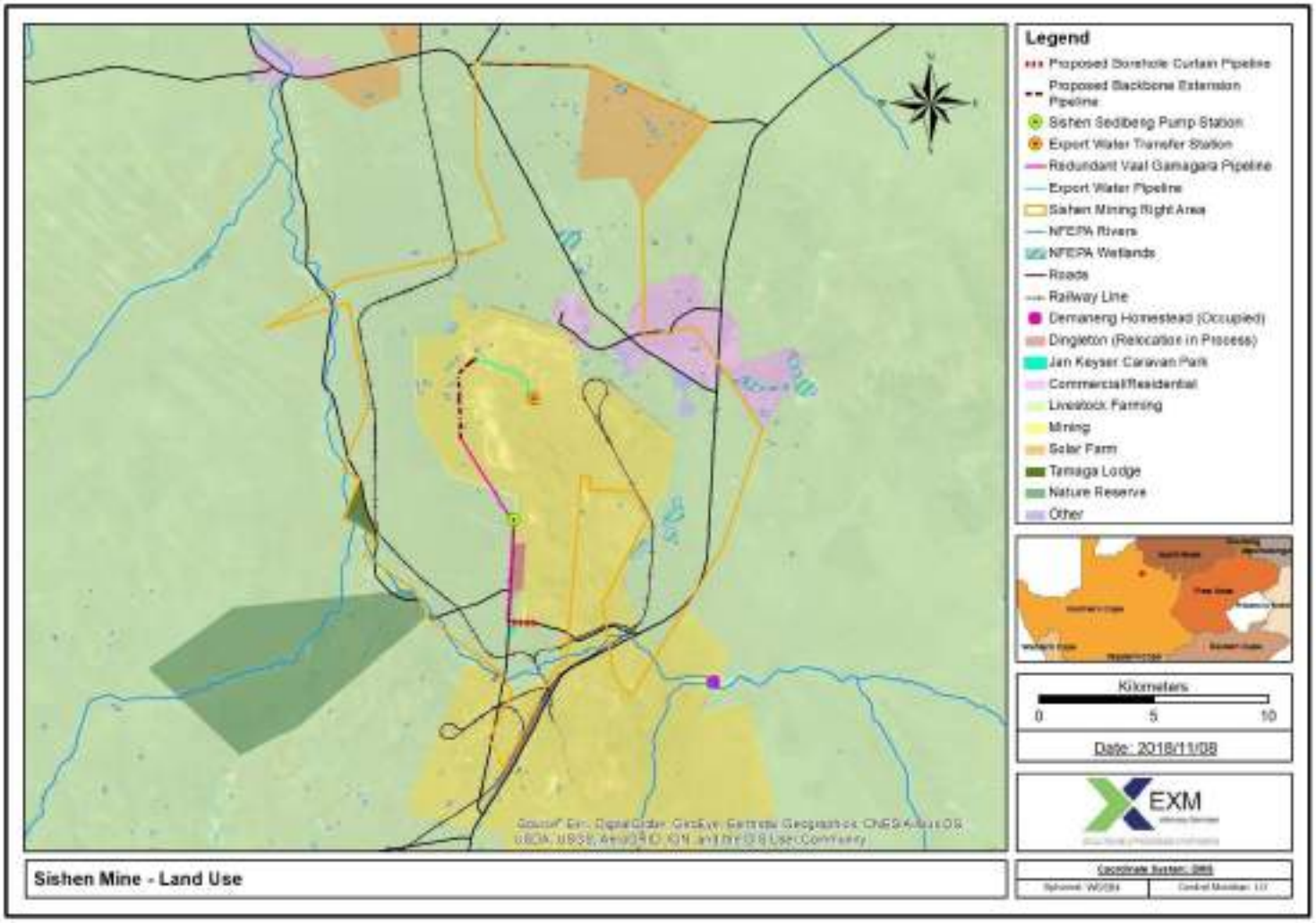


FIGURE 12: SISHEN MINE CURRENT LAND USE MAP

7.10 Impacts identified

The list of the potential impacts of the activities that will be undertaken, as described in the initial site layout are included below. This list of impacts has been informed by both the typical known impacts of such activities and as informed by the consultation with interested and affected parties.

7.10.1 Methodology used in determining the significance of environmental impacts

Impact Ranking Criteria

The impact assessment method used in this assessment considers the current environment, the details of the proposed amendment activities and the findings of the specialist studies. Cognisance has been given to both positive and negative impacts that may result from the developments. The significance of the impact is dependent on the consequence and the probability that the impact will occur.

impact significance = (consequence x probability)

Where:

consequence = (severity + extent)/2

and

severity = [intensity + duration]/2

Each criterion is given a score from 1 to 5 based on the definitions given below. Although the criteria used for the assessment of impacts attempts to quantify the significance, it is important to note that the assessment is generally a qualitative process and therefore the application of this criteria is open to interpretation. The process adopted will therefore include the application of scientific measurements and professional judgement to determine the significance of environmental impacts associated with the project. The assessment thus largely relies on experience of the environmental assessment practitioner (EAP) and the information provided by the specialists appointed to undertake studies for the basic assessment.

Where the consequence of an event is not known or cannot be determined, the "precautionary principle" has been applied and the worst-case scenario assumed. Where possible, mitigation measures to reduce the significance of negative impacts and enhance positive impacts will be recommended. The significance of the impact in light of the mitigation measures has also been rated based on a confidence rating of the mitigation measures.

Consideration will be given to the phase of the project during which the impact occurs. The phase of the development during which the impact will occur will be noted to assist with the scheduling and implementation of management measures.

Criteria for Assessing the Impact Significance

Severity Criteria

INTENSITY = MAGNITUDE OF IMPACT	RATING
Insignificant: impact is of a very low magnitude	**1**
Low: impact is of low magnitude	**2**
Medium: impact is of medium magnitude	**3**
High: impact is of high magnitude	**4**
Very high: impact is of highest order possible	**5**

DURATION = HOW LONG THE IMPACT LASTS	RATING
Very short-term: impact lasts for a very short time (less than a month)	1
Short-term: impact lasts for a short time (months but less than a year)	2
Medium-term: impact lasts for the for more than a year but less than the life of operation.	3
Long-term: impact occurs over the operational life of the proposed mine.	4
Residual: impact is permanent (remains after mine closure)	5

EXTENT = SPATIAL SCOPE OF IMPACT/ FOOTPRINT AREA / NUMBER OF RECEPTORS	RATING
Limited: impact affects the development site	1
Small: impact extends beyond the development site	2
Medium: impact extends to neighbouring properties	3
Large: impact affects the surrounding community	4
Very Large: The impact affects an area larger the municipal area	5

Probability

PROBABILITY = LIKELIHOOD THAT THE IMPACT WILL OCCUR	RATING
Highly unlikely: the impact is highly unlikely to occur	0.2
Unlikely: the impact is unlikely to occur	0.4
Possible: the impact could possibly occur	0.6
Probable: the impact will probably occur	0.8
Definite: the impact will occur	1

Impact Significance

NEGATIVE IMPACTS

≤1	Very low	Impact is negligible. No mitigation required.
>1≤2	Low	Impact is of a low order. Mitigation could be considered to reduce impacts. But does not affect environmental acceptability.
>2≤3	Moderate	Impact is real but not substantial in relation to other impacts. Mitigation should be implemented to reduce impacts.
>3≤4	High	Impact is substantial. Mitigation is required to lower impacts to acceptable levels.
>4≤5	Very High	Impact is of the highest order possible. Mitigation is required to lower impacts to acceptable levels. Potential Fatal Flaw.

POSITIVE IMPACTS

≤1	Very low	Impact is negligible.
>1≤2	Low	Impact is of a low order.
>2≤3	Moderate	Impact is real but not substantial in relation to other impacts.
>3≤4	High	Impact is substantial.
>4≤5	Very High	Impact is of the highest order possible.

DEVELOPMENT PHASE

C	Impact is applicable to the CONSTRUCTION PHASE ONLY
O	Impact is applicable to the OPERATIONAL PHASE ONLY
C&O	Impact is applicable to the CONSTRUCTION AND OPERATIONAL PHASE

7.10.2 The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

NOTE: A comprehensive assessment of impacts is given in Section 9. The impacts of the route alternatives are given in Section 6.

A description of the key impacts associated with the Preferred Alternative – Route 1 are given below.

7.10.2.1 Surface water resources

As indicated in Section 6, the Preferred Route Alternative 1 has a direct impact on (passes through) two wetland pans and is located within 100 m of three additional wetlands. However, since the pans have already been significantly disturbed due to existing activities in the vicinity within the Backbone Extension Pipeline, the impact is considered to be of low significance. Disturbance to the wetland pans is authorised under Section 21(c) & (i) of the existing Sishen water use licence of the National Water Act (Licence No. 10/D41J/BCGI/2643). Mitigation of such an impact as a result of the pipeline development is considered to be impracticable, given that such wetlands will be disturbed by the extension of the mining and associated activities in this area.

7.10.2.2 Groundwater resources

The Western Dewatering Infrastructure will not result in any additional dewatering impacts at Sishen Mine. The infrastructure will be developed within the existing dewatering compartments to facilitate safe mining and no additional dewatering will be undertaken.

The construction of the pipeline will involve the operation of vehicles and machinery and care needs to be taken to ensure that the potential for leaks and spillages of hydrocarbons or wastes used or originating during such activities are managed to protect soils, surface and groundwater resources.

7.10.2.3 Air quality and noise

The construction of the pipeline may result in some additional noise and dust due to the operation of vehicles and machinery. The closest receptors are the people residing in the Jan Keyser Caravan Park which is located approximately 200 m south of the Dewatering Curtain Pipeline. These people are upwind of the proposed activities.

Dingleton is in the process of being demolished, but there are still some persons residing ~1.2 km north and downwind of the Dewatering Curtain Pipeline. Should refurbishments be required along the Vaal-Gamagara pipeline, these could be within 150 m of Dingleton.

Should conditions result in excessive dust it is recommended that dust suppression be undertaken so as not to impact on residents in the neighbouring communities. All equipment used during construction needs to be in a high standard of maintenance to prevent unnecessary noise. Such impacts are however expected to be low.

7.10.2.4 Biodiversity

Although the areas to be disturbed by the development of the Western Dewatering Pipeline infrastructure show high levels of disturbance (see Section 7.9.1.4), the area is characterised by a high number of protected plant species (see Figure 10). It should also be noted that since the broader vegetation in the vicinity of the pipeline is characterised by a high density of such protected species it will be difficult to mitigate the impact by adjusting the pipeline route. It should be noted that impacts on such species along the old Vaal-Gamagara route will only occur should it be necessary to undertake refurbishment to sections of the pipeline. Thus, the intensity of the impact along that section is expected to be low. The area for the development of the Backbone Extension Pipeline will require the removal of ~ 5 *Boscia albitrunca* (Shepherd's trees) and the impact is considered to be moderate. The development of the Dewatering Curtain Pipeline will impact on approximately ~ 75 specimens *of Vachellia erioloba (Camethorn trees) and ~ 5 Lessertia frutescens subsp. Frutescens* (Cancer bush). The impact is thus of high significance. Mitigation will involve the minimisation of unnecessary disturbance of vegetation, particularly when gaining access to the route and for laydown areas. However, protected plants will definitely be destroyed for the development of the pipeline.

The above-ground pipelines will serve as a barrier to the movement of animals. This is most important in the area to be used for the development of the Dewatering Curtain Pipeline as the habitat is outside of the mining area. The area is however significantly disturbed. However, it is recommended that the pipeline be routed as close as practicable to the D3333, as this will mean that the habitat to the south could remain intact, with the road and the pipeline acting as a combined barrier to the north towards the mining activities.

7.10.2.5 Cultural heritage

There are no known heritage, archaeological or palaeontological sites of significance along the pipeline route. However, as per the recommendations of PGS Heritage (October 2018), it will be necessary for the on-site environmental control officer to be trained to identify artefacts or fossils should they be unearthed during the development, a Chance-Find Procedure is to be implemented in accordance with the recommendations made in the Heritage Impact Assessment. A suitable specialist would need to be contacted to undertake the Phase 2 excavation in accordance with a permit issued by South African Heritage Resources Agency (SAHRA). However, it should be noted that since the developments will involve limited excavations as both the Backbone Extension and the Borehole Curtain Pipeline will be on plinths above ground. Some excavations may be necessary for the refurbishment of the old Vaal-Gamagara pipeline, these will take place within areas that are significantly disturbed.

7.10.2.6 Visual impacts

Above ground pipelines are visible to surrounding receptors. Since the Dewatering Curtain Pipeline is located in close proximity to the D3333 and the R383, it will be visible to road users. However, given that the area is already significantly disturbed due to mining and infrastructure development in the area the visual impact is considered to be low. Locating the pipeline as close as practicable (within safety constraints) to the D3333 will maximise the visual absorption capacity into the existing disturbed environment.

7.10.2.7 Socio-economic impacts

The development of the Dewatering Curtain Pipeline section will need to cross the D383 in order to connect to the old Vaal-Gamagara pipeline. It is planned to cross through an existing culvert. Users are to be consulted should there be any disruption to traffic as a result of the crossing.

The immediate economic benefits of the Dewatering Pipeline Infrastructure development will offer limited procurement and possible associated short-term procurement opportunities associated with the development. The economic benefits to Sishen Mine are however significant as it will allow for the proposed western mining expansions to continue.

7.11 The possible mitigation measures that could be applied and the level of risk.

The mitigation measures for each of the identified impacts are included in Tables 6 to 9 of Section 9. Mitigation of key impacts and risks are also discussed in detail in Section 9.

The significance of the impact with mitigation has been weighted by multiplying the significance rating without significance by the following depending on the confidence placed in the successful implementation of the mitigation measures or the effectiveness of those measures in reducing the impact.

1	Very low	Measures are very difficult or expensive to implement or are not expected to be effective in reducing the impact (No Confidence)
0.8	Low	Measures are difficult or expensive to implement or are expected to have limited effectiveness in reducing the impact (20% Confidence)
0.5	Moderate	Measures can be implemented with some effort and cost and/or the measures can be effective in mitigating the impact if implemented (50% Confidence)
0.2	High	There is high confidence that mitigation measures can be implemented and can be effective in mitigating the impact (80% Confidence)

7.12 Motivation where no alternative site was considered.

Not applicable. Three alternatives have been considered. Please refer to Section 6.

7.13 Statement motivating the alternative development location within the overall site.

Please see Section 6 for motivation for selection Preferred Route Alternative 1.

8. FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY.

Please refer to Section 7.10.1 for the methodology used in the ranking of impacts. Please also refer to Section 7.12 for the methodology used for the application of a mitigation confidence ranking to the impact ranking. A comprehensive assessment of all impacts is given in Section 9.

9. ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

The impact assessment for each activity of the proposed project is provided below in tables 6 – 9. The assessment of the impact and recommended mitigation measures have been identified though the utilisation of the baseline environmental, including the impact assessment methodology provided in section 7.10.1 and the methodology used for the application of a mitigation confidence ranking provided in section 7.7.

TABLE 6: DEWATERING CURTAIN PIPELINE IMPACTS FOR THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

ACTIVITY	ASPECT	POTENTIAL IMPACT	PHASE	INTENSITY	DURATION	CONSEQUENCE	EXTENT	SEVERITY	PROBABILITY	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	MITIGATION CONFIDENCE	SIGNIFICANCE WITH MITIGATION
DEVELOPMENT OF DEWATERING CURTAIN PIPELINE	Groundwater	Contamination of underlying aquifers due to storage and handling of potential pollutants used during construction.	C	3	1	2	1	1.5	0.8	1.2 (Low)	Hazardous substances are to be stored in bunded areas and handled on impervious surfaces. Wastes to be stored in temporary facilities in line with regulatory requirements. Wastes to be removed from laydown areas and disposed in accordance with legal requirements. Additional temporary toilets and ablutions are to be provided in laydown areas and in areas of work where there are no existing facilities. Equipment which has the potential to leak oil or other chemicals are to be stored on impervious surfaces within bunded areas. Drip trays are to be provided where mobile equipment has the potential to drip oil. Implement spill prevention and emergency response procedure.	0.5	0.6 (Very Low)
	Groundwater	Lowering of water table/increased cone of dewatering due to project.	O	1	5	3	4	3.5	0.2	0.7 (Very Low)	The project will not result in any additional dewatering and thus no additional impacts are anticipated. Dewatering boreholes are to be drilled in accordance with the water use licence requirements. No additional compartments are to be dewatered.	0.2	0.14 (Very Low)
	Surface Water Resources	Contamination of surface water resources due to contaminated run-off originating spillages/leaks of construction machinery.	C	3	2	2.5	1	1.75	0.6	1.05 (Low)	Implement mitigation measures for the protection of groundwater protection.	0.5	0.53 (Very Low)
	Surface Water Resources	Disturbance of wetlands or watercourses	C	1	5	3	1	2	1	2 (Low)	No mitigation is considered necessary due to the current negative impact status of the pans.	-	-
	Air Quality	Increased dust emissions due to construction activities and entrainment due to the movement of vehicles and machinery used in construction.	C	3	2	2.5	2	2.25	0.6	1.35 (Low)	Dust suppression to be implemented at laydown areas and new roads associated with access to laydown areas and areas of work if necessary, to reduce dust.	0.5	0.68 (Very Low)
	Noise	Increase in noise levels due to construction of backbone extension pipeline.	C	2	2	2	2	2	0.6	1.2 (Low)	Equipment is to be kept in a high level of maintenance. Noise complaints will continue to be monitored and manged through the Sishen External Complaints Procedure.	0.2	0.24 (Very Low)
	Soils	Soil contamination due to storage and handling of potential pollutants.	C	3	2	2.5	1	1.75	0.8	1.4 (Low)	Implement measures indicated for the protection of groundwater from contamination.	0.5	0.70 (Very Low)
	Soils	Compaction and loss of soils due to construction activities.	C	2	2	2	1	1.5	0.8	1.2 (Low)	Removal of soils to be limited to areas where excavations are necessary. Such soils to be backfilled into excavations or used in rehabilitation of sites disturbed during construction activities. Traffic movement to access site to be restricted to designated access routes. These are to be limited to that necessary to safely undertake the construction activities.	0.5	0.60 (Very Low)
	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the development of the pipeline	C	5	5	5	2	3.5	1	3.5 (High)	Disturbance is limited to the minimum required to carry out the construction activities. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	0.5	1.75 (Low)
	Biodiversity	Surface linear infrastructure restricting movement of animals.	O	3	5	4	2	3	0.6	1.8 (Low)	The pipeline should be constructed as close and as safely as possible to the road reserve to combine the barrier of the road and the pipeline and to minimise the impact on the habitat to the south of the road.	0.5	0.90 (Very Low)
	Cultural Heritage	Disturbance of archaeological, palaeontological and heritage sites due to the development of the pipeline.	C	3	5	4	2	3	0.4	1.2 (Low)	Provide training to the on-site ECO in the identification of artefacts that may unearthed. If an archaeological or fossil deposit is unearthed during construction, a controlled sampling of the material found should be done in accordance with the recommendations of the specialist HIA.	0.5	0.60 (Very Low)
	Visual Environment	Increased visual intrusion due to the above ground pipeline.	C&O	2	4	3	2	2.5	0.8	2 (Low)	The pipeline will change the add to the visual disturbance resulting from infrastructure development in the area. The pipeline should be constructed as close and as safely as possible to the road reserve so as combine the visual intrusion of linear infrastructure in the area.	0.4	0.8 (Very Low)

TABLE 7: BACKBONE EXTENSION PIPELINE IMPACTS FOR THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

ACTIVITY	ASPECT	POTENTIAL IMPACT	PHASE	INTENSITY	DURATION	CONSEQUENCE	EXTENT	SEVERITY	PROBABILITY	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	MITIGATION CONFIDENCE	SIGNIFICANCE WITH MITIGATION
DEVELOPMENT OF BACKNONE EXTENSION PIPELINE	Groundwater	Contamination of underlying aquifers due to storage and handling of potential pollutants used during construction.	C	3	1	2	1	1.5	0.8	1.2 (Low)	Hazardous substances are to be stored in bunded areas and handled on impervious surfaces. Wastes to be stored in temporary facilities in line with regulatory requirements. Wastes to be removed from laydown areas and disposed in accordance with legal requirements. Additional temporary toilets and ablutions are to be provided in laydown areas and in areas of work where there are no existing facilities. Equipment which has the potential to leak oil or other chemicals are to be stored on impervious surfaces within bunded areas. Drip trays are to be provided where mobile equipment has the potential to drip oil. Implement spill prevention and emergency response procedure.	0.5	0.6 (Very Low)
	Groundwater	Lowering of water table/increased cone of dewatering due to project.	O	1	5	3	4	3.5	0.2	0.7 (Very Low)	The project will not result in any additional dewatering and thus no additional impacts are anticipated. Dewatering boreholes are to be drilled in accordance with the water use licence requirements. No additional compartments are to be dewatered.	0.2	0.14 (Very Low)
	Surface Water Resources	Contamination of surface water resources due to contaminated run-off originating spillages/leaks of construction machinery.	C	3	2	2.5	1	1.75	0.6	1.05 (Low)	Implement mitigation measures for the protection of groundwater protection.	0.5	0.53 (Very Low)
	Surface Water Resources	Disturbance of wetlands or watercourses	C	1	5	3	1	2	1	2 (Low)	No mitigation is considered necessary due to the current negative impact status of the pans.	-	-
	Air Quality	Increased dust emissions due to construction activities and entrainment due to the movement of vehicles and machinery used in construction.	C	3	2	2.5	2	2.25	0.6	1.35 (Low)	Dust suppression to be implemented at laydown areas and new roads associated with access to laydown areas and areas of work if necessary, to reduce dust.	0.5	0.68 (Very Low)
	Noise	Increase in noise levels due to construction of backbone extension pipeline.	C	2	2	2	2	2	0.6	1.2 (Low)	Equipment is to be kept in a high level of maintenance. Noise complaints will continue to be monitored and manged through the Sishen External Complaints Procedure.	0.2	0.24 (Very Low)
	Soils	Soil contamination due to storage and handling of potential pollutants.	C	3	2	2.5	1	1.75	0.8	1.4 (Low)	Implement measures indicated for the protection of groundwater from contamination.	0.5	0.70 (Very Low)
	Soils	Compaction and loss of soils due to construction activities.	C	2	2	2	1	1.5	0.8	1.2 (Low)	Removal of soils to be limited to areas where excavations are necessary. Such soils to be backfilled into excavations or used in rehabilitation of sites disturbed during construction activities. Traffic movement to access site to be restricted to designated access routes. These are to be limited to that necessary to safely undertake the construction activities.	0.5	0.60 (Very Low)
	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the development of the pipeline	C	2	5	5	2	3.5	1	3 (Moderate)	Disturbance is limited to the minimum required to carry out the construction activities. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	0.5	1.75 (Low)
	Biodiversity	Surface linear infrastructure restricting movement of animals.	O	3	5	4	2	3	0.6	1.8 (Low)	The pipeline should be constructed as close as safely possible to the road reserve to combine the barrier of the road and the pipeline and to minimise the impact on the habitat to the south of the road.	0.5	0.90 (Very Low)
	Cultural Heritage	Disturbance of archaeological, palaeontological and heritage sites due to the development of the pipeline.	C	3	5	4	2	3	0.4	1.2 (Low)	Provide training to the on-site ECO in the identification of artefacts that may unearthed. If an archaeological or fossil deposit is unearthed during construction, a controlled sampling of the material found should be done in accordance with the recommendations of the specialist HIA.	0.5	0.60 (Very Low)
	Visual Environment	Increased visual intrusion due to the above ground pipeline.	C&O	2	4	3	2	2.5	0.8	2 (Low)	The pipeline will change the add to the visual disturbance resulting from infrastructure development in the area. The pipeline should be constructed as close as safely possible to the road reserve so as combine the visual intrusion of linear infrastructure in the area.	0.4	0.8 (Very Low)

TABLE 8: VAAL GAMAGARA PIPELINE IMPACTS FOR THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

ACTIVITY	ASPECT	POTENTIAL IMPACT	PHASE	INTENSITY	DURATION	CONSEQUENCE	EXTENT	SEVERITY	PROBABILITY	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	MITIGATION CONFIDENCE	SIGNIFICANCE WITH MITIGATION
RECOMMISSIONING OF VAAL GAMAGARA PIPELINE	Groundwater	Contamination of underlying aquifers due to storage and handling of potential pollutants used during construction.	C	3	5	4	1	2.5	0.4	1 (Very Low)	Hazardous substances are to be stored in bunded areas and handled on impervious surfaces. Wastes to be stored in temporary facilities in line with regulatory requirements. Wastes to be removed from laydown areas and disposed in accordance with legal requirements. Additional temporary toilets and ablutions are to be provided in laydown areas and in areas of work where there are no existing facilities. Equipment which has the potential to leak oil or other chemicals are to be stored on impervious surfaces within bunded areas. Drip trays are to be provided where mobile equipment has the potential to drip oil. Implement spill prevention and emergency response procedure.	0.5	0.50 (Very Low)
	Groundwater	Lowering of water table/increased cone of dewatering due to project	O	3	5	4	4	4	0.2	0.8 (Very Low)	The project will not result in any additional dewatering and thus no additional impacts are anticipated. Dewatering boreholes are to be drilled in accordance with the water use licence requirements. No additional compartments are to be dewatered.	0.2	0.16 (Very Low)
	Surface Water Resources	Contamination of surface water resources due to contaminated run-off originating from construction activities.	C	3	2	2.5	1	1.75	0.2	0.35 (Very Low)	Implement mitigation measures for the protection of groundwater protection.	0.5	0.18 (Very Low)
	Surface Water Resources	Disturbance of wetlands or watercourses	C	2	4	3	1	2	0.2	0.4 (Very Low)	There are no water resources in the footprint areas and thus no mitigation is necessary.	-	-
	Air Quality	Increased dust emissions due to construction activities and entrainment due to the movement of vehicles and machinery used in construction.	C	2	1	1.5	1	1.25	0.6	0.75 (Very Low)	Dust suppression to be implemented at laydown areas and new roads associated with access to laydown areas and areas of work if necessary, to reduce dust.	0.5	0.38 (Very Low)
	Noise	Increase in noise levels due to construction activities	C	2	1	1.5	1	1.25	0.6	0.75 (Very Low)	Equipment is to be kept in a high level of maintenance. Noise complaints will continue to be monitored and managed through the Sishen External Complaints Procedure.	0.5	0.38 (Very Low)
	Soils	Soil contamination due to storage and handling of potential pollutants at laydown areas and areas of work.	C	2	1	1.5	1	1.25	0.6	0.75 (Very Low)	Implement measures indicated for the protection of groundwater from contamination.	0.5	0.38 (Very Low)
	Soils	Compaction and loss of soils due to construction activities.	C	2	1	1.5	1	1.25	0.6	0.75 (Very Low)	Removal of soils to be limited to areas where excavations are necessary. Such soils to be backfilled into excavations or used in rehabilitation of sites disturbed during recommissioning activities. Traffic movement to access site to be restricted to designated access routes. These are to be limited to that necessary to safely undertake the recommissioning activities.	0.5	0.38 (Very Low)
	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the upgrade of the pipeline.	C	3	5	4	1	2.5	0.6	1.5 (Low)	Disturbance is limited to the minimum required to carry out the upgrade. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	0.5	0.75 (Very Low)
	Biodiversity	Infrastructure restricting movement of animals.	O	1	1	1	1	1	0.2	0.2 (Very Low)	The Vaal Gamagara Pipeline is an underground pipeline and the recommissioning of it will not change this. No mitigation is required.	-	-
	Cultural Heritage	Disturbance of archaeological, palaeontological and heritage sites due to the recommissioning of the pipeline.	C	1	1	1	1	1	0.2	0.2 (Very Low)	The Vaal Gamagara Pipeline is an existing underground pipeline and the recommissioning of it will not result in any disturbance. No mitigation is required.	-	-
	Visual Environment	Increased visual intrusion due to linear infrastructure.	C&O	1	1	1	1	1	0.2	0.2 (Very Low)	The Vaal Gamagara Pipeline is an existing underground pipeline and the recommissioning of it will not result in any visual disturbance/ change. No mitigation is required.	-	-

TABLE 9: SOCIO-ECONOMIC IMPACTS FOR THE PROPOSED WESTERN DEWATERING INFRASTRUCTURE PROJECT

ACTIVITY	ASPECT	POTENTIAL IMPACT	PHASE	INTENSITY	DURATION	CONSEQUENCE	EXTENT	SEVERITY	PROBABILITY	SIGNIFICANCE WITHOUT MITIGATION	MITIGATION	MITIGATION CONFIDENCE	SIGNIFICANCE WITH MITIGATION
IMPLEMENTATION OF WESTERN DEWATERING INFRASTRUCTURE PROJECT	SOCIO-ECONOMICS	Additional procurement for construction	C	1	2	1.5	5	3.25	0.8	2.6 (Moderate)	Local Procurement to be implemented in line with Sishen's Local Procurement Strategy aimed at achieving SLP commitments.	1	2.6 (Moderate)
		Additional employment created during construction	C	1	2	1.5	5	3.25	0.4	1.3 (Low)	Resourcing Plan to be developed and aligned with Sishen's commitments for preferential local employment. Contractors to comply with preferential employment targets for the project in line with the Sishen's Contractor Social Management Procedure.	1	1.3 (Low)
		Provides for western expansion of Sishen Mining Activities	O	5	4	4.5	5	4.75	1	4.75 (Very High)		1	4.75 (Very High)
		Disturbance of traffic due to crossing of the R328 to connect the Borehole Curtain Pipeline to the Vaal-Gamagara Pipeline.	C	1	1	1	3	2	0.6	1.2 (Low)	Consultation with affected users to warn them of traffic disruptions if they are to occur.	0.5	0.6

9.1 Summary of specialist reports.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Terrestrial Ecological	The removal of protected trees and plants will require a Protected Species removal permits from DAFF and DENC.	**X**	Section 7.10.2.4 Mitigation in Section 9 (Tables 6 to 8)
Heritage	Based on the survey results of this project, no archaeological or heritage items were identified and the landscape within the study area and surrounding regions were found to be heavily disturbed by previous farming and/or mining activities. However, the following recommendations are made, based on the significance of archaeological sites within the vicinity of Kathu: If an archaeological or fossil deposit is identified, a controlled sampling of the material found should be done. This work must be done in such a way as to augment the current research questions and fieldwork such as the excavations at the Kathu Townlands Site and Kathu Pan. These test excavations and sampling must be done after a permit has been granted under Section 35 of the NHRA (Act 25 of 1999) to a qualified and experienced Stone Age archaeologist. In the event that substantive material is uncovered, it is recommended that a display is considered in a convenient location. An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project. The appointed archaeologist will be responsible for the following: • Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.	**X**	Section 7.10.2. Mitigation in Section 9 (Table 6 to 10)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	• Conduct an archaeological monitoring program whereby the construction site is visited once every two weeks for at least the first three months of the project. • On-site assessment of any Stone Age material exposed during construction and the provision of recommendations for the way in which the exposed material must be mitigated. • Compile and submit an archaeological monitoring report at the end of the monitoring process. Monitoring undertaken everyday on-site by the ECO will ensure that all construction work is closely monitored. Should any Stone Age material or any archaeological material be identified, all construction work in that area must immediately stop and the ECO must demarcate a construction free area around the discovery. If the ECO made the discovery, a professional archaeologist must be contacted immediately to visit the construction site to assess the exposed material. After assessing the exposed material, the archaeologist must provide recommendations for the exposed material, which may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant)		
Palaeontology	As per the palaeontological desktop assessment (A, the proposed development is unlikely to pose any substantial threat to local fossil heritage and developments should go forward. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist. The specialist involved would require a collection permit from SAHRA. Fossil material must be		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	curated in an approved collection (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.		

9.2 Environmental Impact Statement

9.2.1 Summary of the key findings of the environmental impact assessment.

The following have been identified as the key findings of the impact assessment:

9.2.1.1 Socio-economic benefits

- The Dewatering Infrastructure Project is required to allow for the western expansion of the mining activities at Sishen Mine. The economic benefits of the expanded mining activities are substantial and dependent on this project.
- Potential procurement and additional jobs opportunities directly as a result of the development will be limited.

9.2.1.2 Biodiversity

- The Dewatering Infrastructure Project will result in a definite high impact on species of conservation concern as a result of the need to remove protected tree and plant species along the route.

9.2.1.3 Surface Water Resources

- The pipeline will traverse wetland pan areas, but this will take place in areas already included in the impact of expanded mining activities. The cumulative impact as a result of the pipeline is insignificant.

9.2.1.4 Heritage impacts

- The impacts on heritage, archaeological and palaeontological resources are expected to be limited given existing disturbance at the site. A Change-Find Procedure will however be implemented in accordance with the specialist recommendations

9.2.1.5 Groundwater resources

- The project will not result in any change in the impact of dewatering at Sishen Mine.
- The potential for contamination of soils, groundwater and also surface water resources as a result of hydrocarbon spillages and leaks from machinery and equipment during construction does occur and mitigation to protect such resources is to be put in place.

9.2.1.6 Noise and dust

- The project could result in additional noise and dust levels, but the impacts are expected to be low. Should impacts on surrounding communities be evident, dust suppression is to be implemented.

9.2.2 Final Site Map

The final site map showing the final layout (Preferred Route Alternative 1) is attached as shown in Figure. The map provides for a deviation of the implementation of the route within a 100 m buffer from the SIOCs. This will allow for minor deviations in the route should these become necessary during implementation for technical or environmental reasons. The area has been included in the assessment of impacts and will not affect the outcomes of the Basic Assessment.

9.2.3 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

TABLE 10: SUMMARY OF KEY POSITIVE AND NEGATIVE IMPACTS IDENTIFIED FOR THE MITIGATED AND UNMITIGATED SCENARIO

Activity	Aspect	Impact	Significance	Mitigation	Significance after mitigation
Development of Dewatering Curtain Pipeline	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the development of the pipeline	High	Disturbance is limited to the minimum required to carry out the construction activities. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	Low
Development of Backbone Extension Pipeline	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the development of the pipeline	Moderate	Disturbance is limited to the minimum required to carry out the construction activities. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	Low
Recommissioning of the Vaal-Gamagara Pipeline	Biodiversity	Disturbance of sensitive vegetation and habitats to allow the upgrade of the pipeline.	Low	Disturbance is limited to the minimum required to carry out the upgrade. Protected species to only be removed from the pipeline route (no unnecessary removal of such species). No protected species to be removed without the necessary permits.	Very Low
Implementation of the Western Dewatering Infrastructure Project	Socio-Economics	Additional procurement for construction	Moderate	Local Procurement to be implemented in line with Sishen's Local Procurement Strategy aimed at achieving SLP commitments.	Moderate
		Provides for western expansion of Sishen Mining Activities	Very High	N/A	Very High

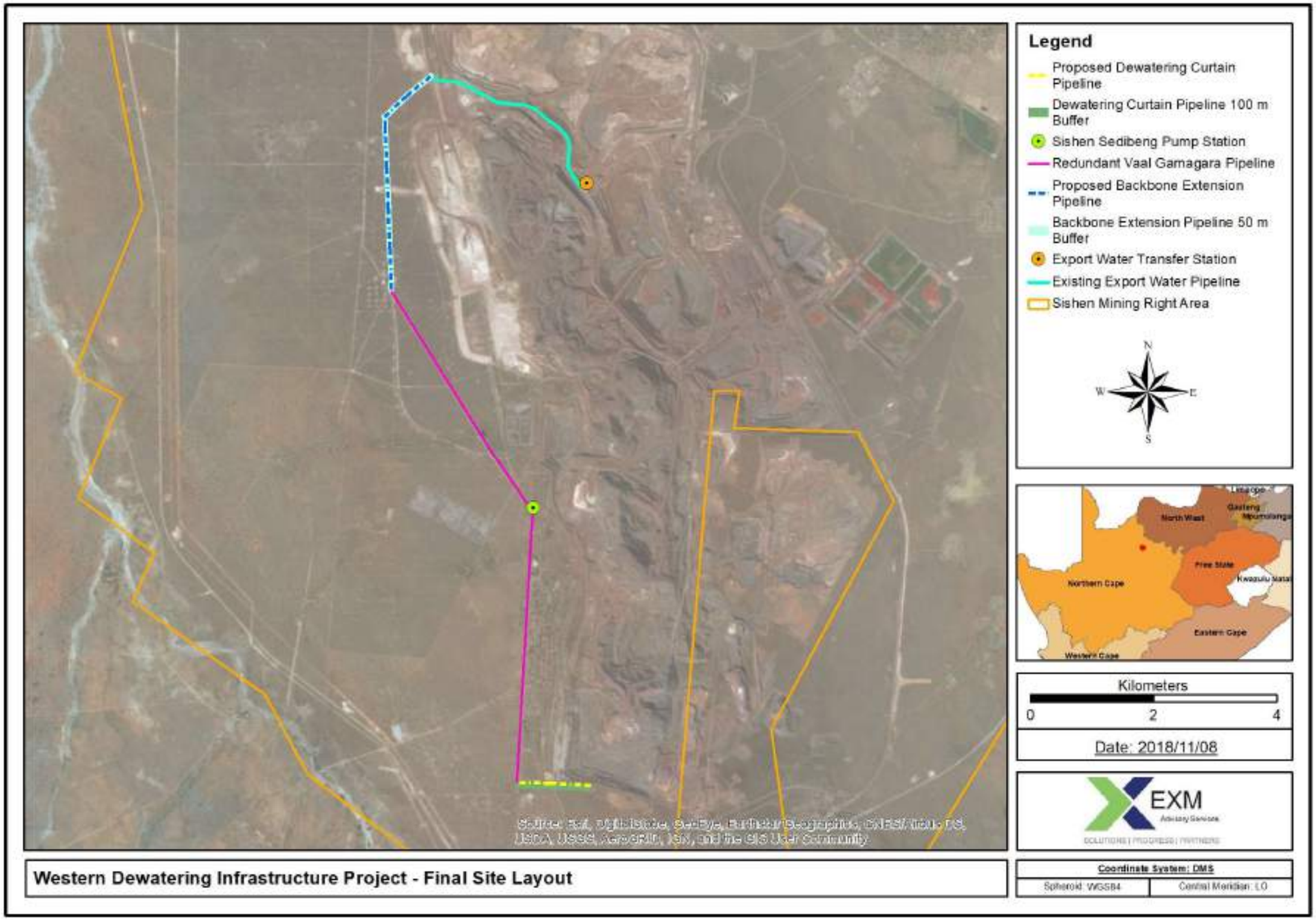


FIGURE 13: FINAL SITE LAYOUT MAP

9.2.4 Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

The key mitigation measures to be included in the EMPr are as follows:

- No unnecessary disturbance is to take place of vegetation and particularly protected species.
- No protected plant species are to be damaged or removed without the necessary permits being in place.
- The Dewatering Curtain Pipeline is to be constructed as close as possible (within the constraints of safety and technical considerations) the existing D3333 so as to limit visual disturbance as well as barriers within ecological habitats.
- An ECO is to be in place on site. This person is to be trained in the identification of archaeological artefacts and fossils that may be unearthed during construction activities. A Chance-Find Procedure is to be implemented in line with the recommendation of the Heritage Impact Assessment.
- Hazardous substances such as hydrocarbons used during construction are to be stored and handled to ensure protection of soils, groundwater and surface water resources.
- No additional dewatering compartments are to be impacted on as a result of the implementation of the Dewatering Curtain Pipeline.
- Should dust or noise resulting from activities impact on neighbouring communities, measures are to be implemented to reduce such impacts to acceptable levels.
- Users of the D3333 are to be informed of the development and any disruptions that may occur as a result of the implementation of the project.

9.2.5 Aspects for inclusion as conditions of Authorisation.

Protected species must remain *in situ* until the necessary permits are obtained from DAFF and DENC. All mitigation as listed in Section 9.2.4 must be adhered to.

9.2.6 Description of any assumptions, uncertainties and gaps in knowledge.

The outcomes of this EIA Report are based on the following assumptions, uncertainties and knowledge gaps:

- The impacts are as for the project description as available at the time of the compilation of the report, as provided by the Sishen Iron Ore Company and as described in Section 3.
- The impacts assessed in Section 9, protected plant species survey as well as the Heritage

Impact Assessment are based on the implementation of Preferred Route Alternative 1 but including a buffer of 100 m from the proposed route.

- Any deviation outside of the buffer is not covered by the Basic Assessment.

9.2.7 Reasoned opinion as to whether the proposed activity should or should not be authorised

9.2.7.1 Reasons why the activity should be authorised or not.

It is the opinion of the EAP that the Sishen Dewatering Infrastructure should be authorised based on the following reasons:

- The proposed development is required for the continuation of the Sishen western expansion and without implementation of the project the expansion cannot continue.
- The proposed development will take place in areas within the authorised Sishen Mine mining right area.
- The areas to be used for the development already show high levels of disturbance.

9.2.7.2 Conditions that must be included in the authorisation

Refer to section 9.2.5

9.2.8 Period for which the Environmental Authorisation is required.

The validity of the authorisation should be linked to the life of mine which is currently until 2039.

9.2.9 Undertaking

, Kerry Colleen Fairley, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- the information provided herein is correct;
- the comments and inputs from stakeholders and I&APs have been correctly recorded;
- information and responses provided to stakeholders and I&APs by the EAP is correct; and the level of agreement with I&APs and stakeholders has been correctly recorded and reported.

9.2.10 Financial Provision

The estimated financial provision required for the rehabilitation and closure of the Western Dewatering Infrastructure Project is **R 254 655.27 including VAT.** Note that since the project will be implemented within a period of less than year, the premature closure cost and the final closure costs are the same.

A summary of the financial provision estimate associated with this project is included in the Table 11. Detailed sheets are provided in Appendix E.

TABLE 11: SUMMARY OF THE WESTERN DEWATERING INFRASTRUCTURE PROJECT FINANCIAL PROVISION

Item	Description	Cost
1	Dewatering Curtain Pipeline	**R53 145.45**
2	Backbone Extension Pipeline	**R168 293.92**
Total (Excl. VAT); (Incl. 10% Contingency)		**R221 439.37**
VAT @ 15%		**R33 215.90**
Grand Total (Incl. VAT)		**R254 655.27**

9.2.10.1 Explain how the aforesaid amount was derived.

The financial provision for the Western Dewatering infrastructure Project has been calculated by EXM according to regulation 6 of the financial provision for prospecting, exploration, mining or production operations regulations (GNR 1147, November 2015). These regulations prescribe the required minimum content.

The model used to develop the closure cost for the mining area was developed in Microsoft Excel. An itemised list of all the required action was included, which contained measurements of the infrastructure to be removed, demolished and areas to be rehabilitated. An appropriate rate was applied to each action to be implemented. The final preferred layout was utilised to measure all the affected areas as a result of the proposed mining activity.

9.2.10.2 Confirm that this amount can be provided for from operating expenditure.

Sishen Mine makes financial provision for closure by means of the KIO Rehabilitation Trust Fund, with any shortfall between the immediate closure cost estimate and the balance in the Trust Account being funded by means of bank guarantees.

These reviews are done annually.

9.2.11 Specific Information required by the competent Authority

9.2.11.1 Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998).

9.2.11.1.1 Impact on the socio-economic conditions of any directly affected person.

The pipeline activities are expected to be limited. Some opportunity for procurement and possible associated employment will be realised, but these are limited. However, consideration will be given to local services where practicable.

Of importance however is the requirement of the Sishen Western Dewatering Infrastructure Project to the implementation of the western expansion activities at Sishen Mine. Such activities are dependent on the implementation of new dewatering pipelines. As such, without the implementation of this project the substantial socio-economic benefits of the western expansion

at Sishen Mine (which is already authorised and commenced) will not be realised.

9.2.11.1.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act

Section 3(2) of the National Heritage Resources Act, No. 25 of 1999 provides a description of all items that is classified as national estate. The EAP has evaluated the list in comparison with the project site. The results of the assessment are provided below with recommendations to the environmental officer where there was uncertainty.

TABLE 12: SUMMARY OF PRESENCE OF NATIONAL ESTATE ITEMS AFFECTED BY THE PROJECT

National Estate Item	Present	Comment
(a) places, buildings, structures and equipment of cultural significance;	No	
(b) places to which oral traditions are attached or which are associated with living heritage;	No	
(c) historical settlements and townscapes;	No	
(d) landscapes and natural features of cultural significance;	No	
(e) geological sites of scientific or cultural importance;	No	
(f) archaeological and palaeontological sites;	None identified in specialised studies	A Chance-Find Procedure to be implemented in accordance with the recommendations of the Heritage Impact Assessment.
(g) graves and burial grounds, including—	No	.
(i) ancestral graves;		
(ii) royal graves and graves of traditional leaders;		
(iii) graves of victims of conflict;		
(iv) graves of individuals designated by the Minister by notice in the Gazette;		
(v) historical graves and cemeteries; and		
(vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);		
(h) sites of significance relating to the history of slavery in South Africa;	No	
(i) movable objects, including—	No	
(i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;	No	
(ii) objects to which oral traditions are attached or which are associated with living heritage;	No	
(iii) ethnographic art and objects;	No	
(iv) military objects;	No	
(v) objects of decorative or fine art;	No	
(vi) objects of scientific or technological interest; and	N/A	
(vii) books, records, documents, photographic positives and negatives,	N/A	

9.2.11.1.3 Other matters required in terms of sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the Act requires the EAP to conduct an investigation of the potential consequences of impacts of alternatives to the activity on the environment and assessment of the significance of those potential consequences. Three Alternatives have been considered as

part of this project. All alternatives were assessed based on both environmental impacts and cost implications. The proposed alternative is Alternative Route 1 as it has the lowest cost and will not result in significant additional impacts on the environment.

PART B
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

10.DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME.

10.1 Details of the EAP

Name of The Practitioner: EXM Advisory Services (Pty) Ltd

Tel No.: 010 007 3617

Fax No.: 086 616 0443

e-mail address: kerry@exm.co.za

TABLE 13: EXPERTISE OF THE EAP

EAP	Qualification	Years' experience
Kerry Fairley	BSc Honours (Botany) Pr.Sci.Nat.	19 Years

10.2 Description of the aspects of the activity

Sishen Mine is in the process of expanding its mining activities towards the western side of the mining pit area. This involves expansion of the pit boundaries, construction of new western waste rock dumps, and relocation of services such as railway lines and groundwater dewatering infrastructure. New dewatering boreholes and pipe infrastructure are required in line with these expansions to be able to continue with safe mining activities.

The Western Dewatering Pipeline infrastructure is required to convey water from the expanded pit areas at Sishen Mine. Furthermore, since the groundwater aquifer on which Sishen Mine is located flows from south to north, the infrastructure provides for the conveyance of water from new boreholes to be located to the south of the pits.

To reduce the number of boreholes needed on site to dewater the pits, dewatering boreholes are being established along the southern end of the mine to dewater the aquifer upstream from the mining pits, thereby reducing the need for new boreholes inside the pits. The proposed pipelines are required to convey water from the new dewatering boreholes to the Vaal Gamagara pipeline.

A proposed new Borehole Curtain Pipeline (a 250 mm diameter HDPE above ground pipeline) will be constructed south of the D3333 road to convey water from the boreholes to a redundant section of the old Vaal-Gamagara pipeline (an existing 700 mm underground pipeline) which runs parallel to the D328 road. It is proposed that the pipeline passes through an existing road culvert to allow for the crossing of the D328.

The water will be pumped northwards via the existing Sishen Sedibeng pump station to a proposed Backbone Extension Pipeline (a 350 mm above ground steel pipeline) which will join with the existing pipeline network within Sishen Mine for export to the Vaal-Gamagara pipeline at the Kathu Reservoir located north of Sishen Mine.

The integrity of the old Vaal-Gamagara pipeline will be checked and where required the necessary refurbishments carried out, if required. The Sishen-Sedibeng pump station which is currently used by Sishen to pump water from some of the southern sections of the mining area, may need to be upgraded to allow the pumping of additional water as a result of the implementation of the new infrastructure.

10.3 Composite Map

A map which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities showing how areas are to be avoided is provided as Figure 14.

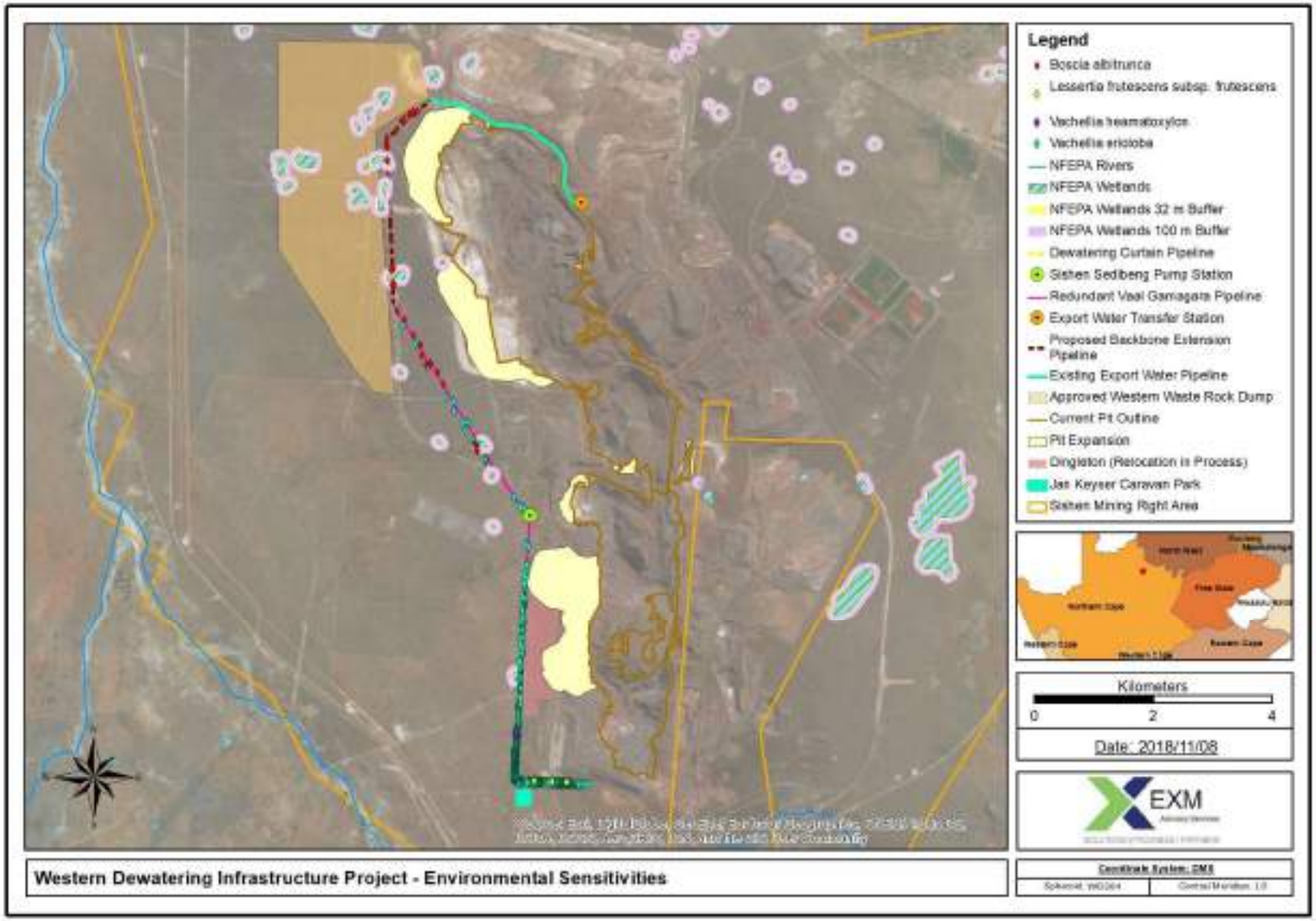


FIGURE 14: WESTERN DEWATERING INFRASTRUCTURE PROJECT SHOWING ENVIRONMENTAL SENSITIVITIES

10.4 Description of impact management objectives including management statements

10.4.1 Determination of closure objectives.

The Sishen Western Dewatering Infrastructure Project will be incorporated into Sishen Mine. Rehabilitation and closure will be undertaken as part of the closure planning for the mine. As described in the Preliminary Closure Plan for Sishen Mine, the final land use at Sishen Mine is envisaged to include a combination of wilderness areas, agricultural and small industrial use.

The following are currently the overarching goals for the closure of Sishen Mine:

- A walk-away closure with limited / no significant long-term liabilities that require management;
- Rehabilitation must be of high quality and sustainable into the predictable future;
- Proposed post-closure land uses that are sustainable;
- Stakeholder engagement is to be undertaken and views considered in closure planning;
- Permanent Sishen employees have been successfully redeployed or re-skilled;
- Legal compliance is achieved;
- Authorities satisfied with the extent of rehabilitation and closure criteria;
- Department of Mineral Resources satisfied to issue a closure certificate with limited / no significant conditions.

10.4.2 Volumes and rate of water use required for the operation.

No additional dewatering or abstraction for use is required as a result of the Dewatering Pipeline Infrastructure Project and all water uses will be in line with the Sishen Water Use Licence Licence No. 10/D41J/BCGI/2643). Insignificant quantities of water will be used for the implementation phase to support drinking and domestic use by the construction team.

10.4.3 Has a water use licence has been applied for?

Not applicable as no new water uses are triggered as a result of the Western Dewatering Infrastructure Project.

10.5 Impacts to be mitigated in their respective phases

The DMS Upgrade Project will be integrated into the overall environmental management programme at Sishen Mine. The environmental actions required based on the outcomes of the impact assessment (see Section 9) are summarised in Table

TABLE 14: ENVIRONMENTAL MANAGEMENT ACTIONS

ASPECT	IMPACT	PHASE	PROPOSED MITIGATION/MANAGEMENT MEASURES	APPLICABLE STANDARD
Groundwater	Contamination of underlying aquifers due to storage and handling of potential pollutants used during construction.	Construction	Hazardous substances are to be stored in bunded areas and handled on impervious surfaces. Wastes to be stored in temporary facilities in line with regulatory requirements. Wastes to be removed from laydown areas and disposed in accordance with legal requirements. Additional temporary toilets and ablutions are to be provided in laydown areas and in areas of work where there are no existing facilities. Equipment which has the potential to leak oil or other chemicals are to be stored on impervious surfaces within bunded areas. Drip trays are to be provided where mobile equipment has the potential to drip oil. Implement spill prevention and emergency response procedure.	National Water Act, Sishen Water Use Licence, Emergency Response Procedure
	Lowering of water table/increased cone of dewatering due to project.	Operation	The project will not result in any additional dewatering and thus no additional impacts are anticipated. Dewatering boreholes are to be drilled in accordance with the water use licence requirements. No additional compartments are to be dewatered.	National Water Act, Sishen Water Use Licence

ASPECT	IMPACT	PHASE	PROPOSED MITIGATION/MANAGEMENT MEASURES	APPLICABLE STANDARD
Surface Water Resources	Contamination of surface water resources due to contaminated run-off originating spillages/leaks of construction machinery.	Construction	Implement mitigation measures for the protection of groundwater protection.	National Water Act, Sishen Water Use Licence
	Disturbance of wetlands or watercourses	Construction	No mitigation is considered necessary due to the current negative impact status of the pans.	Not applicable
Air Quality	Increased dust emissions due to construction activities and entrainment due to the movement of vehicles and machinery used in construction.	Construction	Dust suppression to be implemented at laydown areas and new roads associated with access to laydown areas and areas of work if necessary, to reduce dust.	NEMAQA: National Ambient Air Quality Standards
Noise	Increase in noise levels due to construction of infrastructure	Construction	Equipment is to be kept in a high level of maintenance. Noise complaints will continue to be monitored and manged through the Sishen External Complaints Procedure.	Sishen Complaints Procedure, IFC Standards, SANS 10103 (2008)
Soils	Soil contamination due to storage and handling of potential pollutants.	Construction	Implement measures indicated for the protection of groundwater from contamination.	GN704 and the Department of Water and Sanitation Best Practices (DWA, 2006a)
Soils	Compaction and loss of soils due to construction activities.	Construction	Removal of soils to be limited to areas where excavations are necessary. Such soils to be backfilled into excavations or used in rehabilitation of sites disturbed during construction activities. Traffic movement to access site to be restricted to designated access routes. These are to be limited to that necessary to safely undertake the construction activities.	GN704 and the Department of Water and Sanitation Best Practices (DWA, 2006a)

ASPECT	IMPACT	PHASE	PROPOSED MITIGATION/MANAGEMENT MEASURES	APPLICABLE STANDARD
Biodiversity	Disturbance of sensitive vegetation and habitats to allow the development and recommissioning of the pipelines.	Construction	Disturbance is limited to the minimum required to carry out the construction activities. Protected species to only be removed from the pipeline route (no unnecessary removal so such species). No protected species to be removed without the necessary permits.	National Environmental Management: Biodiversity Act, National Forest Act, Northern Cape Nature Conservation Act
Biodiversity	Surface linear infrastructure restricting movement of animals.	Operation	The pipeline should be constructed as close as safely possible to the road reserve to combine the barrier of the road and the pipeline and to minimise the impact on the habitat to the south of the road.	National Environmental Management: Biodiversity Act, National Forest Act, Northern Cape Nature Conservation Act
Cultural Heritage	Disturbance of archaeological, palaeontological and heritage sites due to the development of the pipelines.	Pre-Construction	Provide training to the on-site ECO in the identification of artefacts that may unearthed.	National Heritage Resources Act
		Construction	If an archaeological or fossil deposit is unearthed during construction, a controlled sampling of the material found should be done in accordance with the recommendations of the specialist HIA (change-find procedure).	National Heritage Resources Act
Visual Environment	Increased visual intrusion due to the above ground pipeline.	Construction and Operation	The pipeline will change the add to the visual disturbance resulting from infrastructure development in the area. The pipeline should be constructed as close as safely possible to the road reserve so as combine the visual intrusion of linear infrastructure in the area.	Not applicable
Traffic	Disturbance of traffic due to crossing of the R328 to connect the Borehole Curtain Pipeline to the Vaal-Gamagara Pipeline.	Construction	Consultation with affected users to warn them of traffic disruptions if they are to occur.	Not applicable

ASPECT	IMPACT	PHASE	PROPOSED MITIGATION/MANAGEMENT MEASURES	APPLICABLE STANDARD
Socio-economics	Additional procurement for construction	Construction	Local Procurement to be implemented in line with Sishen's Local Procurement Strategy aimed at achieving SLP commitments.	Sishen's Local Procurement Strategy
	Additional employment created during construction	Construction	Resourcing Plan to be developed and aligned with Sishen's commitments for preferential local employment. Contractors to comply with preferential employment targets for the project in line with the Sishen's Contractor Social Management Procedure.	Sishen's Local Procurement Strategy
	Provides for western expansion of Sishen Mining Activities	Operation	Not applicable	Not applicable

10.6 Financial Provision

10.6.1 Closure objectives and the extent to which they have been aligned with the baseline environment

In order to achieve the final land-use plan, the following rehabilitation objectives have been set for Sishen Mine:

- All rehabilitated land is to be safe and useable, excluding the open pits and potentially the pit-facing slopes of waste rock dumps which will be wilderness;
- All rubble from plant decommissioning and related areas must not cause long term degradation or safety hazards;
- All waste dumps must be closed and rehabilitated as per legislative requirements;
- Land is to be physically and chemically stable;
- Rehabilitated areas must be used in a sustainable manner;
- Ground and surface water will not be polluted once the mine is closed; and
- Stakeholders will be engaged on final land use planning.

The Western Dewatering Infrastructure Project will be aligned with these objectives.

10.6.2 Confirmation of consultation of closure objectives with landowners

The Basic Environmental Assessment Report and the draft Environmental Management Programme will be subjected to a public participation process in accordance with Regulations 41 of the EIA Regulations (GNR. 982 of 4 December 2014, as amended). The annual rehabilitation compiled in terms of Appendix 3 of the Financial Provision Regulations (GNR. 1147 of 20 November 2015 as amended by GN. 1314 of 26 October 2016) will be compiled by Sishen Mine within 39 months after the coming into effect of the regulations and will be updated annually thereafter. This report will be made available for public review and comment on an annual basis.

10.6.3 Rehabilitation Plan

In line with the Preliminary Closure Plan for Sishen Mine, the following rehabilitation actions are required for the additional infrastructures as a result of the Sishen Western Dewatering Infrastructure Project:

- Removal of surface pipeline and associated infrastructure associated with the Sishen Western Dewatering Infrastructure Project (unless there is an identified and agreed future use);

- The underground sections of pipelines are to be left in place as removal of such infrastructure will result in disturbance of areas which have already rehabilitated to a sustainable ecological state;
- Remediation of landforms in line with final land use;
- Removal or rubble and disposal of waste in accordance with legislative requirements;
- Remediation of the footprint area to a state that is free of contaminants and suitable for the establishment of sustainable vegetation;
- Implementation of stormwater management at contaminated areas (if required);
- Establishment of suitable indigenous vegetation on rehabilitated footprint areas;
- Maintenance and monitoring of revegetated areas to self-sustaining state.

10.7 Explain how the rehabilitation plan is compatible with the closure objectives

The final land use at Sishen Mine is currently envisaged to include a combination of wilderness areas, agricultural and small industrial use. The achievement of the rehabilitation objectives will allow for the successful implementation of agricultural (livestock grazing) or industrial use (should the process plant infrastructure be needed for some future agreed use).

10.7.1 Quantum of Financial Provision required to manage and rehabilitate the environment

The estimated financial provision required for the rehabilitation and closure of the Western Dewatering Infrastructure Project is **R 254 655.27 including VAT.** Note that since the project will be implemented within a period of less than year, the premature closure cost and the final closure costs are the same.

A summary of the financial provision estimate associated with this project is included in the Table 15. Detailed sheets are provided in Appendix E.

TABLE 15: SUMMARY OF THE WESTERN DEWATERING INFRASTRUCTURE PROJECT FINANCIAL PROVISION

Item	Description	Cost
1	Dewatering Curtain Pipeline	**R53 145.45**
2	Backbone Extension Pipeline	**R168 293.92**
Total (Excl. VAT); (Incl. 10% Contingency)		**R221 439.37**
VAT @ 15%		**R33 215.90**
Grand Total (Incl. VAT)		**R254 655.27**

The financial provision for the Western Dewatering infrastructure Project has been calculated by EXM according to regulation 6 of the financial provision for prospecting, exploration, mining or production operations regulations (GNR 1147, November 2015). These regulations prescribe the required minimum content.

The model used to develop the closure cost for the mining area was developed in Microsoft Excel. An itemised list of all the required action was included, which contained measurements of the infrastructure to be removed, demolished and areas to be rehabilitated. An appropriate rate was applied to each action to be implemented. The final preferred layout was utilised to measure all the affected areas as a result of the proposed mining activity.

Sishen Mine makes financial provision for closure by means of the KIO Rehabilitation Trust Fund, with any shortfall between the immediate closure cost estimate and the balance in the Trust Account being funded by means of bank guarantees. These reviews are done annually.

10.8 Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

The Western Dewatering Infrastructure Project will be incorporated into the overall monitoring programme at Sishen Mine:

TABLE 16: SISHEN MINE ENVIRONMENTAL MONITORING/AUDITING PROGRAMME

No	Description	Frequency of monitoring	Frequency of reporting
1	EMPr performance assessment (internal)	Compliance with the approved EMPR will be audited internally by the Environmental Manager on an annual basis. Ad-hoc audits will be undertaken by the Environmental Department.	Records of internal audits will be retained.
2	EMPr performance assessment (external)	The MPRDA Regulations (Regulation 55) states that the frequency of performance assessment reporting shall be in accordance with the period specified in the approved EMPR, every 2 years or as agreed in writing by the Minister. This performance assessment will be undertaken by an independent third party	A formal EMPR Performance Evaluation Report will be submitted to the DMR every 2 years
3	Water quantity & quality monitoring	Monitoring of surface and ground water resources will take place according to the DWA IWUL. The current water quality monitoring network is shown in Figure 8. The mine's water quality monitoring is conducted by an external consultant	Water quantity & quality monitoring results will be reported to DWA as per the IWUL requirements. These results will be reported to DMR on an annual basis
4	Environmental noise monitoring	An environmental baseline noise survey will be undertaken on an annual basis at sensitive noise receptor areas around	Noise baseline survey to be submitted to DMR on annual basis
5	Rehabilitation progress monitoring	Rehabilitation will be undertaken in accordance with the mine's 5-Year Rehabilitation Plan	Progress made with the implementation of the 5-Year Rehabilitation Plan will be reported to DMR on an annual basis

No	Description	Frequency of monitoring	Frequency of reporting
6	Air Quality Monitoring	The mine's air quality monitoring program comprises of PM10 and dust fallout monitoring. PM10 monitoring is by means of permanently mounted particulate monitors that sends data to an online database. In 2014 the mine will also implement PM2.5 monitoring and an asbestos monitoring program	Air quality monitoring results will be reported to DMR and DEA on an annual basis
7	Biodiversity Monitoring	Biodiversity monitoring will be undertaken according to the biomonitoring protocol. Biodiversity monitoring will be undertaken jointly by the mine and external consultants	Biodiversity monitoring results will be reported to DMR on an annual basis
8	EMS audits (internal)	Internal EMS audits will be undertaken by a team of internal auditors according to a yearly audit schedule	Records of internal EMS audits will be retained at the mine
9	EMS audits (external)	An external EMS audit will be undertaken by an independent third party on an annual basis	Records of external EMS audits will be retained at the mine
10	Legal compliance audits (external)	An external legal compliance audit will be undertaken by an independent third party on a bi- annual basis.	Records of external legal audits will be retained at the mine
11	Water use licence performance audit (external)	An external water use licence performance audit will be undertaken by an independent third party on an annual basis	The outcomes of the IWUL performance audit will be submitted to DWS and DMR on an annual basis

The following additional monitoring is to be undertaken during the construction phase of the Western Dewatering Infrastructure Project:

TABLE 17: WESTERN DEWATERING INFRASTRUCTUTRE PROJECT ENVIRONMENTAL MONITORING/AUDITING PROGRAMME

No	Description	Frequency of monitoring	Frequency of reporting
1	Environmental Compliance Audits	Weekly by ECO	Weekly by ECO

10.9 Indicate the frequency of the submission of the performance assessment/ environmental audit report.

Performance Assessments/Compliance Audits will be compiled in accordance with legislative requirements (as applicable at the time) including:

(1) Regulation 34 of the EIA Regulations (GN. 982 of 4 December 2014, as amended);
(2) Regulation 55 of the Minerals and Petroleum Resource Development Act.

The Performance Assessments/Compliance audits will be submitted annually or in accordance with the Environmental Authorisation.

10.10 Environmental Awareness Plan

Sishen Mine developed an awareness and training programme describing the manner in which its employees may be exposed to environmental risk which may result from their work and the manner in which the risks must be dealt with in order to avoid safety incidents and pollution or the degradation of the environment. The operation also has awareness programmes aimed at educating its people and the community about the activities undertaken at the mine and the impacts of these activities on the environment. Shift workers are trained on a weekly basis on environmental focus topics of the month as well as significant environmental aspects on the mine. All persons involved in the Western Dewatering Infrastructure Project will be incorporated into the existing training and awareness programmes.

All persons involved in the construction activities are to be trained additionally on the requirements of the EMPr and the EA before commencement of work at the site.

The ECO appointed for the project is to be trained in the identification of possible archaeological artefacts and fossils that may be unearthed during the development. This is to be completed prior to the commencement of construction activities. The ECO is to be trained on the implementation of the Chance-Find Procedure.

10.11 Specific information required by the competent authority

No additional information not already included in the report is considered necessary. Additional information will be supplied if requested by the Competent Authority.

11.UNDERTAKING

I, **Kerry Colleen Fairley**, acting as independent environmental assessment practitioner hereby confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from specialist reports, where relevant; and
- The acceptability of the project in relation to the finding of the assessment and the level of mitigation proposed.

Kerry Fairley
Pr. Sci.Nat
Environmental Assessment Practitioner

12.REFERENCES

Airshed Planning Professionals, January 2018. Air Quality Assessment for the Sishen DMS Upgrade Project. Report Number: 17EXM04.

Demacon Market Studies, July 2016. Sishen Economic Impact Assessment. Findings and Recommendations.

Lidwala Environmental and Planning Services, March 2013. Biodiversity Action Plan for Sishen Mine, Kathu, Northern Cape.

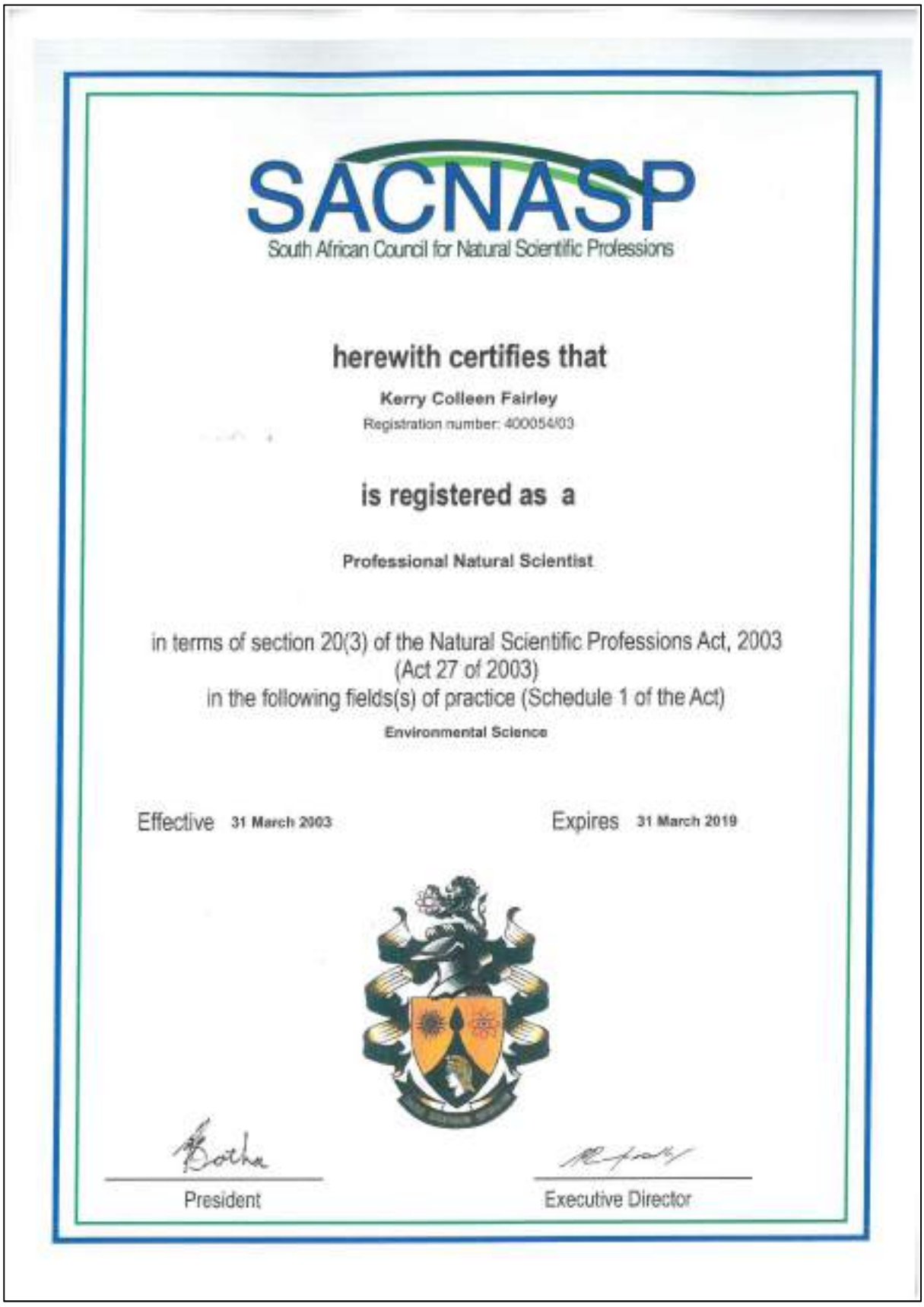
PGS Heritage, October 2018. Phase 1 Heritage Impact Assessment. Proposed Western Dewatering Infrastructure Project on the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

WESTERN DEWATERING INFRASTRUCTURE PROJECT

APPENDICES A & B

APPENDIX A:	**PROOF OF EAP REGISTRATION AND CV OF EAP**
APPENDIX B1:	**INTERESTED AND AFFECTED PARTIES DATABASE**
APPENDIX B2:	**PROOF OF NOTIFICATION**
APPENDIX B3:	**WORDING AND PROOF OF PLACEMENT OF PRESS ADVERTISEMENTS AND SITE NOTICES**
APPENDIX B4:	**MINUTES OF MEETINGS**
APPENDIX B5:	**IAP CORRESPONDENCE RECEIVED TO DATE**

APPENDIX A: PROOF OF EAP REGISTRATION AND CV OF EAP



SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Kerry Colleen Fairley

Registration number: 400054/03

is registered as a

Professional Natural Scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following fields(s) of practice (Schedule 1 of the Act)

Environmental Science

Effective 31 March 2003 Expires 31 March 2019

President

Executive Director

Surname:	Fairley
Names:	Kerry Colleen
Position:	Director and Majority Shareholder
	Principal Environmental Advisor
	Head Environmental Services
Nationality:	RSA
Experience:	18 years in Environmental Consulting
Professional Registration/Affiliations:	Pr.Sci.Nat. (SACNASP) since 2004
	Reg. No. 400054/03
Qualification:	BSc Honours (Botany) 1996
	Higher Diploma Education – 1995
	BSc Zoology & Botany -1994
	University of the Witwatersrand

Kerry has been responsible for several integrated environmental management projects in a diverse range of fields. Her responsibilities have included: liability assessments; compliance auditing; due diligence auditing, water quality assessment; competent persons reporting, review, public participation programmes; environmental impact assessment; identification of feasible mitigation measures, closure planning and the development of environmental management plans. The focus of her career is to prove the overall benefits of incorporating environmental management into all phases of projects. She prides herself in assisting clients in identifying risks and opportunities and developing practical solutions to environmental issues.

KEY AREAS OF EXPERTISE

EIA	Environmental Assessment Practitioner on large-scale projects including mining, waste, renewable energy and industrial processes.
Permitting and Licensing	Environmental authorisation, water use licences, waste management licences, plant protection permits, atmospheric emissions licences
Enviro-Legal	Enviro-legal Review and Advisory Services
Environmental Project Management	Competent Persons Reporting, Fatal-flaw analyses, Risk Assessment, Concept studies, Pre-feasibility, Feasibility and

	project support.
Environmental Auditing	Compliance audits, performance assessment, gap analysis, due diligence and liability assessment
Closure Costing	Calculation of cost of environmental liabilities and environmental cost of closure.

SUMMARY RECENT PROFESSIONAL EXPERIENCE

Year	Client	Designation	Description
2018	Kumba Iron Ore Sishen Iron Ore Company	Environmental Assessment Practitioner	EA Amendment for New Power Line to Kolomela Mine.
2017-2018	Kumba Iron Ore Sishen Iron Ore Company	Environmental Assessment Practitioner	Environmental Impact Assessment and Permitting of the Heuningkranz Project
2016-2017	Pan African Resources – Evander Gold Mines	Environmental Advisor	Water use license auditing. Wetland offset strategy advisor.
2016-2017	Kumba Iron Ore Sishen Iron Ore Company	Environmental Assessment Practitioner	Environmental and Community Feasibility Studies, Environmental Impact Assessment and Permitting of the Sishen DMS Upgrade Project.
2015 &2016	Kumba Iron Ore Sishen Iron Ore Company	Environmental Assessment Practitioner	Permitting (NEMA, NEMWA, NWA) of Expansions of expansions of operations at Kolomela Mine, Northern Cape.
2013-2015 & 2016	Kumba Geoscienes	Environmental Advisor	Ongoing environmental support (procedures, training and awareness material, rehabilitation planning, compliance, performance assessments) to prospecting operations in Northern Cape.
2008-2014	Pan African Resources – Barberton Mines	Environmental Assessment Practitioner	Responsible for annual environmental compliance auditing as well as environmental impact assessments (MPRDA, NEMA, NWA) for expansions for the reworking of tailings facilities.
2013	Goldfields Ghana – Damang Gold Mine	Environmental Assessment Practitioner	Update of Environmental Liability Costing and Environmental Management Plan in terms of Ghanaian legislative requirements
2012	Globe Metals and Mining - Malawi Kanyika Niobium Project	Environmental Assessment Practitioner and Project Management Support	Environmental Feasibility, Environmental and Social Assessment for Kanyika Niobium Project, Malawi.

2012	Weatherly Plc Namibia Tschudi Project	Environmental Assessment Practitioner	Environmental Assessment for the Expansion of the Tschudi Copper Project, Oshikoto Region, Namibia
2011	Dundee Precious Metals – Namibia Tsumeb Smelter	Environmental Assessment Practitioner	Environmental Assessment for the Tsumeb Smelter, Namibia
2011	Transnet Limited Direct Rail Link	Environmental Assessment Practitioner	Environmental Impact Assessment (NEMA and NWA) for the development of a rail link between Postmasburg and the Sishen-Saldanha iron-ore line.

RECENT EMPLOYMENT RECORD

2016-Current	**Director** EXM Advisory Services
2013-2015	**Director & Head Environmental Impact Unit** SLR Consulting Services Africa
2004-2013	**Founder & Director** Synergistics Environmental Services

PUBLICATIONS

Fairley, K. 2004. Closure Costs – a motivation for ongoing environmental management. Proceedings: Third International Mining and Industrial Waste Management Conference, 2004, Johannesburg, South Africa.

Fairley, K and Nolte, C. 2006. The Sishen South Project: Going beyond the EIA to Ensure the Protection of the Environment. International Association for Impact Assessment South Africa, 2006. Pilanesberg, South Africa.

Fairley, K and van der Merwe, D. 2008. A Negative ROD – A Poor Reflection of the Proponent, the Environmental Practitioner or the Environmental Process? International Association for Impact Assessment South Africa, 2008. Bela Bela, South Africa

Fairley, K. 2012. Offsets a passing fad or a feasible strategy for biodiversity conservation in South Africa. International Association for Impact Assessment South Africa, 2012. Cape Town, South Africa.

Ainsley, J, Fairley KC, Nicolau GK. 2016. Report on the Biobash to Postmasburg Areas, Northern Cape, September, 2016. Biodiversity Observations. 7.83: 1-15.

APPENDIX B1: INTERESTED AND AFFECTED PARTIES DATABASE

AUTHORITIES

SURNAME	NAME	POSITION	AFFILIATION	EMAIL	PHONE	FACSIMILE	POSTAL ADDRESS
ABRAHAMS	ABE	REGIONAL MANAGER	NORTHERN CAPE: DEPARTMENT OF WATER & SANITATION	AbrahamsA@dws.gov.za	053 836 7600	086 650 9646	PRIVATE BAG X6101, KIMBERLEY, 8301
MSIMANGO	PHILANI	ACTING VAAL RIVER PROTO - CMA	VAAL RIVER PROTO - CAM	MsimangoP@dws.gov.za	053 836 7649	086 650 9646	PRIVATE BAG X6101, KIMBERLEY, 8301
MANS	JACOLINE	REGIONAL HEAD FORESTER	NORTHERN CAPE: DEPARTMENT OF FISHERIES & FORESTRY	JacolineMa@daff.gov.za	054 338 5909	054 334 0030	PRIVATE BAG X5912, UPINGTON, 8800
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MUILA	VINCENT	CASE OFFICER	NORTHERN CAPE: DEPARTMENT OF MINERAL RESOURCES		053 807 1700		PRIVATE BAG X6093, KIMBERLEY, 8300
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APPENDIX B2: PROOF OF PROJECT NOTIFICATION

Background Information Document (BID)

EXM Advisory Services

ENVIRONMENTAL • MINERAL RIGHTS • SOCIAL & SD

5 September 2018

SISHEN IRON ORE COMPANY (Pty) Ltd

ATTENTION: INTERESTED AND/OR AFFECTED PARTY

WESTERN DEWATERING INFRASTRUCTURE PROJECT, SISHEN MINE, KATHU, NORTHERN CAPE

Dear Sir/Madam

1. INTRODUCTION

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations at Sishen Mine toward the western side of the existing mine pit to allow for safe mining activities to continue. As part of the Western Dewatering Infrastructure Project, Sishen requires the construction of 2 new pipelines to convey groundwater from south of the mining activities to the existing export water transfer station at Sishen Mine.

The location of the proposed pipelines is shown in Figure 1.

An application is being sought for environmental authorisation in terms of:

- The Environmental Impact Assessment Regulations GNR. 982-985 of 4 December 2014, as amended for Activity 9 of Listing Notice 1 for the development of infrastructure for the bulk transportation of water.
- Section 102 of the Minerals and Petroleum Resources Development Act for the amendment of the Sishen Mine Environmental Management Programme (as amended).

The application will be supported by a Basic Assessment Report.

This letter serves to notify you as a landowner, lawful occupier, interested or affected party of the environmental authorisation process that is being sought.

EXM Advisory Services (Pty) Ltd has been appointed as independent Environmental Assessment Practitioner (EAP), responsible for administrating the environmental authorisation process.

Purpose

This document serves to:

- Notify you of the application for environmental authorisation.
- Describe the environmental assessment process.
- Inform you as to how you can provide input into the process.

Your Role

As an interested and affected party, your role is to:

- Ask questions, raise issues and concerns.
- Attend public meetings.
- Review and provide comment on environmental reports.

SOLUTIONS | PROGRESS | PARTNERS

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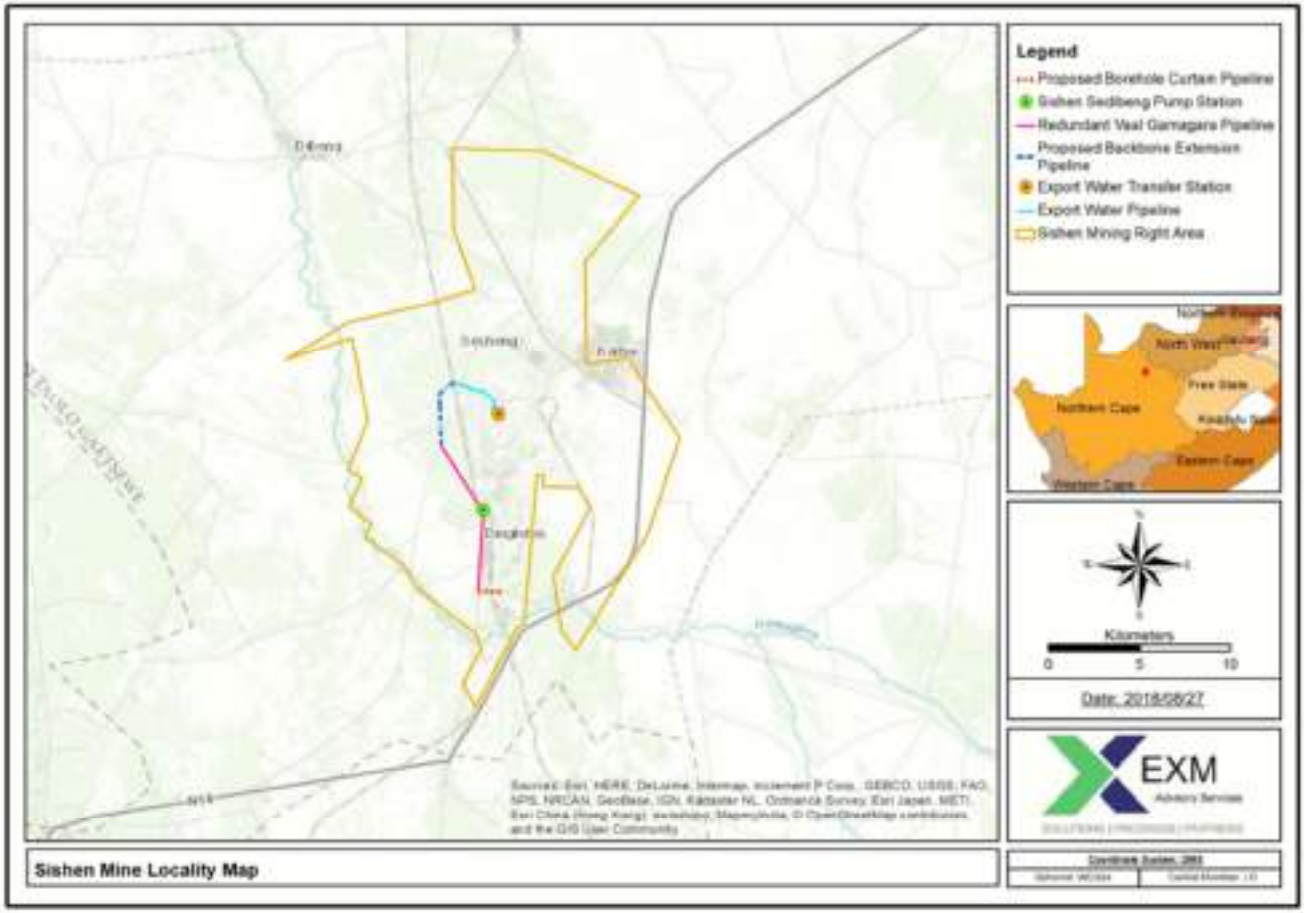


FIGURE 1: LOCATION OF WESTERN DEWATERING PIPELINE, SISHEN MINE, KATHU, NORTHERN CAPE

2. WESTERN DEWATERING INFRASTRUCTURE PROJECT PIPELINES

Sishen Mine is in process of expanding its mining activities towards the western side of the mining pit area. This involves expansion of the pit boundaries, construction of new western waste rock dumps and relocation of services such as railway lines and groundwater dewatering infrastructure. The new dewatering boreholes and pipe infrastructure are required in line with these expansions to be able to continue with safe mining activities.

The groundwater aquifer on which Sishen Mine is located flows from south to north. To reduce the number of boreholes needed on site to dewater the pits, dewatering boreholes are being established along the southern end of the mine to dewater the aquifer upstream from the mining pits, thereby reducing the need for new boreholes inside the pits. The proposed pipelines are required to convey water from the new dewatering boreholes to the Sishen Mien Export Transfer Station.

A proposed new Borehole Curtain Pipeline (a 250 mm diameter HDPE above ground pipeline) will be constructed along the D3333 road to convey water from the boreholes to a redundant section of the Vaal-Gamagara pipeline (an existing 700 mm underground pipeline) which runs parallel to the D328 road.

The water will be pumped northwards via the existing Sishen Sedibeng pump station to a proposed Backbone Pipeline (a 350 mm above ground steel pipeline) which will join with the existing pipeline network within Sishen Mine and the Sishen Export Water Transfer Station, for export to the Vaal-Gamagara pipeline at the Kathu Reservoir located north of Sishen Mine.

The layout of the proposed pipeline is given in Figure 2.

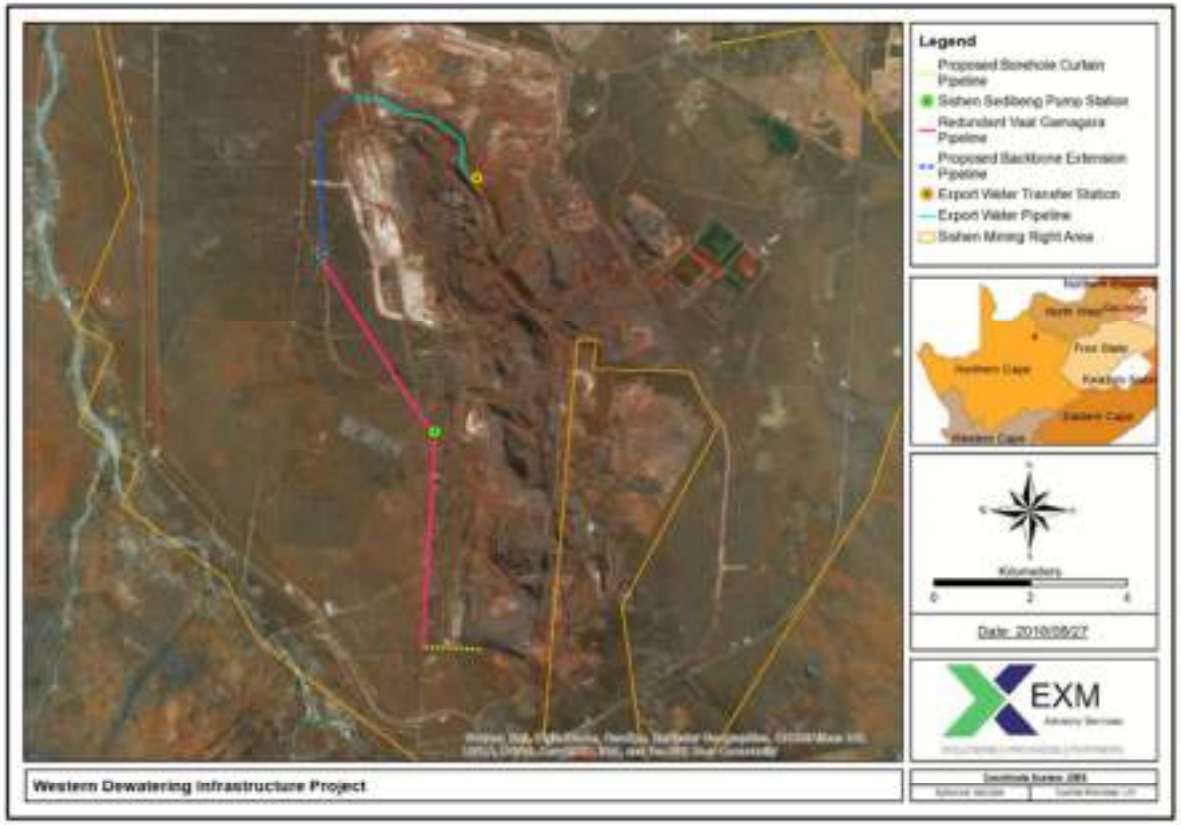


FIGURE 2: PROPOSED LAYOUT OF THE WESTERN DEWATERING INFRASTRUCTURE PROJECT

3. ENVIRONMENTAL AUTHORISATIONS

3.1 Minerals & Petroleum Resources Development Act (No. 28 of 2008)

The current approved Environmental Management Programme and its subsequent amendments do not provide for the Western Dewatering Infrastructure Project. Section 102 of the Minerals & Petroleum Resources Development Act indicates that an Environmental Management Programme may not be amended without authorisation.

The Environmental Management Programme compiled as part of the supporting documentation for the application for the environmental authorisation also serves as an amendment to the existing authorised management programme and the amendments thereto, in terms of Section 102 of the Minerals and Petroleum Resources Development Act.

3.2 National Environmental Management Act (No. 107 of 1998)

Authorisation is to be sought in terms of Section 24 of the National Environmental Management Act for the proposed activities that may have a detrimental impact on the environment. Activities to be authorised as per those listed in the Environmental Impact Assessment (EIA) Regulations Listing Notices GNR. 983-985 of 4 December 2014 as amended.

Activities in Listing Notice 1 require a Basic Impact Assessment in support of the application for authorisation. Therefore, a Basic Assessment Report will be undertaken in support of the application for environmental authorisation.

EIA LISTED ACTIVITIES

Activity No	Description
Listing Notice 1	
9	Development of infrastructure for the bulk transportation of water

4. BASIC ASSESSMENT

A Basic Assessment Process comprises a mini Environmental Impact Assessment aimed at determining the effect that the planned activities will have on the environment and surrounding communities.

Basic Assessment Report

The assessment process involves the review of available environmental information as well as the collation of additional information to identify potential environmental issues and concerns associated with the project. Public input is a key component of the identification of issues and concerns to be addressed in the study.

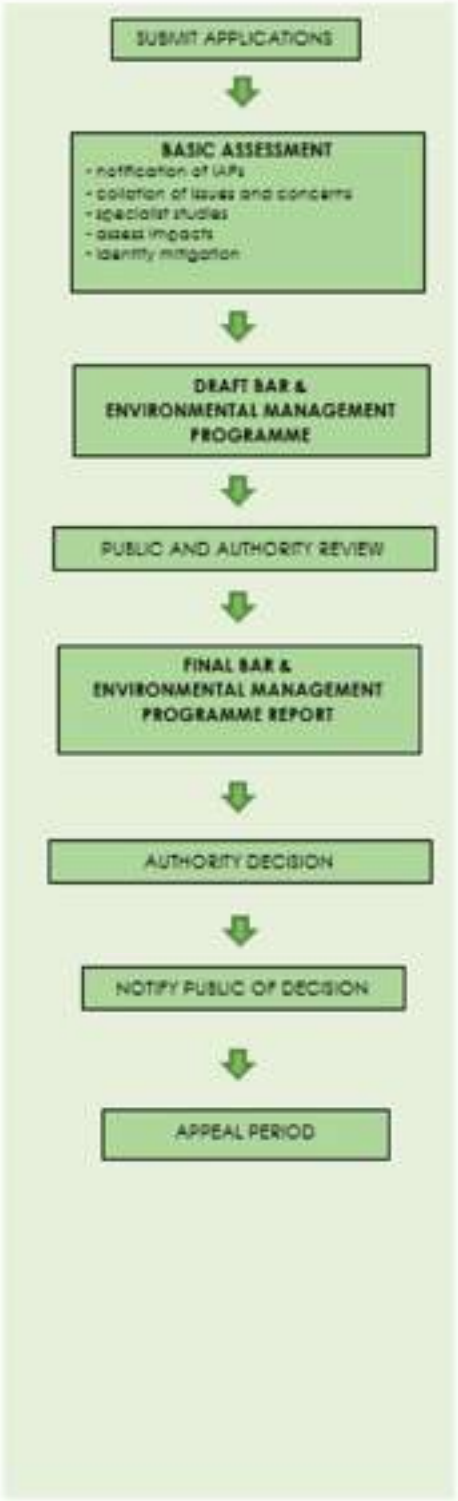
Key impacts will be related to clearance of sites for the development of the new pipelines. A specialist study will be undertaken to identify sensitive species and habitats. Impacts on such species and habitats will be avoided where practicable.

Interested & Affected Parties (IAPs) will be notified when the Basic Assessment Report is available for public review. IAPs are to ensure that issues raised have been adequately captured in the report.

The findings and the proposed measures identified to mitigate such impacts will be documented in a Basic Assessment Report.

Environmental Management Programme

An Environmental Management Programme (EMPr) will be drafted aimed at addressing impacts identified and reducing risks to acceptable levels. Recommendations of the specialists are used to assist in developing the management programme. The EMPr will be made available for public review and comment.



5. PUBLIC PARTICIPATION PROCESS

Interested & affected parties are invited to participate in the environmental process. You can provide input by:

- Registering as an interested and affected party
- Asking questions and raising initial concerns (see attached response form for your convenience)
- Attending the public meeting (see invitation below)
- Reviewing and providing comment on the Basic Assessment Report and Environmental Management Programme
- Reviewing environmental authorisations

IAPs will be notified via email, sms and/or fax when the draft Basic Assessment Report and Environmental Management Report is available for public comment.

Should your issues and concerns not be addressed through the process, you also have the opportunity to appeal should environmental authorisation be given.

Interested & affected parties are invited to attend a **public information-sharing meeting**:

INVITATION TO PUBLIC MEETING

Date: **Thursday 13 September 2018**
Time: **17h30-18h30**
Venue: **Cherry on Top, Kalahari Country Club, Kathu**

Should you have questions or require more information, **please contact**:

Kerry Fairley
EXM Advisory Services
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Yours sincerely

Kerry Fairley
EXM Advisory Services (Pty) Ltd

PUBLIC RESPONSE SHEET WESTERN DEWATERING INFRASTRUCTURE PROJECT	
Name:	
Address:	
Telephone/cell phone:	
Fax:	
E-mail:	
Date:	
Signature:	

If you know of others who should be informed of this application, please provide us with their contact details:

Name:	
Address:	
Telephone/cell phone:	
Fax:	
E-mail:	

ISSUES, CONCERNS AND QUESTIONS

EXM Advisory Services
Fax: 086 616 0443 PO Box 1822, Rivonia, 2128 email: kerry@exm.co.za

Notification via SMS

Phone Number	Network	Status	Submitted Date	Sent Data
27828219466	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27827771145	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27828082737	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27829224627	CELL C	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27635054223	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27828227898	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27827273823	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27828497655	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27829226890	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27827537806	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27832638092	MTN	UNDELIV	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.

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27829269670	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27829401876	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27833487242	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27832789499	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27833259965	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27833893255	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27833041144	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27833796126	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27834565417	Vodacom	BLIST	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27834076324	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27834085599	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27834862791	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27836495452	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.

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27836006461	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27836091237	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27836544687	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27825756828	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27839984001	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27825720732	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27825643580	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27845174913	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27715015586	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27715599091	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27726298389	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27722545726	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27733951969	MTN	EXPIRED	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.

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27727032656	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27734646312	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27761508054	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27761199642	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27787670942	MTN	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27769068934	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27780457045	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27791967248	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27796561938	Vodacom	EXPIRED	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27795167551	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27823313477	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27798900715	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27822939880	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.

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27823716672	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27823751847	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824750633	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824827579	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824670408	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824446013	Vodacom	EXPIRED	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824943135	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27823680356	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27825658779	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27824998001	Vodacom	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.
27846793274	CELL C	DELIVRD	03/Sep/2018 09:12	Notice: Sishen Iron Ore Company (Pty) Ltd is planning on expanding its mining operations at Sishen Mine (Kathu, Northern Cape) which requires the construction of two new pipelines for the transportation of groundwater. You are invited to a public information-sharing meeting at 17:30 on Thurs 13 Sep 2018 at Cherry on Top, Kalahari Country Club, Kathu. Please contact Kerry Fairley (kerry@exm.co.za or 010 007 3617) for more information.

Notification via email

Wording of Email (English)

Dear Interested & Affected Party

APPLICATION FOR ENVIRONMENTAL AUTHORISATION
SISHEN MINE WESTERN DEWATERING INFRASTRUCTURE PROJECT

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations at Sishen Mine towards the western side of the existing mine pit. As part of the expansion, Sishen requires the construction of 2 new pipelines to convey groundwater from dewatering boreholes to south of the mining activities to the existing export water transfer station at Sishen Mine. This forms part of the Western Dewatering Infrastructure Project.

An application is being sought for environmental authorisation in terms of:

- The Environmental Impact Assessment Regulations GNR. 982-985 of 4 December 2014, as amended for Activity 9 of Listing Notice 1 for the development of infrastructure for the bulk transportation of water.
- Section 102 of the Minerals and Petroleum Resources Development Act for the amendment of the Sishen Mine Environmental Management Programme (as amended).

The application will be supported by a Basic Assessment Report.

This letter serves to notify you as a landowner, lawful occupier, interested or affected party of the environmental authorisation process that is being sought.

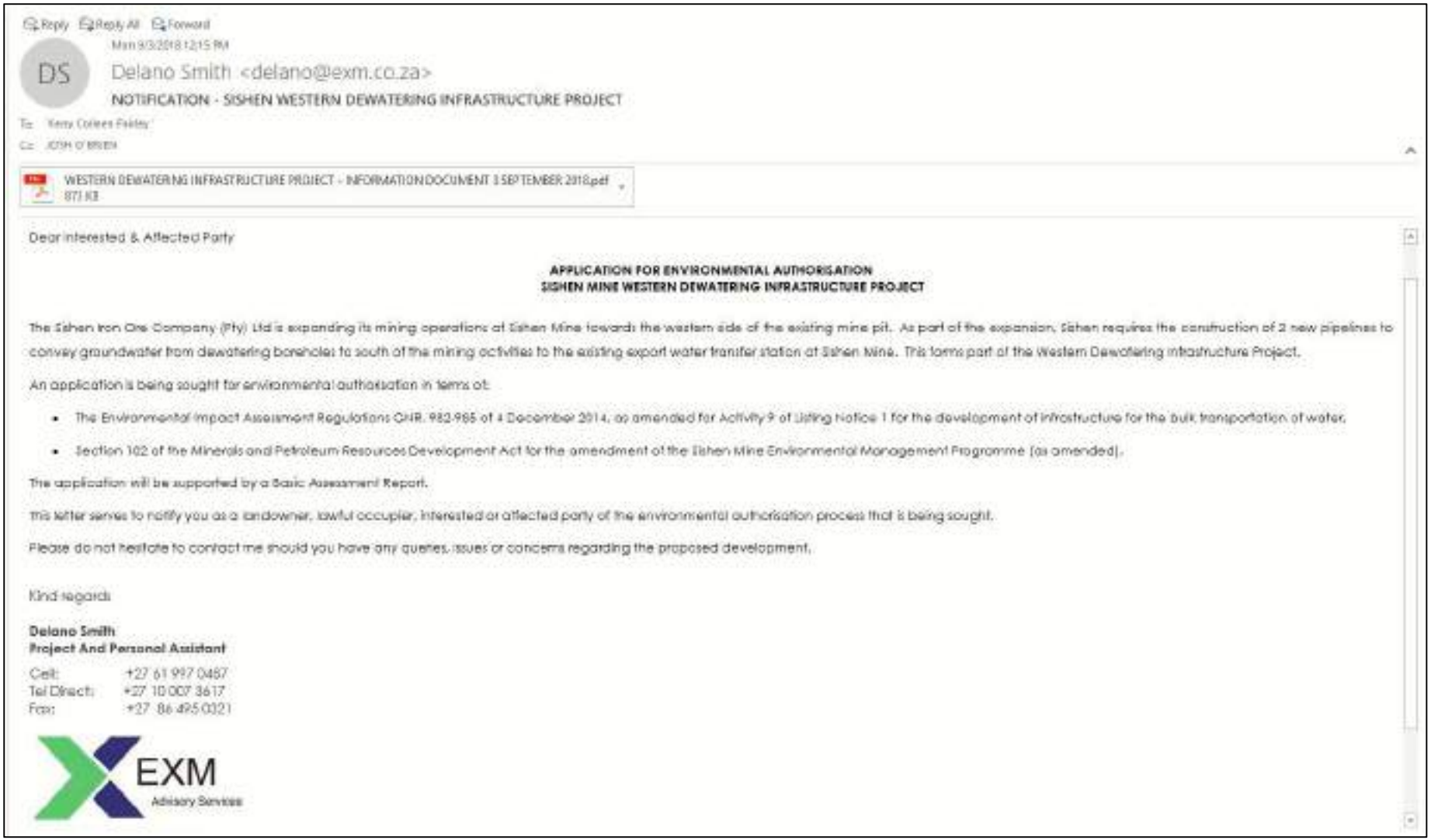
Please do not hesitate to contact me should you have any queries, issues or concerns regarding the proposed development.

Kind regards

Delano Smith
Project And Personal Assistant

Cell: +27 61 997 0487
Tel Direct: +27 10 007 3617
Fax: +27 86 495 0321

Proof of Email



Reply Reply All Forward

Mon 9/3/2018 12:15 PM

DS Delano Smith <delano@exm.co.za>

NOTIFICATION - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

To: Kerry Colleen Paisley

Cc: JOSH O'BRIEN

WESTERN DEWATERING INFRASTRUCTURE PROJECT - INFORMATION DOCUMENT 3 SEPTEMBER 2018.pdf
871 KB

Dear Interested & Affected Party

APPLICATION FOR ENVIRONMENTAL AUTHORISATION
SISHEN MINE WESTERN DEWATERING INFRASTRUCTURE PROJECT

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations at Sishen Mine towards the western side of the existing mine pit. As part of the expansion, Sishen requires the construction of 2 new pipelines to convey groundwater from dewatering boreholes to south of the mining activities to the existing export water transfer station at Sishen Mine. This forms part of the Western Dewatering Infrastructure Project.

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The application will be supported by a Basic Assessment Report.

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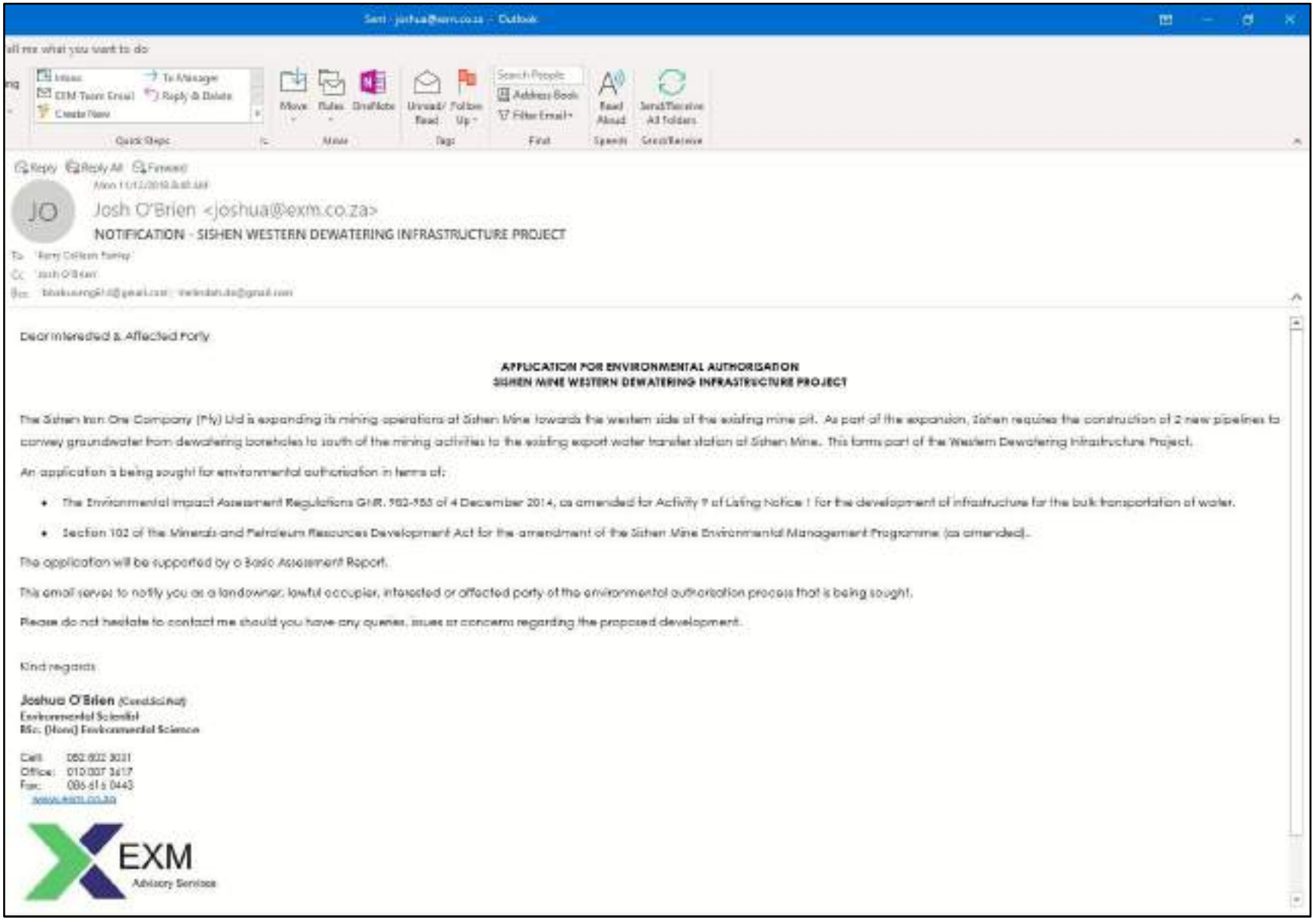
Please do not hesitate to contact me should you have any queries, issues or concerns regarding the proposed development.

Kind regards

Delano Smith
Project And Personal Assistant

Cell: +27 61 997 0467
Tel Direct: +27 10 007 3617
Fax: +27 86 495 0321

EXM Advisory Services



Reply Reply All Forward

JO

Josh O'Brien <joshua@exm.co.za>

NOTIFICATION - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

Dear Interested & Affected Party

APPLICATION FOR ENVIRONMENTAL AUTHORISATION
SISHEN MINE WESTERN DEWATERING INFRASTRUCTURE PROJECT

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations at Sishen Mine towards the western side of the existing mine pit. As part of the expansion, Sishen requires the construction of 2 new pipelines to convey groundwater from dewatering boreholes to south of the mining activities to the existing export water transfer station at Sishen Mine. This forms part of the Western Dewatering Infrastructure Project.

An application is being sought for environmental authorisation in terms of:

- The Environmental Impact Assessment Regulations GNR. 982-985 of 4 December 2014, as amended for Activity 9 of Listing Notice 1 for the development of infrastructure for the bulk transportation of water.
- Section 102 of the Minerals and Petroleum Resources Development Act for the amendment of the Sishen Mine Environmental Management Programme (as amended).

The application will be supported by a Basic Assessment Report.

This email serves to notify you as a landowner, lawful occupier, interested or affected party of the environmental authorisation process that is being sought.

Please do not hesitate to contact me should you have any queries, issues or concerns regarding the proposed development.

Kind regards

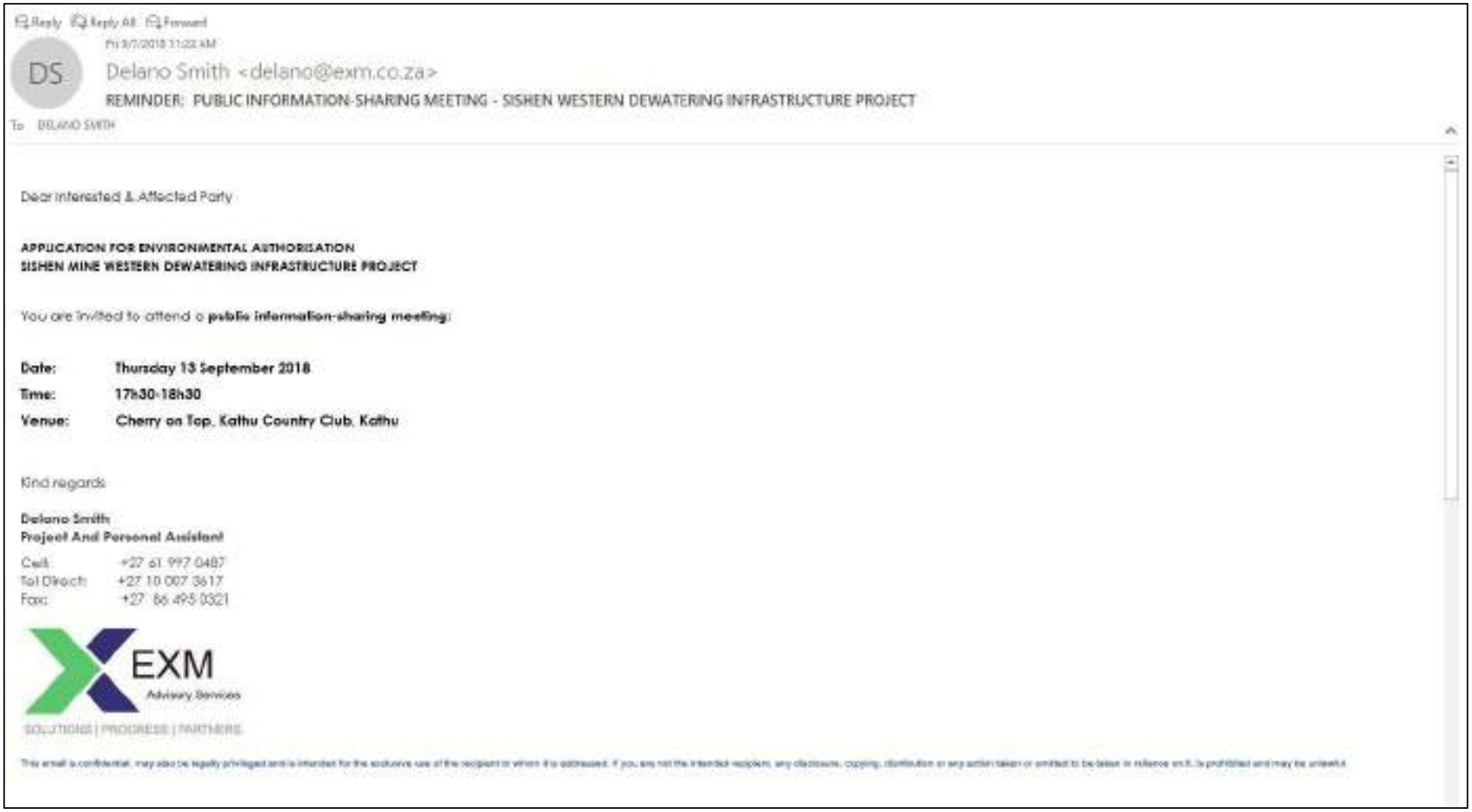
Joshua O'Brien (Cand.Sci.Nat)
Environmental Scientist
BSc. (Hons) Environmental Science

Cell: 082 602 3031
Office: 010 007 3617
Fax: 086 615 0443
www.exm.co.za

EXM
Advisory Services

Reminder of meeting

A reminder was sent on 7 September 2018 for the public meeting on 13 September 2018.



Reply Reply All Forward

Fri 9/7/2018 11:22 AM

DS Delano Smith <delano@exm.co.za>

REMINDER: PUBLIC INFORMATION-SHARING MEETING - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

To DELANO SMITH

Dear Interested & Affected Party

APPLICATION FOR ENVIRONMENTAL AUTHORISATION
SISHEN MINE WESTERN DEWATERING INFRASTRUCTURE PROJECT

You are invited to attend a **public information-sharing meeting:**

Date: **Thursday 13 September 2018**
Time: **17h30-18h30**
Venue: **Cherry on Top, Kathu Country Club, Kathu**

Kind regards

Delano Smith
Project And Personal Assistant

Cell: +27 61 997 0487
Tel Direct: +27 10 007 3617
Fax: +27 86 495 0321

EXM Advisory Services

SOLUTIONS | PROGRESS | PARTNERS

APPENDIX B3: WORDING AND PROOF OF PLACEMENT OF PRESS ADVERTISEMENTS AND SITE NOTICES

B3.1 Press Advertisements

Wording of Press Advertisement (English)

SISHEN IRON ORE COMPANY (PTY) LTD - SISHEN MINE

WESTERN DEWATERING INFRASTRUCTURE PROJECT

KATHU, NORTHERN CAPE

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations at Sishen Mine towards the western side of the existing mine pit. As part of the expansion, Sishen requires the construction of 2 new pipelines to convey groundwater from dewatering boreholes to south of the mining activities to the existing export water transfer station at Sishen Mine. This forms part of Western Dewatering Infrastructure Project.

Application is being made for environmental authorisation in terms of:

- The Environmental Impact Assessment Regulations GNR. 982-985 of 4 December 2014, as amended for Activity 9 of Listing Notice 1 for the development of 2 new pipelines for the transportation of groundwater.
- Section 102 of the Minerals and Petroleum Resources Development Act for the amendment of the Sishen Mine Environmental Management Programme (as amended) to include the Western Dewatering Infrastructure.

Interested & affected parties are invited to attend a public information-sharing meeting:

Date: Thursday 13 September 2018
Time: 17h30-18h30
Venue: Cherry on Top, Kalahari Country Club, Kathu

The application will be supported by a Basic Assessment Report and Environmental Management Prgramme.

Should you wish to obtain further information or register as an interested and affected party kindly make written submission to:

Kerry Fairley
EXM Advisory Services (Pty) Ltd
Tel: 010 007 3617 Fax: 086 616 0443
Post: PO Box 1822, Rivonia, 2128
Email: kerry@exm.co.za

EXM Advisory Services
SOLUTIONS | PROGRESS | PARTNERS

Proof of Press Advertisement in Kalahari Bulletin (English)

A press advertisement was placed in the Kalahari Bulletin on 6 September 2018, informing the public of the project and the date of the public meeting.

Geklassifiseerd

SISHEN IRON ORE COMPANY (PTY) LTD – SISHEN MINE
WESTERN DEWATERING INFRASTRUCTURE PROJECT
KATHU, NORTHERN CAPE

The Sishen Iron Ore Company (Pty) Ltd [illegible] Sishen [illegible] the Western Dewatering Infrastructure Project.

Application [illegible] in terms of:

- The Environmental Impact Assessment Regulations [illegible] December 2014, as amended, [illegible]
- Section [illegible] of the Mineral and Petroleum Resources Development Act [illegible] the Sishen [illegible] Environmental Management Programme [illegible] Western Dewatering Infrastructure.

Interested and affected parties are invited to attend a public information sharing meeting:
Date: Thursday 13 September 2018
Time: 17:30–18:30
Venue: [illegible], Kalahari Country Club, Kathu

The [illegible] will be supported by a Basic Assessment Report and Environmental Management Programme.

Should you wish to obtain further information or register as an interested and affected party, kindly make written submission to:

[illegible]
EXM Advisory Services (Pty) Ltd
Tel: [illegible] Fax: [illegible]
Post: PO Box [illegible]
E-mail: [illegible]

PURPLEGLAZE 3CC T/A E-CAT WATER USE LICENCE APPLICATION FOR E-CAT PUBLIC PARTICIPATION PROCESS

Project:	Purpleglaze 3CC t/a E-CAT
Property No:	Erf 3985, Kuruman
Location:	3620 [illegible] Street, industrial area of Kuruman, Northern Cape
Water uses being applied for:	21 (a) taking water from a water resource (borehole)
Application:	Will be submitted to Department of Water and Sanitation in terms of Regulation No. 267 (24 March 2017) of the NWA.

Any queries, comments and/or objections to the application are to be received in writing by the person listed below by no later than [illegible] November 2018.

Contact details: CE Claassens
E-mail: [illegible]@e-cat.co.za
Fax: 086 [illegible]
Post: PO Box 1232, Kuruman 8460
Queries: Call 083 [illegible]

E-CAT

GS VEILINGS KATHU
VRYDAG 14 SEPTEMBER 2018 OM 09:00
Ou Goodies Leather-perseel, Kathu

NAMENS ONS KLIENT VERKOOP ONS PER OPENBARE VEILING:
Aluminiumsteierwerk ('scaffolding') 7-m-toring met wiele, 20+ volledige steierwerkeenhede.
GEREEDSKAP: Elektriese boor, 'sanders', handskaaf, 'grinders', 'socket'-stelle, skroewedraaiers, 'spanners', bobbejaan- en 'shifting spanners', hamers, tange, baie boorpunte, Dumpy Level, waterpasse.
ANDER: Robertson-betonmenger (pulk toestand, werkend), staalwerkbank met bank-skroef, werkbankgemonteerde slyp-/poleermasjien, 'concrete whole saw', 2 sweismasjiene, Honda-petrolmotor.
UNIEK: HILTI-gasspykermasjien, Metabo-magneetbasisboormasjien, Husqvarna-bosie-kapper, Metabo-'combo' koordlose boormasjien, RACO-'socket'-stel, 36 mm/80 mm, hout-'sleepers'.
YARD CLEANING: Skrootmetaal, beproeïngs-materiaal, dromme vol los boute/moere, baie oorskietboumateriaal, verf, grawe, pikke, harke, kruiwaens, baie elektriese onderdele, 'plugs', ens.
VOERTUIE: Mercedes-Benz C220 DI 2005. Diens op datum. Pulk voertuig.
TE VEEL OM TE NOEM. WEES DAAR.
KOM BESIGTIG DAG VOOR VEILING VANAF 14:00.
VOORWAARDES: KONTANT OF EFT. R50 REGISTRASIE (nie terug betaalbaar). 10% KOPERSKOMMISSIE.
NAVRAE: GERRIT 082 823 5197
G S VEILINGS KATHU

SIOC COMMUNITY DEVELOPMENT TRUST

SIOC COMMUNITY DEVELOPMENT TRUST (SIOC-CDT) STAKEHOLDER ROADSHOW NOTICE FOR NORTHERN CAPE PROVINCE BENEFICIARY COMMUNITIES

The SIOC Community Development Trust [illegible]

Roadshow dates and venues:

MUNICIPAL AREAS	MEETING DATES	VENUES	TIMES
GA-SEGONYANA	10 September 2018	[illegible] Multi-purpose centre (MPC)	10:00 - 14:00
JOE MOROLONG	11 September 2018	[illegible] Community hall	10:00 - 14:00
	12 September 2018	[illegible] Post Office	10:00 - 14:00
GAMAGARA	13 September 2018	[illegible] Community hall	10:00 - 13:00
	13 September 2018	[illegible] Multi purpose centre (MPC)	17:00 - 19:00
	14 September 2018	[illegible] Community hall	10:00 - 12:00
	17 September 2018	[illegible] Community hall	10:00 - 14:00

We look forward to meaningful engagements with you as a valued stakeholder and encourage community members to attend these sessions at their respective communities.

For more information on the roadshows kindly contact [illegible]

FROM THE OFFICE OF THE CHIEF EXECUTIVE OFFICER
Physical address:
SIOC Community Development Trust
Cnr [illegible] Roads
SIOC-cdt Office Park
Block A, Ground Floor
Kathu
8446

WIL JY R25 000 WEN?

Speel van September tot November saam met Sanlam iTrade op die aandelebeurs en staan die kans om R25 000 te wen!

Skryf nou in vir die iTrade met 'n [illegible]

NETWERK24

[illegible] www.netwerk24.com vir meer inligting

Sanlam PRIVATE Wealth

Wording of Press Advertisement (Afrikaans)

SISHEN IRON ORE COMPANY (PTY) LTD - SISHENMYN

WESTELIKE ONTWATERING INFRASTRUKTUUR PROJEK

KATHU, NOORD-KAAP

Sishen Iron Ore Company (Pty) Ltd is tans besig om mynboubedrywighede by Sishenmyn uit te brei na die westekant van die bestaande mynput. Die beplande uitbreiding by Sishenmyn behels die konstruksie van 2 nuwe pyplyne vir die oordrag van grondwater vanaf ontwateringsboorgate suid van die mynbou-aktiwiteite na die bestaande uitvoer oordrag pompstasie by Sishenmyn. Dit vorm deel van die Westelike Ontwatering Infrastruktuur Projek:

Aansoek word gedoen vir omgewingsmagtiging in terme van:

- Omgewingsimpakbepalingsregulasies GNR. 982-985 van 4 Desember 2014, soos gewysig vir Aktiwiteit 9 van Notering Kennisgewing 1, vir die ontwikkeling van 2 nuwe pyplyne vir die oordrag van grondwater.
- Artikel 102 van die Wet op die Ontwikkeling van Minerale en Petroleumhulpbronne vir die wysiging van die bestaande Sishenmyn Omgewingsbestuursplan (soos gewysig) om die Westelike Ontwatering Infrastruktuur in te sluit.

Belanghebbende en geaffekteerde partye word uitgenooi om 'n openbare inligtingsvergadering by te woon:

Datum: Donderdag 13 September 2018
Tyd: 17h30-18h30
Plek: Cherry on Top, Kalahari Country Club, Kathu

Die aansoek sal ondersteun word deur 'n Basiese Impakstudieverslag en 'n Omgewingsbestuursplan.

Indien u verdere inligting wil verkry of as 'n belanghebbende en geaffekteerde party wil registreer, maak asseblief skriftelike voorlegging aan:

Kerry Fairley
EXM Advisory Services (Pty) Ltd
Tel: 010 007 3617 Faks: 086 616 0443
Pos: PO Box 1822, Rivonia, 2128
Epos: kerry@exm.co.za

EXM Advisory Services
SOLUTIONS | PROGRESS | PARTNERS

Proof of Press Advertisement in Volksblad (Afrikaans)

A press advertisement was placed in the Volksblad on 5 September 2018, informing the public of the project and the date of the public meeting.

RAMAGE-MOORD

Twee hoor hul vonnis vandag

16-jarige môre aan die beurt

Kovsies besorg oor hul veiligheid

Inwoners gemaan ná nog aanvalle

Matika se bedanking 'bittersoet oorwinning'

B3.2 Site Notices

Wording of Site Notice (English)

SISHEN IRON ORE COMPANY (PTY) LTD

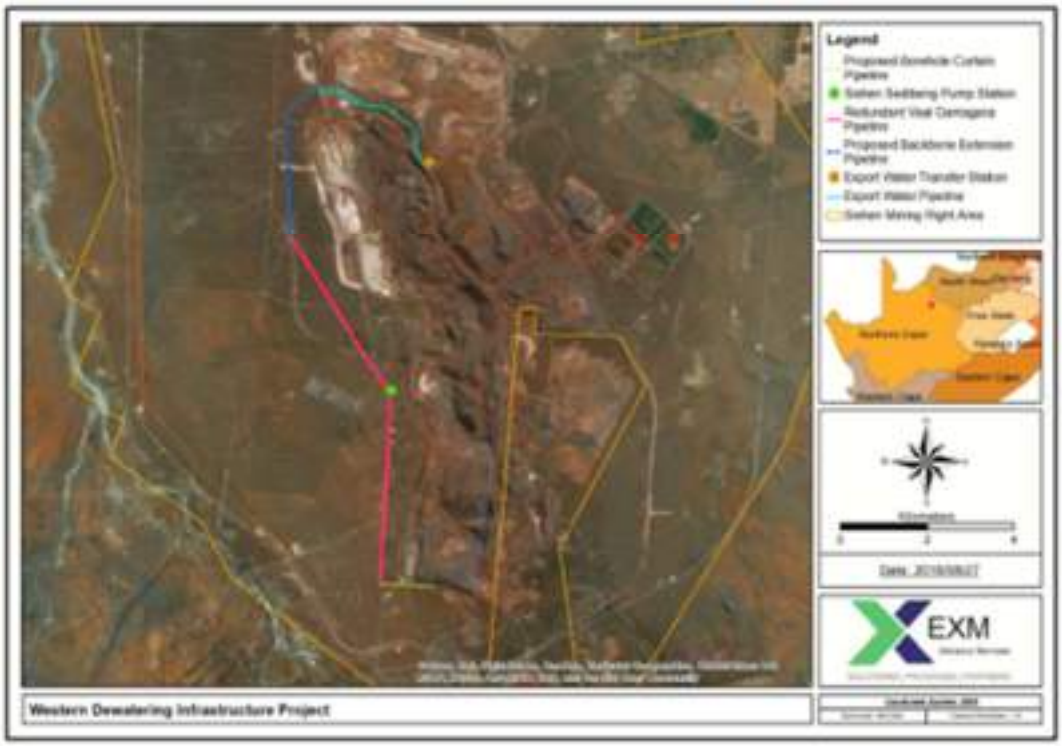
SISHEN MINE

SISHEN DEWATERING INFRASTRUCTURE PROJECT

KATHU, NORTHERN CAPE

NOTICE OF THE ENVIRONMENTAL AUTHORISATION PROCESS

The Sishen Iron Ore Company (Pty) Ltd is expanding its mining operations toward the western side of the existing mine pit and is required to relocate the old dewatering infrastructure to areas suitable and safe for mining activities to continue. SIOM plans to undertake the construction of a 4 km Backbone Extension Pipeline as well as a 1.2 km Borehole Curtain Pipeline.



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- Section 102 of the Minerals and Petroleum Resources Development Act for the amendment of the Sishen Mine Environmental Management Programme (as amended).

The application will be supported by a **Basic Assessment Report.**

Should you wish to obtain further information or **register as an interested and affected party** kindly make a written submission to:

Kerry Fairley
EXM Advisory Services (Pty) Ltd
Tel: 082 871 2958 Fax: 086 616 0443
Post: PO Box 1822, Rivonia, 2128
Email: kerry@exm.co.za

EXM Advisory Services

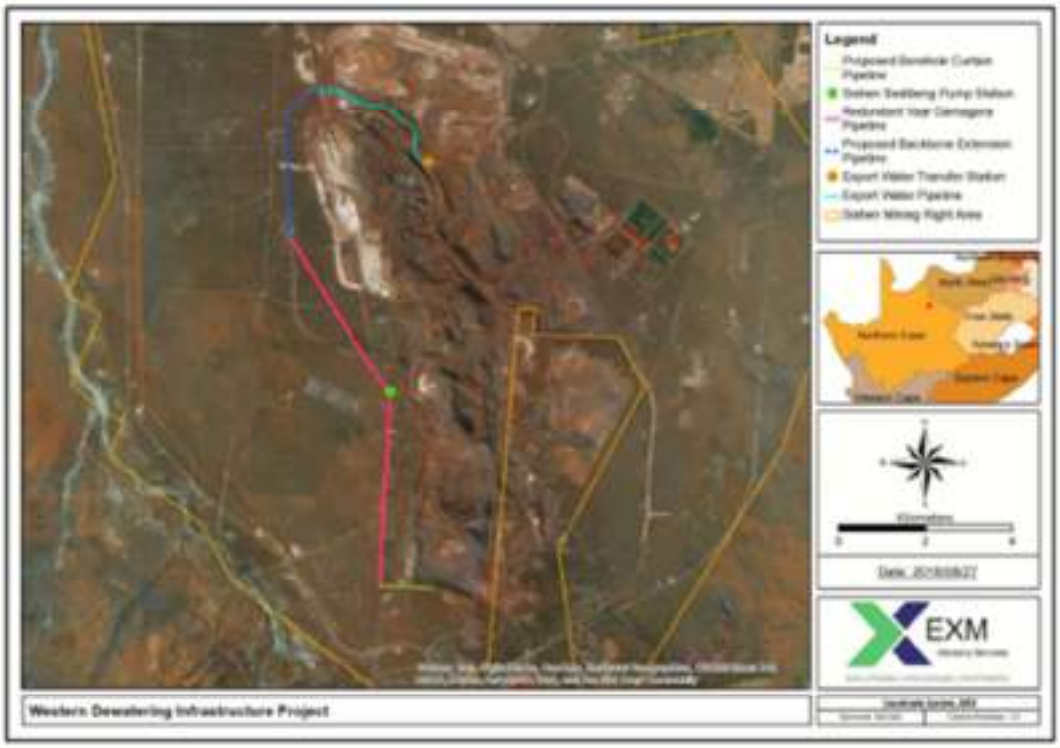
Wording of Site Notice (Afrikaans)

SISHEN IRON ORE COMPANY (PTY) LTD

SISHENMYN
WESTELIKE ONTWATERING INFRASTRUKTUUR PROJEK
KATHU, NOORD-KAAP

KENNISGEWING VAN OMGEWINGSIMPAK PROSES

Sishen Iron Ore Company (Pty) Ltd is tans besig om mynboubedrywighede by Sishenmyn uit te brei na die westekant van die bestaande mynput. Die beplande uitbreiding by Sishenmyn behels die konstruksie van 2 nuwe pyplyne vir die oordrag van grondwater vanaf ontwateringsboorgate suid van die mynbou-aktiwiteite na die bestaande uitvoer oordrag pompstasie by Sishenmyn. Dit vorm deel van die Westelike Ontwatering Infrastruktuur Projek.



Aansoek word gedoen vir omgewingsmagtiging in terme van:

- Omgewingsimpakbepalingsregulasies GNR. 982-985 van 4 Desember 2014, soos gewysig vir Aktiwiteit 9 van Notering Kennisgewing 1, vir die ontwikkeling van 2 nuwe pyplyne vir die vervoer van grondwater.
- Artikel 102 van die Wet op die Ontwikkeling van Minerale en Petroleumhulpbronne vir die wysiging van die bestaande Sishenmyn Omgewingsbestuursplan (soos gewysig) om die Westelike Ontwatering Infrastruktuur in te sluit.

Die aansoek sal ondersteun word deur 'n **Basiese Impakstudieverslag** en 'n **Omgewingsbestuursplan.**

Indien u verdere inligting wil verkry of as 'n **belanghebbende en geaffekteerde party** wil registreer, maak asseblief skriftelike voorlegging aan:

Kerry Fairley
EXM Advisory Services (Pty) Ltd
Tel: 082 871 2959 Faks: 086 616 0443
Pos: PO Box 1822, Rivonia, 2128
Epos: kerry@exm.co.za

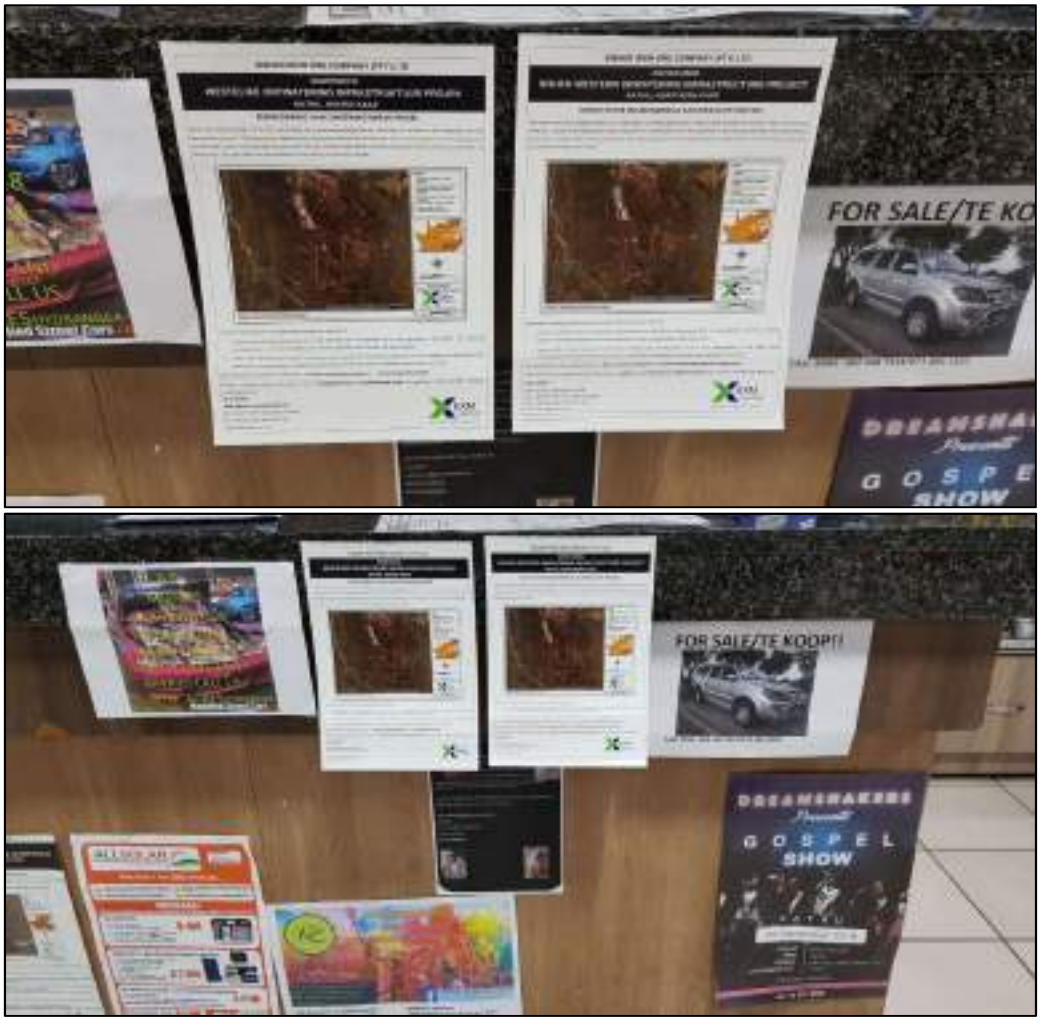
EXM Advisory Services
SOLUTIONS | PROGRESS | PARTNERS

Proof of Placement of Site Notice Posters

Two site notice posters (one in English and one in Afrikaans) were placed at each of the following locations on 13 September 2018.

Outside Foodzone

Outside Spar



Sishen Mine Main Entrance


SISHEN IRON ORE COMPANY (PTY) LTD
SISHEN MINE
WESTERN DEWATERING INFRASTRUCTURE PROJECT
KATHU, NORTHERN CAPE
SISHEN IRON ORE COMPANY (PTY) LTD
SISHEN MYN
WESTELIKE ONTWATERING INFRASTRUKTUUR PROJEK
KATHU, NOORD-KAAP
EXM
EXM

Next to Road near Lylyveld

APPENDIX B4: MINUTES OF MEETING

SISHEN MINE WESTERING DEWATERING INFRASTRUCTURE PROJECT
PUBLIC INFORMATION-SHARING MEETING

DATE: 13 September 2018
PLACE: Kalahari Golfklub, Cherry on Top
TIME: 17H30

PRESENT

Moses Moalani (MM)	Fernando Massozi
Nancy Mohutsiwa	Sakkie van Niekerk (SvN)
Fred Viljoen	Travis White (TW)
Attie Du Toit (ADT)	Ferdi Goussard (FG)
Jadia Hoffman	Mashua Fhatuwani (MF)
Jaap Hoffman (JH)	Kerry Colleen Fairley (KF)
Tops van der Linde	Lynné Viljoen
Llewelyn Orange	Divan van der Merwe (DvM)
Willie Uys (WU)	

Nr	Item
1.	**Introduction**
1.1	KF welcomes everyone at the meeting and introduces everyone involved in the project.
2.	**Purpose of the Meeting**
2.1	KF states that Sishen Mine is expanding its mining operations to the western side of the existing pit and that Sishen requires the construction of 2 new pipelines as part of this development. She confirms that this forms part of the Western Dewatering Infrastructure Project.
2.2	KF explains that the expansions require authorisation from the DMR in terms of Section 102 of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA) and the Environmental Impact Assessment Regulations, 2014 (EIA Regulations). KF further explains that the application for environmental authorisation is to be supported by a Basic Assessment Report and an Environmental Management Programme.
2.3	KF states that the purpose of the meeting was to inform interested and affected parties of the proposed project; collate issues and concerns to be taken into consideration in

Nr	Item
2.4	when assessing the impacts of the project as well as to provide an opportunity for persons to ask questions. KF confirms that there is no need for approval of the Department of Water and Sanitation for this project.
3.	**Locality**
3.1	KF shows the location of the pipelines on the map.
4.	**Project Overview**
4.1	KF states that the proposed pipelines are required to convey water from boreholes to the south of the pits to the Sishen Mine Export Transfer Station and that the pipelines will replace pipeline infrastructure which needs to be moved for the Western Expansion Project.
4.2	KF explains that a proposed new Borehole Curtain Pipeline will be constructed along the D3333 (south of the Dingleton Road) and will be a 250 mm diameter HDPE above ground pipeline, 1.2 km in length and will convey 200-600 m3/hr of water (55 – 167 l/s). This pipeline will convey water to a redundant section of 8.7 km of the Vaal-Gamagara Pipeline, an existing 700 mm underground pipeline. The water will be pumped via the existing Sishen Sedibeng pump station to a new proposed Backbone Pipeline.
4.3	KF explains that the Backbone Pipeline will be a 350 mm above ground steel pipeline 4.2 km in length and will convey 400-650 m3/hr (110 – 180 l/s) from the recommissioned Vaal-Gamagara pipeline. The Backbone Pipeline will join the existing pipeline network within Sishen Mine and the Sishen Export Water Transfer Station, for Export to the Kathu Reservoir and the Vaal-Gamagara Pipeline.
5.	**Authorisation Process**
5.1	KF confirms that authorisation is being sought for an amendment of the Sishen EMPr (as amended) to allow for the Western Dewatering Infrastructure Project in terms of Section 102 of the MPRDA.
5.2	KF confirms that authorisation is also being sought for an Environmental Authorisation of EIA listed activities for infrastructure development - listed in the EIA Regulations for - Activity 9, Listing Notice 1 as well as Activity 45, Listing Notice 1.
5.3	KF explains that a full EIA is not required for smaller projects however a Basic Assessment will be conducted. She confirms that specialist studies for fauna and flora as well as a Heritage Impact Assessment Study will be conducted.
5.4	KF explains the Basic Assessment process.
5.5	

Nr	Item
	KF states that the report will be available for review by December 2018 and will be emailed to the Interested Parties. She recommends that if anything is of interest for you in the report that you must go to the specific section and read that section.
6.	**Way forward**
6.1	KF explains that the draft Basic Assessment Report will be available for public comment on the 9 November – 10 December 2018 and that the final Basic Assessment Report will be submitted to the DMR on the 12 December 2018.
6.2	KF confirms that Authorisation decision is expected in May 2019. KF states that the decision is due in May 2019 but that the DMR are running behind on their decisions and for that reason it may be later.
7.	**Questions**
7.1	SvN asks if the infrastructure will be moved or will it be a new system?
7.2	TW responds that it will be a combination of both: moving of existing pipeline as well as a newly built pipeline.
7.3	SvN asks if the boreholes will replace current boreholes?
7.4	TW states that they are only adding to the existing system.
7.5	JH asks if their boreholes will be affected?
7.6	TW confirms that it will not be affected as it is two completely different aquifers and that the water that they are pumping out is not connected to the farmers swallow boreholes.
7.7	SvN aks what is the current water level in the boreholes?
7.8	TW answers: 195m
7.9	FG confirms that it is within the existing dewatering area and states that monitoring will take place in order to determine the impacts.
7.10	MM asks what the water will be used for?
7.11	KF confirms that water will go to the mine and will be exported to the Gamagara Municipality and to Sedibeng and that the current situation does not change only the boreholes change. She further confirms that the project doesn't affect the amount of dewatering.
7.12	TW states that they will be pumping within the Water Use Licence (WUL) and that it will only be a smaller area and therefore a more confined impact zone.
7.13	AdT asks if Sishen need to apply for a WUL?
7.14	KF responds that the WUL makes provision for changes and accommodates an annual update of boreholes to indicate where the boreholes are located if they have changed.
7.15	DvM adds that the WUL allow you to change boreholes within the same aquifer compartment and that you will only need a new WUL once you go out of the compartment.

Nr	Item
7.16	DvM asks if the impacted areas will be affected by the project?
7.17	TW responds that it will not be affected and that it may make the impacted area smaller.
7.18	WU mentions that he attended a meeting for extension of the WUL and that he provided input and that the mine is now starting a new project, while he has not heard anything about the previous project.
7.19	FG confirms that it is two separate applications and that the Artificial Aquifer Project has nothing to do with this project.
7.20	WU states that he is worried about the water in the boreholes as there is already problems in the area and asks if the boreholes will be moved to different compartments?
7.21	TW responds that the boreholes will be in the same compartment, the volumes will be the same, they will pump less water to get more draw down and if will therefore be more effective.
7.22	KF states that this is a better way of dewatering the required pipeline, there is nothing new, only the pipelines will change and that she doesn't think there is a big issue on the pipelines.
7.23	KF confirms that they will map the compartments and show how it will change.
7.24	MM asks if Sedibeng has the capacity to handle the volume of water?
7.25	TW responds that Gamagara and Sedibeng can't take the full capacity and they need to turn off some boreholes but that they are able to send water to Kalahari East to make sure upstream the Vaal Gamagara pipeline is not as full. He states that they will report where the water goes on a monthly basis.
7.26	JH asks if the road will be cut off during construction?
7.27	TW answers: no, they will use existing culvert and that there will be minimal disturbances.
7.28	MM raises his concern regarding old graves in the Dingleton Area.
7.29	KF states that a Heritage Impact Assessment will be conducted but that they don't expect any disturbances as they will use the old Gamagara pipeline that is already there.
7.30	MF states the project will take place above the ground and therefore there will be limited disturbances.
7.31	KF closed out the meeting and thanked everyone for coming.

Compiled by: Lynné Viljoen
Cell: 081 507 9947
Fax: 086 407 9911
Email: lynne@exm.co.za
Date: 17 September 2018

APPENDIX B5: IAP CORRESPONDENCE RECEIVED TO DATE

Name	Comment from IAP	Response to IAP	Status
Judi Bolweg	Dear Delano I wish to thank you for inviting the Kathu Gazette to this very important step in the proposed expansion of Sishen mine and the necessary construction of 2 pipelines in order to facilitate the expansion, however as the local newspaper I would be more interested in a report back of the meeting, detailing some of the objections raised by farmers or interested and affected parties. If you do provide such a report, I would be very interested in receiving such. Regards; Judi Bolweg; EDITOR	A report containing objections raised by farmers or interested parties, is available for review in the Basic Assessment Report.	Consensus
Sakkie van Niekerk	Hi Delano As interested and affected party I want to understand a bit more. Is this application only for the construction of the pipeline or does it include the extraction of the water from the indicated boreholes? Dewatering in this area may pose a risk as it is in a very sensitive area. Water flow from the south is coming from the Gamagara river which is very sensitive regarding the farming community as well as to the forming of sink structures putting at risk the N14 and rail lines. These boreholes are also on strike with major dyke systems into the lavas and can lead to dewatering on this already very sensitive area. The Parson area is up till now relatively good protected against dewatering but there is a possibility that these new holes may affect this area looking at the Khumani model. My biggest concern is the sink structures already existing relatively close to this area and I never saw any plan to cater for that. You may note this as a concern from my side I will try to come to the meeting. Regards; Sakkie	This application only includes the pipeline. There will be no addition abstraction from boreholes as part of this project. The pipeline falls within the same dewatering compartment, and therefore, there will be no additional impacts on dewatering. According to Travis White, the current impacts at the mine will not change. Dewatering is in the same compartment, and impacts will not change.	Consensus
Philani P. Msimango	Good Day Could you please clarify why was this project not included as part of the Sishen Consolidated water use license application submitted in June 2018? There were a few lengthy discussions held with Sishen Iron Ore Company where it was discussed that all projects which are to be implemented in the nearby future be included in one consolidated application (which was submitted in June 2018). I was under the assumption that all projects have been included in the consolidated water use license. Your assistance in this regard will be highly appreciated. Regards; Mr. Phlani P. Msimango	Dear Philani There is no water use license requirement for this application. You have been notified of the development as a commenting authority. This is only an EA process falling under the responsibility of the DMR to authorise. Please do not hesitate to contact me should you any queries. Kind Regards Kerry Fairley	Consensus

Name	Comment from IAP	Response to IAP	Status
	Good Day I think you are misinterpreting my concern so please allow me to provide clarity. The purpose of alerting the competent authority is for the said competent authority to provide input into whether the proposed project triggers any requirements for authorisation from that said competent authority. This might be a notification, but it is a notification on a water related project and therefore affects the Department of Water and Sanitation. All water related projects should at the very least be included in the IWWMP. Therefore, my concern still stands, why was this project not included with the June 2018 application (on the IWWMP at the very least)? Regards; Mr. Philani P. Msimango	Dear Philani Your comment is noted. I will confirm what was included in the IWWMP of 2018 and revert soonest with an informed response. Kind regards Kerry Fairley	Consensus
		Good morning All, This project was considered and includes in the IWWMP as follow: 1. The pipeline is part of the western expansion project 2. One new borehole had been included in the IWWMP (SW1100) I phoned Philani this morning and gave him clarity on the objective of this project (take the pipe outside of the WWRD footprint) and confirmed it is not changing the mine's water uses it is merely to ensure completeness of the EA. I also indicated we did update the 21j/a water use table of production boreholes in the IWWMP to reflect the new borehole (SW1100) that might be used this year. All concerns from DWS are resolved. Regards, Divan van der Merwe	Consensus
Koos van Zyl	Hallo Delano, Ek kan ongelukkig nie die vergadering bywoon nie. Is dit moontlik om vir my die info per epos deur te stuur, asb? Vriendelike groete; Koos van Zyl; Winton.	A report containing information from the meeting is available for review in the Basic Assessment Report.	Consensus

Name	Comment from IAP	Response to IAP	Status
Public Meeting*	Sakkie van Niekerk asks if the infrastructure will be moved or will it be a new system?	Travis White responds that it will be a combination of both: moving of existing pipeline as well as a newly built pipeline.	Consensus
Public Meeting*	Sakkie van Niekerk asks if the boreholes will replace current boreholes?	Travis White states that they are only adding to the existing system.	
Public Meeting*	Jaap Hoffman asks if their boreholes will be affected?	Travis White confirms that it will not be affected as it is two completely different aquifers and that the water that they are pumping out is not connected to the farmers swallow boreholes	
Public Meeting*	Sakkie van Niekerk asks what the current water level in the boreholes is?	Travis White answers: 195m. Ferdi Goussard confirms that it is within the existing dewatering area and states that monitoring will take place in order to determine the impacts.	
Public Meeting*	Moses Moalani asks what the water will be used for?	Kerry Fairley confirms that water will go to the mine and will be exported to the Gamagara Municipality and to Sedibeng and that the current situation does not change only the boreholes change. She further confirms that the project doesn't affect the amount of dewatering. Travis White states that they will be pumping within the Water Use Licence (WUL) and that it will only be a smaller area and therefore a more confined impact zone.	
Public Meeting*	Attie Du Toit asks if Sishen need to apply for a WUL?	Kerry Fairley responds that the WUL makes provision for changes and accommodates an annual update of boreholes to indicate where the boreholes are located if they have changed. Divan van der Merwe adds that the WUL allow you to change boreholes within the same aquifer compartment and that you will only need a new WUL once you go out of the compartment	
Public Meeting*	Divan van der Merwe asks if the impacted areas will be affected by the project?	Travis White responds that it will not be affected and that it may make the impacted area smaller	
Public Meeting*	Willie Uys mentions that he attended a meeting for extension of the WUL and that he provided input and that the mine is now starting a new project, while he has not heard anything about the previous project.	Ferdi Goussard confirms that it is two separate applications and that the Artificial Aquifer Project has nothing to do with this project.	
Public Meeting*	Willie Uys states that he is worried about the water in the boreholes as there is already problems in the area and asks if the boreholes will be moved to different compartments?	Travis White responds that the boreholes will be in the same compartment, the volumes will be the same, they will pump less water to get more draw down and if will therefore be more effective.	

Name	Comment from IAP	Response to IAP	Status
		Kerry Fairley states that this is a better way of dewatering the required pipeline, there is nothing new, only the pipelines will change and that she doesn't think there is a big issue on the pipelines. Kerry Fairley confirms that they will map the compartments and show how it will change.	
Public Meeting*	Moses Moalani asks if Sedibeng has the capacity to handle the volume of water?	Travis White responds that Gamagara and Sedibeng can't take the full capacity and they need to turn off some boreholes but that they are able to send water to Kalahari East to make sure upstream the Vaal Gamagara pipeline is not as full. He states that they will report where the water goes on a monthly basis.	
Public Meeting*	Jaap Hoffman asks if the road will be cut off during construction?	Travis White answers: no, they will use existing culvert and that there will be minimal disturbances	
Public Meeting*	Moses Moalani raises his concern regarding old graves in the Dingleton Area.	Kerry Fairley states that a Heritage Impact Assessment will be Divan van der Merwe conducted but that they don't expect any disturbances as they will use the old Gamagara pipeline that is already there. Mashua Fhatuwani states the project will take place above the ground and therefore there will be limited disturbances.	
Farmers Forum	Wat is die impak van die suidelike gat op die ontwateringskone sowel as huidige ontwatering en watervlakke?	There will be no additional impacts on groundwater, as the boreholes will be in the same compartment. In fact, the impact area may be reduced.	Consensus
Transnet	Please see Appendix B5.1a for a letter from Transnet.	Transnet will be notified once the BAR is available for public review.	Consensus
Transnet	Please see Appendix B5.2a for a letter from Transnet.	Transnet will be notified once the BAR is available for public review. Future correspondence will be made as requested.	Consensus

*Please see Appendix B4 for the full minutes of the public meeting held on 13 September 2018.

APPENDIX B5.1: Email correspondence with Philani Msimanga

[illegible]

Maimango Philani (KBY) <MaimangoP@dws.gov.za>

RE: NOTIFICATION - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

To: [illegible]

Cc: [illegible]

Good Day

I think you are misinterpreting my concern so please allow me to provide clarity.
The purpose of alerting the competent authority is for the said competent authority to provide input into whether the proposed project triggers any requirements for authorisation from that said competent authority.
This might be a notification but it is a notification on a water related project and therefore affects the Department of Water and Sanitation. All water related projects should at the very least be included in the IWWMP. Therefore my concern still stands, why was the project not included with the June 2018 application (on the IWWMP at the very least)?

Regards

Mr. Philani P. Maimango
[illegible]
"The only true wisdom is knowing you know nothing" - Socrates

[illegible]

Kerry Colleen Fairley <kerry@exm.co.za>

RE: NOTIFICATION - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

To: [illegible]

Cc: [illegible]

Dear Philani

Your comment is noted. I will confirm what was included in the IWWMP of 2018 and revert soonest with an informed response.

Kind regards

Kerry Fairley
Director
[illegible]
Cell: 082 871 2959
Tel Office: 010 007 3617
Fax: 086 416 8840

EXM Advisory Services
SOLUTIONS | PROGRESS | PARTNERS

[illegible]

From: Divan van der Merwe <[illegible]>
Sent: Tuesday, September 11, 2018 8:53 AM
To: [illegible]
Cc: [illegible]; 'Kerry Colleen Fairley' <kerry@exm.co.za>
Subject: RE: NOTIFICATION - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

Good morning All,

This project was considered and includes in the IWWMP as follow:

1. The pipeline is part of the western expansion project
2. One new borehole had been included in the IWWMP (SW1180)

I phoned Philani this morning and gave him clarity on the objective of this project [illegible] and confirmed it is not changing the mine's water uses it is merely to ensure completeness of the EA. I also indicated we did update the 21(a) water use table of production boreholes in the IWWMP to reflect the new borehole (SW1180) that might be used this year.

All concerns from DWS are resolved.

Regards,

Divan van der Merwe
[illegible]

EXM Advisory Services
SOLUTIONS | PROGRESS | PARTNERS

[illegible]

APPENDIX B5.2: Email correspondence with Judi Bolweg

Dear Delano

I wish to thank you for inviting the Kathu Gazette to this very important step in the proposed expansion of Sishen mine and the necessary construction of 2 pipelines in order to facilitate the expansion, however as the local newspaper I would be more interested in a report back of the meeting, detailing some of the objections raised by farmers or interested and affected parties.

If you do provide such a report, I would be very interested in receiving such.

Regards

Judi Bolweg
EDITOR

GAZETTE

APPENDIX B5.3: Email correspondence with Sakkie van Niekerk

APPENDIX B5.4: Email correspondence with Koos van Zyl

From: koosvz <koosvz@isat.co.za>
Sent: 10 September 2018 04:07 PM
To: Delano Smith <delano@exm.co.za>
Subject: Re: REMINDER: PUBLIC INFORMATION-SHARING MEETING - SISHEN WESTERN DEWATERING INFRASTRUCTURE PROJECT

Hallo Delano,

Ek kan ongelukkig nie die vergadering bywoon nie.
Is dit moontlik om vir my die info per epos deur te stuur, asb?

Vriendelike groete,
Koos van Zyl
Winton.

APPENDIX B5.5: Email correspondence with Transnet

TRANSNET

19 September 2018

Ref: TFR/RN/WR/13/16/1/121

Mr. D. Smith
EXM Advisory Services PTY LTD
PO BOX 1822
Rivonia
2128

Dear Mr. D. Smith

KAMFERSDAM-HOTAZEL: WESTERN DEWATERING INFRASTRUCTURE PROJECT, SISHEN MINE, KATHU, NORTHERN CAPE

Your letter dated 3rd September 2018refers.

This office has no objection to the proposal. Transnet and it's OD's are not affected as the site lies ± 1,45km south from the closest railway line.

Technically speaking, from a Civil point of view, we foresee no objections to the proposal.

Transnet Freight Rail would however, like the opportunity to re-evaluate our position with regards to this proposal once final plans have been prepared.

Yours truly

A. ZEMANI
DEPOT MANAGER

Transnet SOC Ltd
Registration Number
1990/000900/30

DEPOT ENGINEER
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Kimberley
8315

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APPENDIX B5.6: Email correspondence with Transnet

TRANSNET

28 September 2018
EXM Advisory Services
Cell: +27 61 997 0487
Tel: + 27 10 007 3617
Fax: +27 86 495 0321

Dear Delano Smith

NOTIFICATION - APPLICATION FOR AN ENVIRONMENTAL AUTHORISATION: SISHEN MINE WESTERN DEWATERING INFRASTRUCTURE PROJECT

Your abovementioned notification in relation to the Environmental Impact Assessment (EIA) Regulations GNR. 982-985 of 4 December 2014, as amended for Activity 9 of Listing Notice 1 for the development of infrastructure for the bulk transportation of water and Section 102 of the Minerals and Petroleum Resources Development Act (MPRDA) for the amendment of the Sishen Mine Environmental Management Programme (as amended) for the construction of two (2) new pipelines to convey groundwater from dewatering boreholes to south of the mining activities to the existing export water transfer station at Sishen Mine, refers.

In reviewing the aforementioned notification, the following was noted:-

- The study area of the proposed project is located ± 1, 45 km south from the closest railway line therefore, Transnet Soc Limited and its Operational Divisions do not object to the proposed project.

Please kindly direct any future correspondence in this regard to send hereof or to Mr Ezekiel Monyamane at 011 584 0547 or Ezekiel.Monyamane@transnet.net.

Yours faithfully

Mr. Livhuwani W. Ndou
Senior Consultant: Environment & Sustainability
Transnet Freight Rail
Date: 28/09/2018

Transnet SOC Ltd
Registration Number
1990/000900/30

Carlton Centre
150 Commissioner
Street
Johannesburg
2001

P.O. Box 72501
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T +27 11 308 3001
F +27 11 308 2638

Directors: [illegible]
*Executive
Group Company Secretary: [illegible]

www.transnet.net

Heritage Impact Assessment

Proposed Western Dewatering Infrastructure Project on the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

Issue Date:	21 October 2018
Revision No.:	3
Client:	EXM Advisory Services (Pty) Ltd
Project Number:	351HIA

DECLARATION OF INDEPENDENCE

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for EXM Advisory Services (Pty) Ltd. The views stipulated in this report are purely objective and no other interests are displayed in the findings and recommendations of this Heritage Impact Assessment.

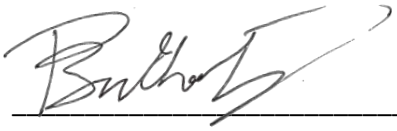
HERITAGE CONSULTANT: PGS Heritage

CONTACT PERSON: Polke Birkholtz

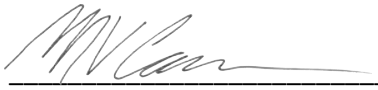
Tel: +27 (012) 332 5305

Fax: +27 (012) 332 2625

Email: polke@pgsheritage.co.za

SIGNATURES: 

STONE AGE SPECIALIST: Dr. Matt Caruana

SIGNATURES: 

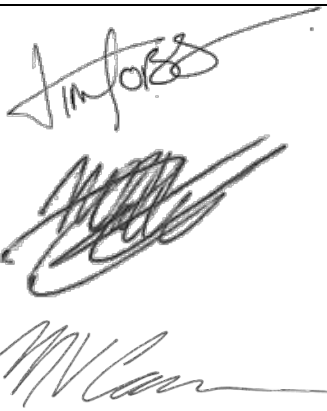
DETAILS OF CLIENT:

CLIENT: EXM Advisory Services (Pty) Ltd

CONTACT PERSON: Kerry Fairley

Tel: +27 (010) 007 3617

Email: kerry@exm.co.za

Report Title	Proposed Western Dewatering Infrastructure Project on the Sishen Iron Ore Mine, Kathu, Northern Cape Province.		
Control	**Name**	**Signature**	**Designation**
Author	**Polke Birkholtz**		**Heritage Specialist / PGS Heritage**
Co-authors	**Dr. Tim Forssman** **Dr. Matt Lotter** **Dr. Matthew Caruana**		**Stone Age Specialists / PGS Heritage Associates**

The heritage impact assessment report has been compiled taking into account the NEMA Appendix 6 requirements for specialist reports as indicated in the table below.

NEMA Regulations (2014) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report.	Cover Page and Page 2 of Report – Contact details and company
The expertise of that person to compile a specialist report including a curriculum vitae.	Section 1.2
A declaration that the person is independent in a form as may be specified by the competent authority.	Page 2 of Report
An indication of the scope of, and the purpose for which, the report was prepared.	Section 1.1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Section 3.1
A description of the methodology adopted in preparing the report or carrying out the specialised process.	Section 3.1
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	Sections 5 & 6
An identification of any areas to be avoided, including buffers.	Sections 5 & 6
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	Section 6
A description of any assumptions made and any uncertainties or gaps in knowledge.	Section 1.3
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment.	Section 7
Any mitigation measures for inclusion in the EMPr.	Section 8
Any conditions for inclusion in the environmental authorisation.	Section 8
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	Section 8
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised; and	Executive Summary & Section 9
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan.	
A description of any consultation process that was undertaken during the course of carrying out the study.	Not applicable. A public consultation process was handled as part of the basic assessment and EMP process.
A summary and copies if any comments that were received during any consultation process.	Not applicable. A public consultation process was handled as part of the basic assessment and EMP process.
Any other information requested by the competent authority.	Not applicable.

EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

Abbreviations	Description
AIA	Archaeological Impact Assessment
ASAPA	Association of Southern African Professional Archaeologists
CMP	Conservation Management Plan
CRM	Cultural Resource Management
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
ESA	Earlier Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LIA	Late Iron Age
LSA	Later Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PGS	PGS Heritage
PIA	Palaeontological Impact Assessment
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System

EXECUTIVE SUMMARY

Introduction

PGS Heritage (Pty) Ltd was appointed by EXM Advisory Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), including a palaeontological desktop study, which forms part of the Basic Assessment (BA) for the proposed Western Dewatering Infrastructure Project associated with the Vaal-Gamagara pipeline that services current mining activities within the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

Proposed Development

The study area is comprised of two parts located north and south of the existing Vaal-Gamagara pipeline. Development in the northern section will involve the construction of an above-ground, backbone extension of the current Vaal-Gamagara pipeline that will transport water to the Kathu Reservoir, located north of the Shishen Iron Ore Mine. Development in the southern section will involve the construction of an above-ground, borehole pipeline curtain that will pump water northwards from existing boreholes to the Vaal-Gamagara pipeline and into the backbone extension.

Archaeological and Historical Desktop Study

An archaeological and historical desktop study was undertaken and was used to compile a historical layering of the study area within its regional context. This component indicates that the landscape within which the project area is located has a rich and diverse history.

The proposed National Heritage Site Nomination of the Kathu Archaeological Complex demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013; SAHRIS accessed August 2014). The scientific and heritage significance as well as the occurrence of archaeological material was taken into account in the HIA under review (Beaumont, 1990, 2004, 2013; Porrat et al, 2010; Herries, 2012; Chazan et al, 2012; Wilkins & Chazan, 2012; Walker et al, 2013; Walker et al 2014).

Fieldwork

Due to the significance of the Stone Age sites from the surrounding landscape, and in adherence to

the recommendation made by SAHRA in their letter of response to the initial submission of the proposed development on SAHRIS, Dr. Matt Caruana was appointed by PGS Heritage to conduct an archaeological survey of the proposed pipeline routes as well as a buffer area around each of the pipeline routes should alternatives to the existing pipelines be considered. Dr. Caruana was also appointed to perform the palaeontological desktop study for this area.

The methodology comprised a detailed walk through of the study area by Dr. Caruana.

Recommendations resulting from Fieldwork

Based on the survey results of this project, no archaeological or heritage items were identified and the landscape within the study area and surrounding regions were found to be heavily disturbed by previous farming and/or mining activities. However, the following recommendations are made, based on the significance of archaeological sites within the vicinity of Kathu:

- If an archaeological or fossil deposit is identified, a controlled sampling of the material found should be done;
- This work must be done in such a way as to augment the current research questions and fieldwork such as the excavations at the Kathu Townlands Site and Kathu Pan;
- These test excavations and sampling must be done after a permit has been granted under Section 35 of the NHRA (Act 25 of 1999) to a qualified and experienced Stone Age archaeologist;
- In the event that substantive material is uncovered, it is recommended that a display is considered in a convenient location;
- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase[1] of the project. The appointed archaeologist will be responsible for the following:

    - Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.
    - Conduct an archaeological monitoring program whereby the construction site is visited

[1] *the initial site establishment when the area is cleared and support infrastructure is established.*

once every two weeks for at least the first three months of the project.

- On-site assessment of any Stone Age material exposed during construction and the provision of recommendations for the way in which the exposed material must be mitigated.
- Compile and submit an archaeological monitoring report at the end of the monitoring process.

- Monitoring undertaken everyday on-site by the ECO will ensure that all construction work is closely monitored. Should any Stone Age material or any archaeological material be identified, all construction work in that area must immediately stop and the ECO must demarcate a construction free area around the discovery. If the ECO made the discovery, a professional archaeologist must be contacted immediately to visit the construction site to assess the exposed material. After assessing the exposed material, the archaeologist must provide recommendations for the exposed material, which may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

Palaeontology

As per the palaeontological desktop assessment (**Annexure B**), the proposed development is unlikely to pose any substantial threat to local fossil heritage and developments should go forward. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

Conclusions

The proposed development may continue if the recommendations as outlined in this report are adhered to.

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TABLE OF FIGURES

1 INTRODUCTION

PGS Heritage (Pty) Ltd was appointed by EXM Advisory Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), including a palaeontological desktop study, which forms part of the Basic Assessment (BA) for the proposed Western Dewatering Infrastructure Project associated with the Vaal-Gamagara pipeline that services current mining activities within the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

1.1 Scope of the Study

The aim of the study is to identify possible heritage sites and finds that may occur in the proposed development area. The Heritage Impact Assessment (HIA) aims to inform the BA in the development of a comprehensive Environmental Management Plan (EMP) to assist the developer in managing the identified heritage resources in a responsible manner in order to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act 25 of 1999) (NHRA).

1.2 Specialist Qualifications

This HIA was compiled by PGS, the staff of which has a combined experience of nearly 50 years in the heritage consulting industry and have extensive experience in managing HIA processes.

Mr. Polke Birkholtz, the project manager and principal heritage specialist, is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is also accredited with the CRM Section of the same association. He has 18 years of experience in the heritage assessment and management field and holds a B.A. (cum laude) from the University of Pretoria specialising in Archaeology, Anthropology and History and a B.A. (Hons.) in Archaeology (cum laude) from the same institution.

Dr. Matthew Caruana acted as the Stone Age and Palaeontological Specialist in this report. He has been involved in a variety of archaeological and palaeontological projects ranging from Pliocene to Holocene in age. His specialty is in the analysis of Earlier Stone Age (ESA) archaeological materials and excavation methods. Matt currently works at Swartkrans Cave (Gauteng Province), Amanzi Springs (Eastern Cape Province) and the Taung World Heritage Site (Northwest Province). While specializing in the ESA time period, he is also involved in the analysis of fossil remains, as well as Middle and Later Stone Age materials from numerous sites in South Africa.

Dr. Matt Lotter acted as specialist for the Stone Age. Since 2007 he has participated in research programmes from a range of sites across South Africa, Botswana, and most recently at sites in China; these include Historic, Iron Age, Rock Art, and Stone Age sites. Matt has published in international peer-reviewed scientific journals and continues to do so. Currently, Matt is the co-permit holder for three ESA sites in the Eastern Cape Province. Matt is a member of the Association of Southern African Professional Archaeologists (ASAPA).

Dr. Tim Forssman acted as specialist for the Stone Age. He has undertaken extensive and in-depth research at several Stone Age, Iron Age and rock art localities around southern Africa. He has also published several scientific articles with a focus on the Later Stone Age, Iron Age, rock art and archaeological method. He is registered with the Association of Southern African Professional Archaeologists (ASAPA).

1.3 Assumptions and Limitations

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage sites located during the fieldwork do not necessarily represent all the heritage sites present within the area. Should any heritage features or objects not included in the inventory be located or observed, a heritage specialist must immediately be contacted. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

1.4 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

I. National Environmental Management Act (NEMA) Act 107 of 1998
II. National Heritage Resources Act (NHRA) Act 25 of 1999
III. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

I. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impacts Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Programme (EMP) – Section (34)(b)

II. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protected Areas – Section 28;
    b. Protection of Heritage Resources – Sections 34 to 36; and
    c. Heritage Resources Management – Section 38

III. Minerals and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that "*no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…*". The NEMA (No 107 of 1998) states that an integrated EMP should (23:2 (b)) "*…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage*." In accordance with legislative requirements and EIA rating criteria, the regulations of SAHRA and ASAPA have also been incorporated to ensure that a comprehensive and legally compatible HIA report is compiled.

1.5 Terminology and Abbreviations

Archaeological resources

I. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;

II. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including a 10m buffer area;

III. wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;

IV. structures, features and artefacts associated with military history which are older than 75 years and the site on which they are found.

Construction Phase

The initial site establishment when the area is cleared and support infrastructure is established.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Development

This means any physical intervention, excavation or action other than those caused by natural forces, which may according to the heritage agency result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

I. construction, alteration, demolition, removal or change in use of a place or a structure at a place;
II. carrying out any works on or over or under a place;
III. subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
IV. constructing or putting up for display signs or boards;
V. any change to the natural or existing condition or topography of land; and
VI. any removal or destruction of trees, or removal of vegetation or topsoil

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Find Spot

Can be classified as an area where only a single artefact or low density of artefacts occurs. The absence of associated material or artefacts that indicate a temporal shallow or ephemeral

occupation. The association of numerous artefacts or structures and /or cultural deposits that all combine to indicate a temporal depth and information to a site.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means place or object of cultural significance. The association of numerous artefacts or structures and /or cultural deposits that all combine to indicate a temporal depth and information to a site.

Later Stone Age (LSA)

The archaeology of the last 20 000 years, associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 2000 years up to the 1800s associated with ironworking and farming activities such as herding and agriculture.

Middle Stone Age (MSA)

The archaeology of the Stone Age from 20 000/40 000-300 000/300 000 years ago – a period associated with early modern humans.

Earlier Stone Age (ESA)

The archaeology of the Stone Age from 300 000 years ago to >3.2 million years ago, associated with the Lomekwian, Oldowan and Acheulean industries.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past and any site which contains such fossilised remains or trace.

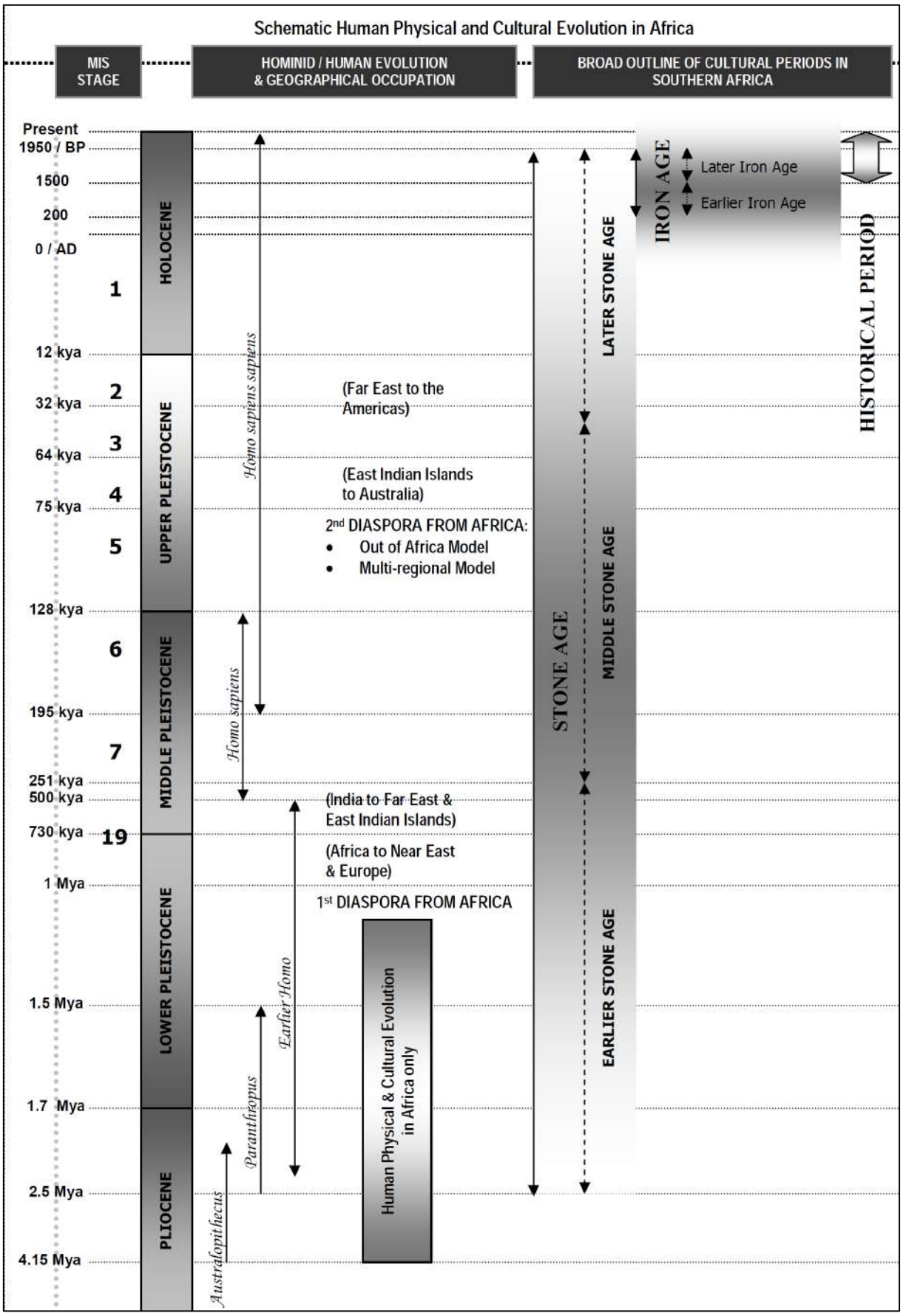

Figure 1 – Human and Cultural Time line in Africa (Morris, 2008; Lomekwian not included).

2 TECHNICAL DETAILS OF THE PROJECT

2.1 Site Location and Description

Coordinates	Backbone Extension Pipeline: 27°43'39.34"S; 22°57'27.36"E Borehole Curtain Pipeline: 27°48'51.35"S; 22°59'5.67"E
Property	Backbone Extension Pipeline: Farms Woon 469 & Fritz 540 Borehole Curtain Pipeline: Farm Gamagara 541
Location	The proposed areas of development are situated north and south of the existing Vaal-Gamagara Pipeline within the boundaries of the Sishen Iron Ore Mine. The northern section is approximately 7.9 km northwest of Dingleton and 8.5 km west by southwest of Kathu; the southern section is approximately 700m south of Dingleton and 14 km south by southwest of Kathu.
Extent	The northern section of the study area is approximately 37 hectares and the southern section is approximately 13 hectares in extent.
Land Description	The northern section of the study area is located within the Sishen Iron Ore mining rights boundary. The southern section runs outside the mining rights border, albeit the property where the borehole curtain route has been proposed is owned by the Sishen Iron Ore Company (Pty) Ltd. The entire study area has been heavily disturbed by current mining activities. The nature of this disturbance has affected the local environment, but it is characterised by flat plains with mixed wooded and shrub savannah and a Kalahari Sand substrate.

2.2 Technical Project Description

The following technical project description was provided by the client.

The Sishen Iron Ore Company (Pty) Ltd has applied for the Western Dewatering Infrastructure Project, which involves pipeline extensions to the current extent of the Vaal-Gamagara pipeline (see **Figure 2**). In effort to reduce the number of boreholes needed to dewater active mining pits on the Sishen Iron Ore Mine, new boreholes are being established at the southern end of the current mining operation to dewater pits by taking advantage of the natural north-to-south flow of the aquifer underlying this area. As such, this will reduce the need to create boreholes within open mining pits. The proposed pipelines (backbone extension and curtain) will extend the capacity of the existing Vaal-Gamagara pipeline to dewater mining operations within the western portion of the Sishen Iron Ore Mine.

Within the southern section of the study area, a new Borehole Curtain Pipeline (a 250 mm diameter

HDPE above ground pipeline) is proposed for construction along the D3333 road to transport water to a redundant section of the Vaal-Gamagara pipeline (an existing 700 mm underground pipeline) which runs parallel to the D328 road. The Vaal-Gamagara pipeline will then feed into the proposed backbone extension (a 350 mm above ground steel pipeline) via the Sishen Sedibeng pump station to a proposed Backbone Extension Pipeline, which terminate into the Kathu Reservoir, north of Sishen Mine.

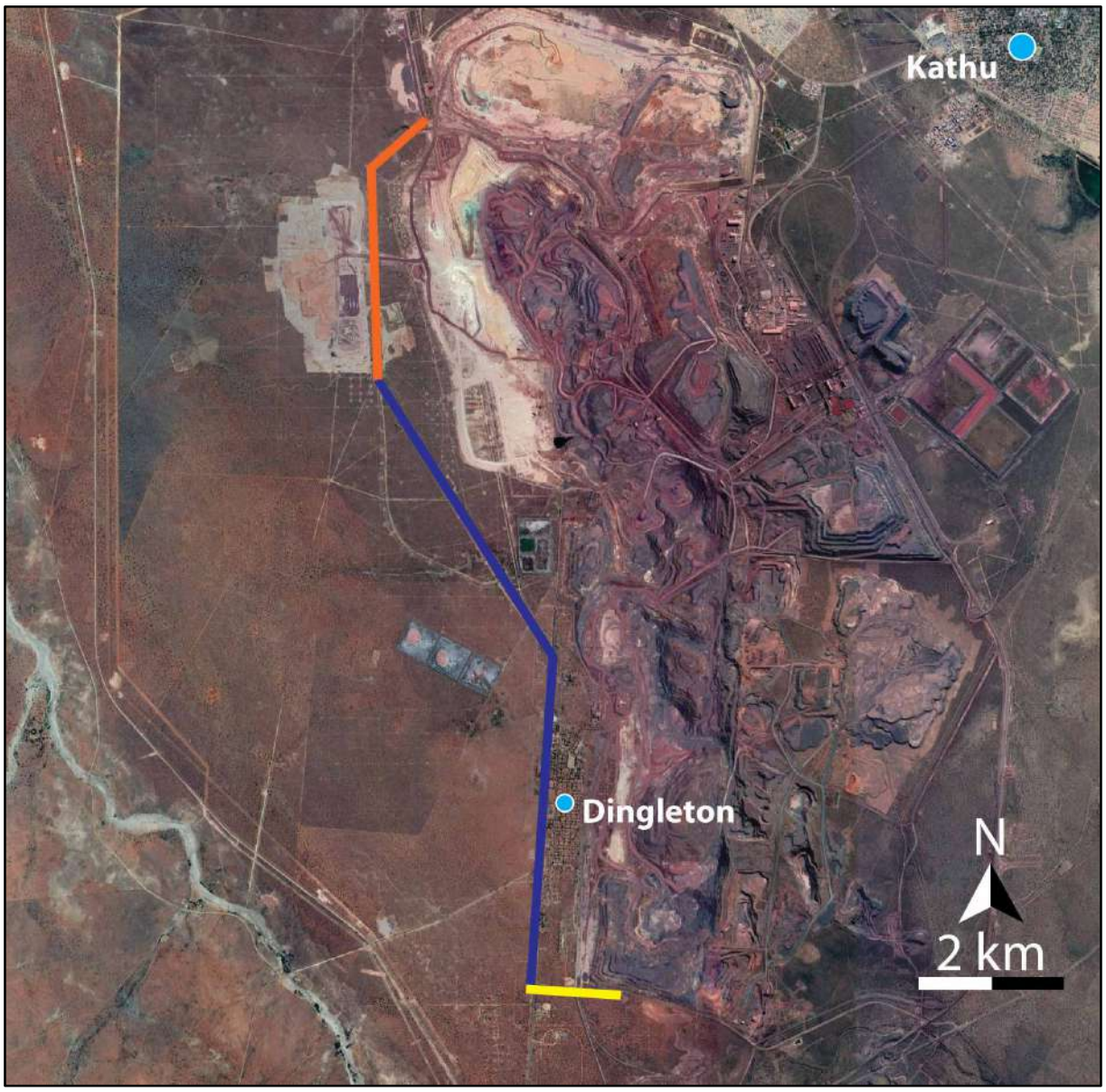

Figure 2 - Map of proposed study area in relation to Kathu, Dingleton and the Sishen Iron Ore Mine. Orange = the proposed backbone extension pipeline; Yellow = the borehole curtain pipeline; Blue = the existing Vaal-Gamagara pipeline.

3 ASSESSMENT METHODOLOGY

3.1 Methodology for Assessing Heritage Site Significance

This report was compiled by PGS for proposed Western Dewatering Project within the Sishen Iron Ore Mine. The applicable maps, tables and figures are included as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consisted of three steps:

Step I – Literature Review: An archaeological and historical background study was undertaken using available sources. This was augmented by an assessment of historic topographical maps, which allowed for the historic layering of the study area. Previous archaeological and heritage studies from the study area and surroundings were also accessed using inter alia the South African Heritage Resources Information System (SAHRIS) of the South African Heritage Resources Agency (SAHRA).

Step II – Physical Survey: The physical survey was conducted on foot over the accessible areas proposed for the development. A systematic inspection of the study area (north and south sections) involved walking over the planned pipeline routes within 50 m square area of the proposed Backbone Extension Pipeline route and an area extending 100 m wide from a borehole access road, and including the proposed Curtain Dewatering Pipeline route. The fieldwork was conducted on Thursday, 4 October 2018 by archaeologist Dr. Matthew Caruana. The survey focused on the study area as provided by the client, as well as the recommendation of alternative routes within the north and south sections of the study area.

Step III – Report: The final step involved the recording and documentation of relevant heritage resources, the assessment of resources in terms of the heritage impact assessment criteria as well as mapping and recommendations. All of this was undertaken as part of the report.

The significance of heritage sites was based on five main criteria:

- Site integrity (i.e. primary vs. secondary context);
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures);
- Density of scatter (dispersed scatter);
    - Low - <10/50m2
    - Medium - 10-50/50m2

- High - >50/50m2

- Uniqueness; and
- Potential to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or relocate development position

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site.

3.1.1 Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region were used for the purpose of this report (see **Table 1**).

Table 1 - Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High	Mitigation; Part of site should be retained
Generally Protected A (GP.A)		High/Medium	Mitigation before destruction
Generally Protected B (GP.B)		Medium	Recording before destruction
Generally Protected C (GP.C)		Low	Destruction

3.2 Methodology for Impact Assessment

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for

the assessment of impacts against the following criteria:

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

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria.

A summary of each of the qualitative descriptors, along with the equivalent quantitative rating scale for each of the aforementioned criteria, is given below.

Table 2 - Quantitative rating and equivalent descriptors for the impact assessment criteria

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated corridor / proposed corridor*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

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

3.2.1 Significance Assessment

The significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these, since their importance in the rating scale is very relative. For example, 10 structures younger than 60 years might be affected by a proposed development, and if destroyed the impact can be considered as VERY LOW in that the structures are all of Low Heritage Significance.

If two of the structures are older than 60 years and of historic significance, and as a result of High Heritage Significance, the impact will be considered to be HIGH to VERY HIGH. A more detailed

description of the impact significance rating scale is given in **Table 3** below.

Table 3 - Description of the significance rating scale

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

3.2.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale.

The spatial assessment scale is described in more detail in **Table 4** below.

Table 4 - Description of the spatial significance rating scale

RATING		DESCRIPTION
5	Global / National	The maximum extent of any impact.
4	Regional / Provincial	The spatial scale is moderate within the bounds of possible impacts, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

3.2.3 Temporal/Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal or duration scale is rated according to criteria set out in **Table 5** below**.**

Table 5 - Description of the temporal rating scale

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

3.2.4 Degree of Probability

The probability or likelihood of an impact occurring is outlined in **Table 6** below.

Table 6 - Description of the degree of probability of an impact occurring

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very likely
5	It's going to happen / has occurred

3.2.5 Degree of Certainty

As with all studies, it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used, as discussed in **Table 7** below**.** The level of detail for specialist studies is determined according to the degree of certainty required for decision-making.

Table 7 - Description of the degree of certainty rating scale

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

3.2.6 Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner, in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale, as described below:

Impact Risk = (SIGNIFICANCE ***+****Spatial****+*** Temporal) X Probability

3 5

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

Table 8: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCAL	TEMPORAL SCAL	PROBABILITY	RATING
	LOW	Local	Medium Term	Could Happen	**LOW**
Impact heritage site	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, which is divided by 3 to give a criterion rating of 2.67. The probability (3) is divided by 5 to give a probability rating of 0.6. The criteria rating of 2.67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in the table below.

Table 9: Impact Risk Classes

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

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

4 CURRENT STATUS QUO

4.1 Description of Study Area

The northern and southern sections of the study area are situated within the current mining rights of the Sishen Iron Ore Mine. The northern section is approximately 7.9 km northwest of Dingleton and 8.5 km west by southwest of Kathu; the southern section is approximately 700m south of Dingleton and 14 km south by southwest of Kathu (**Figure 3**). In total, the study area comprises an area

approximately 50 hectares in extent and is characterised by mixed wooded tree and shrub species on a Kalahari Sand substrate (Kalahari Group) (**Figure 4**). Notably, the entire area surveyed for this project was heavily disturbed by past and current mining activities.

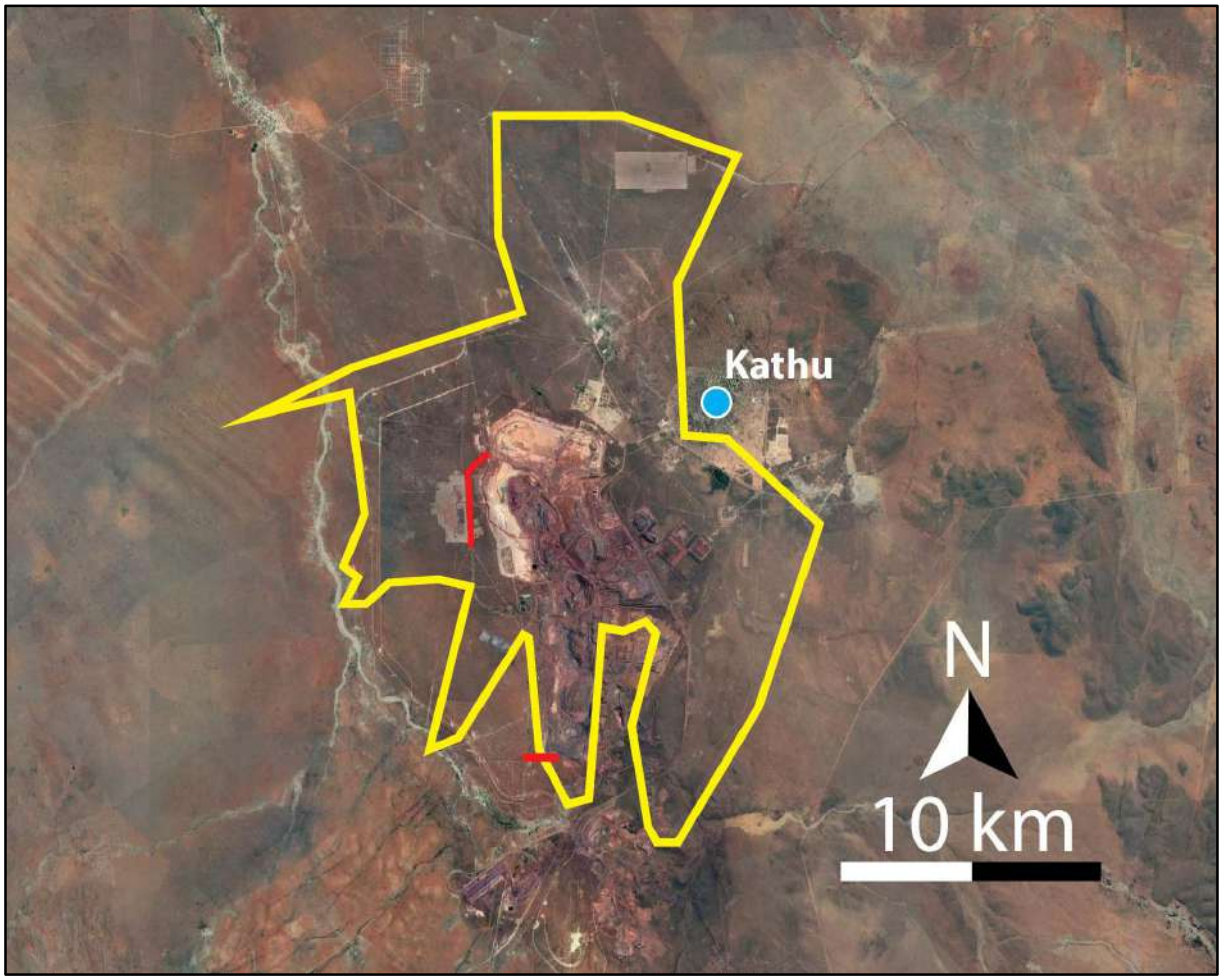

Figure 3 – Google Earth depiction of the study area within its wider surroundings. The approximate position of the mining rights area of Sishen is shown in yellow, with the study area in red.

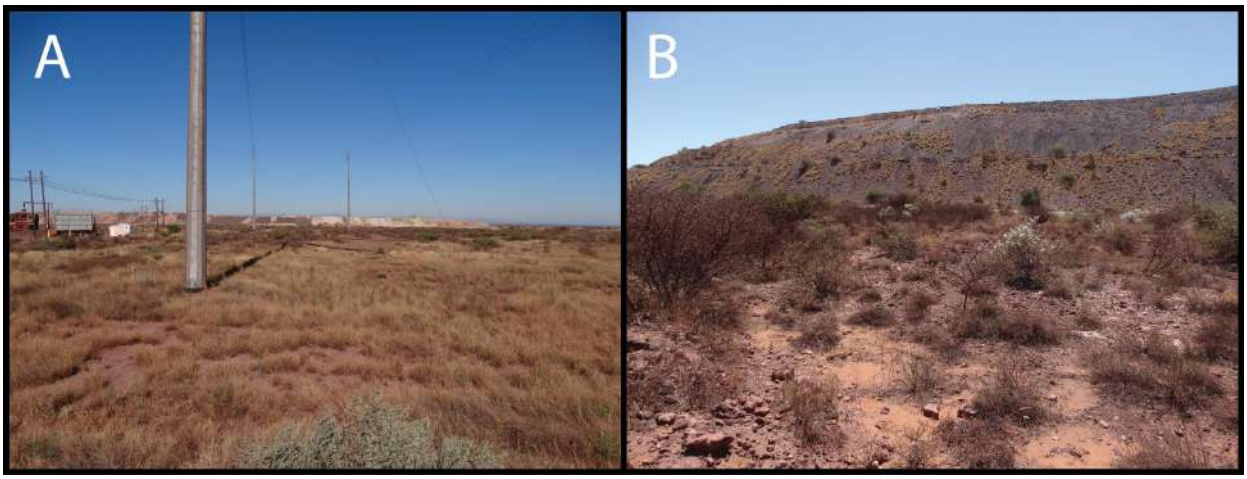

Figure 4 – General view of typical scenes found within the study area. A. Northern section; B. Southern section.

5 DESKTOP STUDY FINDINGS

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore, an internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

5.1 Previous Studies

Researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a great number of previous archaeological studies were conducted around Kathu. Several other previous archaeological or historical studies had been performed within the wider vicinity of the study area. A selection of previous studies for the area in the APM Report Mapping Project are listed in chronological order. Refer to **Figure 5** for a locality map of the studies completed in close vicinity to the current study area:

- Morris, D. & Beaumont, P.B. 1994. **Ouplaas 2 Rock Engravings, Daniëlskuil.** An unpublished report by the McGregor Museum on file at SAHRA as 1994-SAHRA-0025.

- Morris, D. 1999. **Proposed mining areas and properties at Ulco, Northern Cape, Including the vicinities of Gorrokop and Groot Kloof.** An unpublished report by the McGregor Museum on file at SAHRA as 1999-SAHRA-0055.

- Beaumont, P.B. 2000. **Archaeological Impact Assessment: Archaeological Scoping Survey for the purpose of an EMPR for the Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2000-SAHRA-0023.

- Morris, D. 2001. **Report on Assessment of Archaeological Resources in the vicinity of proposed mining at Morokwa.** An unpublished report by the McGregor Museum on file at SAHRA as 2001-SAHRA-0078.

- Beaumont, P.B. 2004. **Heritage EIA of two areas at Sishen Iron Ore Mine.** An unpublished report by the McGregor Museum on file at SAHRA as 2004-SAHRA-0067.

- Morris, D. 2005. **Report on a Phase 1 Archaeological Assessment of Proposed Mining Areas of the Farms Bruce, King, Mokaning and Parson, Between Postmasburg and Kathu, Northern Cape.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0032.

- Beaumont, P.B. 2005a. **Heritage Impact Assessment of an area of the Sishen Iron Ore Mine that may be covered by the Vliegveldt waste dump.** An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0230.

- Beaumont, P.B. 2005b. **Heritage Impact Assessment for EMPR Amendment for crusher at**

Sishen Iron Ore Mine. An unpublished report by the McGregor Museum on file at SAHRA as 2005-SAHRA-0259.

- Beaumont, P.B. 2006a. **Phase 1 Heritage Impact Assessment Report on Erf 1439, Remainder of Erf 2974, Remainder of Portion 1 of the Farm Uitkoms 463, and Farms Kathu 465 and Sims 462 at and near Kathu in the Northern Cape Province.** An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0127.

- Beaumont, P.B. 2006b. **Phase 1 Heritage Impact Assessment Report on Portions A and B of the Farm Sims 462, Kgalagadi District, Northern Cape Province.** An unpublished report by the McGregor Museum on file at SAHRA as 2006-SAHRA-0165.

- Beaumont, P.B., 2006c. **Phase 1 Heritage Impact Assessment Report on Portion 48 and the remaining Portion of Portion 4 of the Farm Bestwood 459, Kgalagadi District, Northern Cape Province.** An Archaeological Impact Assessment report by the Archaeology Department, McGregor Museum, prepared for MEG Environmental Impact Studies.

- Dreyer, C. 2006. **First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at the farm Hartnolls 458, Kathu, Northern Cape.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2007. **Supplementary Archaeological Impact Assessment report on sites near or on the Farm Hartnolls 458, Kgalagadi District Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008a. **Phase 1 Archaeological Impact Assessment Report on Portion 459/49 of the farm Bestwood 459 at Kathu, Kgalagadi District Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Beaumont, P.B. 2008b. **Phase 1 Heritage Impact Assessment Report on a portion of the remainder of the farm Sekgame 461, Kathu, Gamagara Municipality, Northern Cape Province.** Accessed SAHRIS 14 August 2014.

- Dreyer, C. 2007. **First Phase Archaeological and Cultural Heritage Assessment of the Proposed Garona-Mercury Transmission Power Line, Northern Cape, North-West Province & Free State**. An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2007-SAHRA-0052.

- Dreyer, C. 2008a. **First Phase Archaeological and Cultural Heritage Assessment of the proposed residential developments at a portion of the remainder of the farm Bestwood 459 Rd, Kathu, Northern Cape.** An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0433.

- Dreyer, C. 2008b. **First Phase Archaeological and Cultural Heritage Assessment of the proposed Bourke project, ballast site and crushing plant at Bruce Mine, Dingleton, near Kathu, Northern Cape.** An unpublished report by Pr. Archaeologist/Heritage Specialist on file at SAHRA as 2008-SAHRA-0666.

- Kaplan, J.M. 2008. Phase 1 **Archaeological Impact Assessment: proposed housing development, Erf 5168, Kathu, Northern Cape Province.** An unpublished report by the Agency for Cultural Resources Management on file at SAHRA as 2008-SAHRA-0487.

- Morris, D. 2008. **Archaeological and Heritage Phase 1 Impact Assessment for proposed upgrading of Sishen Mine diesel depot storage capacity at Kathu, Northern Cape.** An unpublished report by the McGregor Museum on file at SAHRA as 2008-SAHRA-0489.

- Morris, D. 2010. **Solar energy facilities. Specialist input for the environmental impact assessment phase and environmental management plan for the proposed Kathu-Sishen solar energy facilities, Northern Cape**. Accessed SAHRIS 13 August 2014.

- Van Schalkwyk, J. 2010. **Archaeological impact survey report for the proposed development of a solar power plant on the farm Bestwood 459, Kathu Region, Northern Cape Province**. Accessed SAHRIS 13 August 2014.

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- SAHRIS case number 1063. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for prospecting right in respect of manganese and sugillite on Portions 1 and 2 of the farm Curtis No. 470, situated in Magisterial District of Kuruman, Northern Cape.**

- SAHRIS case number 1089. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Programme for a mining right in respect of manganese and iron ore on Erf 416, 417, 418, 419, 420, 421, 422, remaining extent of Erf 423, 424, 426, 493, 548, 549, (a**

portion of Portion 548), 550 (a portion of Portion 548), 551(a portion of Portion 548), 569, 679 (a portion of Portion 548), and 681 (a portion of Portion 548) of farm Dingleton township (now Dingle) 543 remaining extent of Portion 2 (Doornvlei), Portions 7, 11 (a portion of Portion 2) and 13 (a portion of Portion 2) of the farm Gamagara 541, remaining extent of Portion 19 (a portion of Portion 1), Portion 24 (a portion of Portion 19) and 25 (a portion of Portion 19) of the farm Sishen 543, remaining extent of Portion 2 (Parson a) and Portion 6 (a portion of Portion 2) of the farm Parson 564, remaining extent, remaining extent of Portion 2 (Grensplaat) and Portion 4 (Stuk) of the farm Fritz No.540, situated in the Magisterial District of Kuruman, Northern Cape region.

- SAHRIS case number 1332. **Resources Development Act 2002, (Act 28 of 2002) for the approval of an amendment to the Environmental Management Programme for a mining right in respect of iron ore on Portion 2, 6 and the remainder of farm Parson Po. 564, Portions 1,2,3 and the remainder of farm King No. 561, Portion 3,4,5 and the remainder of Bruce No.544, Portion 1,2,3,4,5 remainder of Mokaning No.560 situated in the Magisterial District of Kuruman, Northern Cape.**

- SAHRIS case number 1402. **Consultation in terms of Section 40 of the Mineral and Petroleum Resources Development Act of 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan in respect of borrow pits 1,2,3,4,5,6,7,8 & 9 on Portion 19 of farm 543, remaining extent and Portion 1 of Gamagara 541, Portion 1 and Portion 2 of Fritz 540, remainder of Nooitgedacht 469 and remainder of Lylyveld 545, situated in the Magisterial District of Kuruman Northern Cape region.**

- SAHRIS case number 1411. **Consultation of scoping report submitted in terms of Section 22 of the Mineral and Petroleum Resources Development Act 2002, (Act 28 of 2002) in respect of remaining extent of Portion 1 (Barnadene) of farm sims No.462, remaining extent of and remaining extent and remaining extent of Portion 2 (Rusoord) and remaining extent of Portion 3 (Portion of Portion 1) of Farm Sacha No.468, remaining extent of Portion 4 of the farm Gamagara No.541, remaining extent of Portion 1 (lot a) of the farm Sishen No. 543, situated in the Magisterial District of Kuruman.**

- SAHRIS case number 1505. **Environmental Impact Assessment and Environmental Management Programme.**

- SAHRIS case number 2516. **Consultation in terms of Section 40 of the Mineral and petroleum Resources Development Act 2002, (Act 28 of 2002) for the approval of an Environmental Management Plan for mining permit for aggregate gravel on the remainder of the farm Galway No.431, situated in the Magisterial District of Kuruman, Northern Cape region.**

- SAHRIS case number 2769. **Proposed construction of 400kV transmission line from Ferrum substation (Kathu) to Garona substation (Groblershoop) in the Northern Cape.**

- SAHRIS case number 3029. **Proposed Development of 3 500 Erven on 280 Ha of Vacant Land on a Portion of Remainder of Farm Sekgame 461, Kathu.**

- SAHRIS case number 3157. **Consultation in terms of section 40 of the mineral and petroleum resources development act 2002, (act 28 of 2002) in respect of prospecting for manganese and iron ore on the farm Seldsden No.464 situated in the Magisterial District of Kuruman, Northern Cape Region.**

- SAHRIS case number 3698. **Proposed relocation of the Vaal Gamagara water pipeline at the Sishen Iron Ore Mine.**

- SAHRIS case number 3701. **Proposed relocation of Rail and Associated Infrastructure at Sishen Iron Ore Mine.**

- SAHRIS case number 4456. **Proposed development of 380ha for residential uses, Kathu, Portion 175/1 and Portion 175/2, Joe Morolong Local Municipality, John Taolo District Municipality, Northern Cape Province.**

- SAHRIS case number 4785. **SAHRA comments for the Heritage Impact Assessment Report for the Kalahari Solar Power Project located on Farm Kathu 465, near Kathu within the Northern Province.**

- SAHRIS case number 4460. **Residential development on Remainder, and Portion 3 of Farm Bestwood 459 near the town of Kathu, Northern Cape.**

- SAHRIS case number 5323. **EIA and EMPr for the Proposed Solar CSP Integration Project: Project 2 - 400kV Power Line from Ferrum to the Solar Substation.**

- SAHRIS case number 5648. **The project will consist of the construction of an approximately 67km Double Circuit 400kV power line from the Manganore Substation to the Ferrum Substation, including the construction of the new Manganore TX (Transmission) Substation adjacent to the existing Manganore DX (Distribution) Substation. The line runs in a northerly direction through areas of the Tsantsabane, Ga-Segonyana and Gamagara Local Municipalities in the Northern Cape Province.**

Most of the studies listed above located surface scatters of Stone Age artefacts of limited significance (e.g. Dreyer 2008a, 2008b; Kaplan 2008; SAHRIS case number 3029) if not actual Stone Age sites. A few studies did not identify any heritage resources (e.g. Beaumont 2006; SAHRIS case number 1063; SAHRIS case number 2769; SAHRIS case number 5323) although in some cases this was possibly because the survey area had already been altered by mining activities (e.g. Dreyer 2008b). Many studies referred to the Kathu Pan site, an ancient limestone sinkhole formation, discovered in 1974 during the establishment of the town of Kathu and renowned for both significant palaeontological (including specimens from up to 850 000 years BP) and Stone Age deposits from 500 000 BP onwards (e.g. SAHRIS case number 4785). Equally, a number of studies consulted referred to the Uitkoms 1 site on Kathu Hill with its high number of Stone Age artefacts (e.g. SAHRIS case number 4785).

Four of the studies consulted on the SAHRIS website had no relevant documents available (SAHRIS case number 1089; SAHRIS case number 2516; SAHRIS case number 3157; SAHRIS case number 3701). One study referred to heritage sites listed in an earlier impact assessment document, the latter not being available on the SAHRIS website (SAHRIS case number 1332). Some studies had documentation with no relevant heritage information (e.g. SAHRIS case number 1402) or documentation that referred to the need for completion of archaeological studies (e.g. SAHRIS case

number 1411).

In a survey for the expansion of the Sishen Mine immediately to the south of the current study area Beaumont (2000) recorded surface LSA lithics which he stated were not associated with living sites. This study also listed a large number of Stone Age artefacts as well as two Iron Age collections from the near vicinity of the study area and accessioned in the McGregor Museum. Partially overlapping and to the south of the study area Beaumont (2004) recorded only surface scatters of possible Acheulian lithics while later studies in approximately the same area located no heritage resources (Beaumont 2005a, 2005b) or, again, a few scattered stone tools of MSA appearance (Morris 2008). Morris (2001) undertook a survey 25 kilometres to the south, locating surface scatters of stone artefacts, but noting that the area between Postmasburg and Kathu is known for specularite workings and that any development should take cognisance of this. In another survey, between eight kilometres south of the current study area, Morris (2005) located scatters of stone artefacts on hills and plains, ceramic remains reflecting a Tswana settlement, and four cemeteries.

To the north of the study area, Beaumont (2006) undertook a survey for the Kalahari Gholf en Jag development. While no significant new heritage resources were located in this survey, the author referred to previous surveys and excavations undertaken on the properties involving nine archaeological sites. These included six of the Kathu Pan sites characterised by Late Pietersburg, Howiesons Poort, Wilton and Fauresmith technologies, as well as Later Stone Age ceramics. Further, this includes the Kathu Townlands site, excavated in the 1980s and found to contain approximately 10 000 Acheulian artefacts per cubic metre, and finally a Late Iron Age site thought to be of Tswana origin (Beaumont 2006). A later survey for the same development concurred with the findings of this report that most of the area was devoid of heritage resources. However, it stressed the high importance of the Kathu Pan sites and recommended that its northern area be excluded from any development, especially as the use of GPS technology had improved the accuracy of mapping and it had been found that some of the sites now fell within the development area (SAHRIS case number 4456). Many of the other studies referred to these and other known heritage sites, such as specularite workings on the Gamagara River south west of Kathu (see SAHRIS case number 3029).

In a survey of two options for a power line route, Dreyer (2007) noted the wealth of stone tool sites in the vicinity of Kathu, particularly extensive ESA sites, and the presence of the Kathu cemetery, suggesting mitigation measures to avoid these. A survey for the Kalahari Solar Power project some 21 kilometres to the north of the current study area located a number of Stone Age sites as well as surface scatters of lithics and referred to the possibility of significant sub-surface deposits in a

number of localities (SAHRIS case number 4785). On the Ghaap Escarpment, Morris (1999) identified LSA and MSA lithics and referred to known rock painting sites at Groot Kloof. These paintings are of unusual quality and the most elaborate of their kind along the Ghaap escarpment (Morris 1999; SAHRIS case number 1505). Rock engravings at Lime Acres, more than 80 kilometres to the south east, consist of 119 distinct images spread over some 22 dolomite rock slabs and are interesting in that they are fairly recent, depicting colonial scenes such as horses with riders and were likely engraved by Korana people (Morris & Beaumont 1994).

Van der Ryst & Küsel (2012) conducted a Phase 2 around a pan and surrounds for a proposed extension of the Sishen waste dump. Sampling of the lithics produced low to medium densities of MSA and LSA tool types on the plains and the periphery of the pan and surrounds. This is consistent with the results from several surveys as discussed above. Where Stone Age occurrences have been documented these are usually distributed either in fairly low scatters over large areas, or in very high densities where sources of, in particular, Banded Ironstone Formations (BIFs) outcrop. Surface sites around Kathu exhibit a palimpsest of prehistoric utilisation and may contain lithics from all periods in the Stone Age succession.

It is therefore important to note a concern raised by Morris (2014: unpaged) that a "*consistent issue in the assessment of the presence or absence of archaeological deposits in and around Kathu … is the fact that the landscape is often capped by (1) calcrete (not uniformly ancient – Walker et al 2013) and (2) younger Gordonia Formation Aeolian sands (Almond 2014*)". That subsurface archaeological remains may occur under overlying soils and calcretes should be taken into account when archaeological and heritage surveys are undertaken. The clearing of topsoils during development activities frequently exposes archaeological deposits. In areas where BIFs outcrop there tends to be extremely high densities of lithics. BIFs are an excellent source of good toolstone. It was extensively used in the extraction of raw materials and the *in situ* manufacture of ESA Large Cutting Tools (LCT's) and for MSA assemblages. Significant exposures of siliceous BIFs in association with high levels of lithic production have been recorded at, for example, Kathu Townlands and Bestwood.

The LCT's from this area often contain very fine handaxes with some superb examples produced on banded ironstone. Lithics in some of the Acheulian deposits, but also in MSA levels, display a shiny silica skin. At Kathu Townlands an outcropping of banded ironstone that covers a large area of around 25 km contains enormous quantities of flaked items. This phenomenon is ascribed to the use of the high-grade bedrock ironstone as a source for raw materials and is supported by the high incidence of handaxe roughouts (Beaumont 2004b). The prepared core technique was used to

produce the spectacular small handaxes, long blades, convergent flakes/points and scrapers found in Fauresmith collections.

The Kathu Complex sites contain important ESA Acheulian and transitional ESA/MSA Fauresmith assemblages (Beaumont, 1990, 2004, 2013; Herries, 2011; Chazan et al, 2012; Wilkins & Chazan, 2012, Walker et al, 2014). Walker et al (2014) suggest that the intensive occupation of the Kathu region can be linked to the availability of water resources. Current research projects are yielding important data on typologies, lithic technologies, technological innovations, complex spatial organisation and also dates for the ESA Acheulian and for the MSA assemblages. Research at Kathu Pan 1 established a date of 500 000 years for a Fauresmith blade assemblage where blades were systematically removed from prepared cores (Wilkins & Chazan, 2012).

Archaeological and palaeoenvironmental data from Kathu Pan and Kathu Townlands were used to reconstruct changes over time in the prehistoric environment (Beaumont 2004b). Associated faunal remains with some of the Acheulian include *Elephas recki recki*. These animals disappeared at sites in East Africa such as at Olorgesailie, Kenya, at around 600 000/800 000 years ago (Beaumont, 2004b; McNabb, 2004). Biostratigraphy or faunal correlation is often used to date the southern African sites and gives some indication of the approximate age of some of the associated assemblages. More recently a combination of OSL and ESR/U-series dating (Porat et al, 2010; Herries, 2011; Walker et al, 2014) were used to date the transition to MSA tool forms. At Kathu Pan the transitional Fauresmith has been dated to ca. 500 000 BP (Porat et al, 2010). Kathu Pan is formed by a shallow depression with an internal drainage and a high water table.

North-east of Kathu several newly-found ESA sites with LCT's and an associated range of tools occur in sand quarries and on a hilltop at Uitkoms Farm and the Bestwood locality (**Figure 5**) (Chazan et al, 2012). The residential and commercial developments at Bestwood and close to the Townlands demonstrate the importance of Phase 2 heritage studies in the Kathu region.

The concerns that Walker et al (2014:8) raise with regard to the impact of the exponential development should feature in any survey that is undertaken around Kathu. With reference to the Townlands locality they urge that a "…*broader landscape-based effort of subsurface testing including palaeo-landscape and paleo-environmental reconstruction is essential to our understanding of this extraordinary record. Sources of this information must be protected along with archaeological remains. Together with the other components of the Kathu Complex, this site represents a high density of hominin occupation that presents a challenge to reconstructions of hominin adaptations*

during the Early-Middle Pleistocene".

The surrounding area was previously studied by Beaumont (**Table 10**), and lithic densities and debitage frequencies found at Uitkoms 1 (**Figure 5**) was comparable to those found at Kathu Townlands 1. He describes Uitkoms 4 (**Figure 5**) as a buried site approximately 100 meters wide. No controlled excavations have been done at Uitkoms 4.

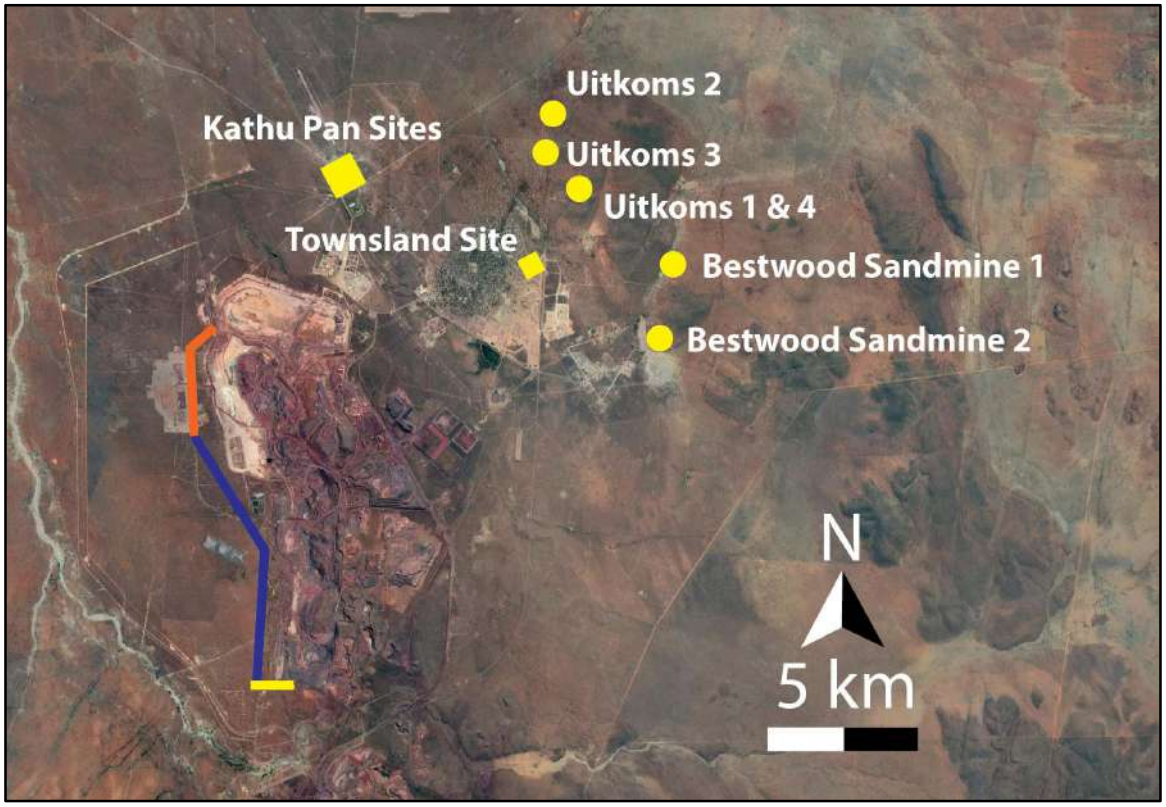


Figure 5 - Map of archaeological sites in the Kathu region (yellow), relative to the study area.

Table 10 - Table of studies associated with Figure 5 (Walker et al., 2013b)

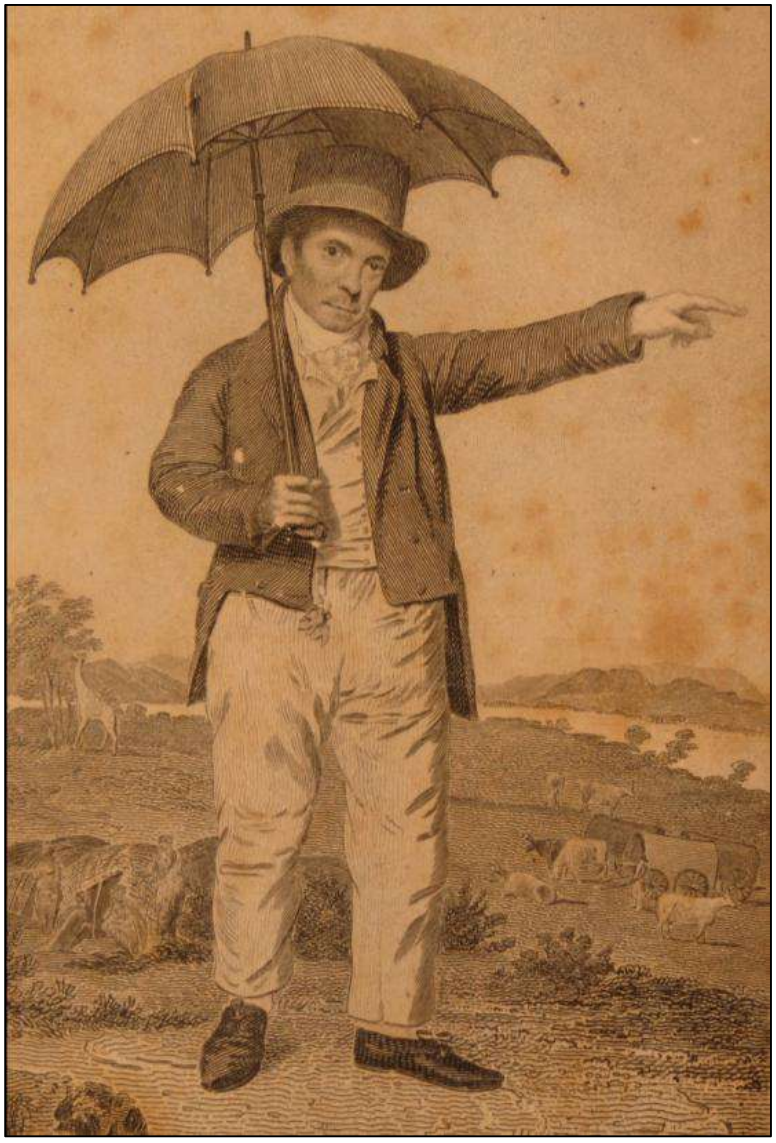
RMP	Report Date	Project name	Reference
MAPID_00906	30-Apr-06	Kalahari Golf en Jag Expansion	(Beaumont, 2006a)
Not mapped	29-May-06	Bestwood 459 Portion 48	(Beaumont, 2006c)
MAPID_00918	30-May-06	Uitkoms 463, Portion 5	(Beaumont, 2006b)
MAPID_00997	28-Jun-06	Hartnolls 458, 1st Phase 1	(Dreyer, 2006)
MAPID_00998	17-Jan-07	Hartnolls 458, 2ndPhase 2	(Beaumont, 2007)
MAPID_01686	06-Feb-08	Portion of Sekgame 461	(Beaumont, 2008b)
MAPID_01687	07-Feb-08	Uitkoms 463, Portion 8	(Beaumont, 2008a)
MAPID_01692	12-Jun-08	Bestwood 459 Portion 49	(Beaumont, 2008c)
MAPID_01617	11-Aug-08	Bestwood Estates	(Dreyer, 2008)

5.2 Archaeological & Historical Sequence

DATE	DESCRIPTION
3.2 million to 250 000 years ago	The Earlier Stone Age (ESA) is the first and oldest phase identified in South Africa's archaeological history and here it comprises two technological phases. The earliest of these, known only from sites outside of southern Africa, is the Lomekwian industry (3.2 Myr) and is associated with percussive tools and large flakes. Occurring in South Africa is the Oldowan industry (2.6 – 1.5 Myr), characterised by expedient, yet organised flaking systems with primarily core- and flake-based assemblages. Finally, the Acheulian industry (1.7 Myr – 250 kyr) is the last ESA industry to develop, comprised by Large Cutting Tools (i.e. handaxes and cleavers) and organised core reduction (i.e. Levallois). A number of important ESA sites are known from the general vicinity, including the very significant ESA Kathu Pan and Kathu Townlands localities and also the Bestwood sites (Chazan et al, 2012) respectively 17km north-west, 13km north-east and 12km-14.5km north-east of the study area. Research at Kathu Townlands was first undertaken by P.B. Beaumont (1990, 2004). The locality has a remarkable high lithic density containing millions of ESA artefacts (Mitchell, 2002; Walker et al, 2013 Walker et al. 2014). Moreover, the interface between the ESA and MSA is also represented at Kathu Pan by the transitional lithic industry of the Fauresmith (Porat et al 2010).
>250 000 to 40 000 years ago	The Middle Stone Age (MSA) is associated with flakes, points and blades manufactured by means of the prepared core technique. This phase is furthermore associated with modern humans and complex cognition (Wadley 2013). MSA sites and occurrences have been identified in the Kathu area, including the very significant Kathu Pan localities (Wilkins & Chazan, 2012). See also, for example, Beaumont (2009) and Kruger (2014).
40 000 years ago to the historic past	The Later Stone Age (LSA) is the third archaeological phase identified and is associated with an abundance of very small stone tools known as microliths. A number of Later Stone Age sites are known from the direct vicinity of the existing Kathu area. According to Beaumont (2000) pecked engravings, originally from the farms Sishen 543 and Bruce 544, were donated to the McGregor Museum with some engravings located on the grounds of the Sishen Iron Ore Mine as well. The Aldag component of the study area is located on the farm Sishen 543. More engraving sites are known from further afield including one on the farm Palingpan. This farm is situated roughly 44.7km south of the present study area.
800 AD – 820 AD	The archaeological excavations undertaken by Beaumont and Bashier (1974) and Thackeray et al (1983) have revealed that the mining of specularite at Doornfontein and Tsantsabane/Blinkklipkop commenced during this time. Blinkklipkop for example is located 66.7km south of the study area. During this initial period the mining activities would have been undertaken by San hunter-gatherers and Kora pastoralists. Only after the 17th century were such mining activities likely also undertaken by the Iron Age Tswana groups.

DATE	DESCRIPTION
Early 1600s	The Tswana groups known as the Thlaping and Thlaro moved southward into the area presently known as the Northern Cape. A century later they were settled in areas as far south as Majeng (Langeberg), Tsantsabane (Postmasburg) and Tlhaka le Tlou (Daniëlskuil) (Snyman, 1986). In terms of the Thlaro specifically, Breutz (1963) states that after they broke away from the Hurutshe during the period between 1580 and 1610, they travelled along the Molopo River and the Southern Kalahari before arriving at the confluence of the Kudumane, Mosaweng and Molopo. From here they established themselves at Tsowe (west of Morokweng), Gatlhose (10.9km south-east of the study area), Majeng (Langberg), Khoiise (Khuis on the Molopo River) and Tlhaka-la-Tlou (present day Danielskuil situated roughly 72km south-east of the study area). It is evident that the study area and surrounding landscape would be been central within the overall settlement area of the two Tswana groups at the time.
c. 1770	During this time, the Kora moved into the area. Due to their superior firearms they applied increasing pressure on the Thlaping and Thlaro groups. In the end, the Thlaping moved into a north-eastern direction to settle in the general vicinity of Dithakong, north-east of present-day Kuruman. The Thlaro settled in areas to the west and north-west of the Thlaping (Snyman, 1986).
c. 1786 – c. 1795	The German deserter by the name of Jan Bloem established himself at Tsantsabane (Blinkklip) (Legassick, 2010). This place is located 5km north-east of the present-day town of Postmasburg. The settlement of Jan Bloem at the specularite mine may have been a way in which to control the valuable site and any trading activities associated with it.
c. 1795	Legassick (2010) confirms the presence of the Thlaping, Thlaro and Kora in the general vicinity of the study area during this time. This said, the study area and surrounding landscape would have represented a western peripheral area of the overall landscape occupied by especially the Thlaping and Thlaro groups at the time. From a map depicted in Leggassick (2010:338), it is evident that at the time the Kora started moving in north-eastern direction from the areas along the central Orange river to the banks of the Harts River.
Early 1800s	After the threat of the Kora became less intensive, the Thlaping moved to the vicinity of present-day Kuruman. The Thlaro returned to the Langeberg, establishing them on a permanent basis there during the 1820s (Snyman, 1986). The settlement of the Thlaping in the vicinity of Kuruman occurred during the reign of Molehabangwe. This period in the history of the Thlaping was seen as a period of wealth and power, and at the time they even had control of the *sibello* quarry near Blinkklip (Legassick, 2010).
1801	The first known visit to this area by European explorers (i.e. excluding European renegades and fugitives such as Jan Bloem) took place in 1801. The journey was undertaken by P.J. Truter and Dr W. Somerville. They crossed over the Orange River in the vicinity of Prieska, and passed Blinkklip on their way to present-day Kuruman (Bergh, 1999). Although their exact route is not known, it is possible that their journey from present-day Postmasburg to Kuruman would have passed some distance to the east of the proposed cemetery.

DATE	DESCRIPTION
1802 - 1813	During this period William Anderson and Cornelius Kramer, both of the London Missionary Society, established a mission station at a place called Leeuwenkuil. The focus of their work was a group known as the Bastards (Erasmus, 2004). This group could be described as a cultural conglomeration descending not only from relationships between different cultures and races (i.e. European and Khoi), but also comprised remnants of Khoi and San groups as well as freed slaves. The particular group later became known as the Griqua. Due to the problems caused by the presence of lions at Leeuwenkuil, the mission station was moved in 1805 to Klaarwater. On 7 August 1813 the name of the settlement which had sprung up here was renamed Griquatown. This came about as a result of a number of proposals made by Reverend John Campbell, the Director of the London Missionary Society who was visiting the mission stations from this area at the time. He suggested that "...*the Bastards change their name to 'Griqua' and that Klaarwater became Griquatown. This was because 'on consulting among themselves they found a majority were descended from a person of the name Griqua'*..." (Legassick, 2010). Griquatown is located 114km south of the present study area.
1805	During this year German explorer Martin Hinrich Carl Lichtenstein travelled through the general vicinity of the study area. After crossing the Orange River in the vicinity of present-day Prieska, Lichtenstein's party visited present-day Daniëlskuil, and by June 1805 they were at Blinkklip (Postmasburg), a well-known source for obtaining specular haematite. Archaeological investigations at Blinkklipkop (also known as Nauga) established a date of AD 800 for the utilisation of this particular rich source (Thackeray, et al 1983). From here they travelled further north and reached the Kuruman River where they met Tswana-speaking people. They followed the river downstream for three days, after which they followed a tributary to reach Lattakoe. From here they turned south and reached the Orange River on 11 July 1805. While on his way to the Kuruman River (and to the south thereof), Lichtenstein visited a small settlement consisting of "*…about thirty flat spherical huts.*" Although the people staying here were herdsmen who looked after the cattle of richer people living on the Kuruman River, they indicated that San (Bushmen) were also present in the area (Lichtenstein, 1930). Although Lichtenstein was certainly not the first European explorer to travel through this area (the Truter & Somerville expedition had for example passed through this area in 1801), or for that matter the last (Burchell travelled through the area in 1811 followed by John Campbell in 1813) (Bergh, 1999), Lichtenstein did leave behind a written record of this journey providing a valuable glimpse into the early history of the general surroundings of the study area. What is also significant about the visit of Lichtenstein is that his journey took him from present-day Postmasburg to a place known as Tsenin which is located north-west of Kuruman. As a result, he would have passed in close proximity to the present study area.
1813	During 1813 John Campbell of the London Missionary Society also visited the general vicinity of the study area. He arrived at Klaarwater on 9 June 1813, where he rested for a few days before continuing in a northern direction toward present-day Kuruman, passing through Blinkklip on the way (Bergh, 1999).

DATE	DESCRIPTION
	 *Figure 6 – Reverend John Campbell (Campbell, 1815). He passed through the general vicinity of the study area during his travels from Klaarwater to Kuruman.*
20 December 1820	On this day Andries Waterboer was elected as leader of Griquatown in the place of Berend Berends (Legassick, 2010). This period saw fission within the Griqua community, and it is not surprising that two long-term leaders moved away from Griquatown to establish autonomous settlements away from their former town. Berend Berends for example moved to Danielskuil (72km south-east of the study area), whereas Adam Kok II established himself in the vicinity of Campbell (138km south-east of the study area) (Legassick, 2010).
1821 – August 1828	During this period a group of Griqua became dissatisfied with Waterboer and moved away from Griquatown to settle along the Modder River. They were known as the Bergenaars and were supported by Kora and San elements (Cope, 1977). A section of the Bergenaars known as the Klein Bergenaars (Little Bergenaars), settled along the Langberg. This mountain range is located roughly 31km west of the present study area.

DATE	DESCRIPTION
	The Bergenaars constantly attacked the Thlaro, Thlaphing as well as the Griqua. On three separate occasions (Late 1824, July 1827 and December 1827) they attacked Griquatown itself. They also attacked the London Missionary Society station at Kuruman on several occasions with the last attack taking place in August 1828 (Cope, 1977).
1824	Robert Moffat of the London Missionary Society established the mission station at Kuruman (Erasmus, 2004).
Early 1830s	During this time Andries Waterboer stationed a number of Griqua families at a fountain north of Tsantsabane (Blinkklip) as well as at Danielskuil (Legassick, 2010).
22 April 1842	On this day a treaty was signed between Griqua leader Andries Waterboer and Thlaping leader Mahura at Mahura's settlement near Taungs. The agreement included a definition of the boundary between the two groups. The section of the agreed upon boundary closest to the study area ran from "...*the northerly point of the Langeberg and extending a little south of Nokaneng, and further half-way between Maremane and Klipfontein*..." (Legassick, 2010:291). While the exact location of Nokaneng is not currently known, the farms Klipfontein 437 and Maremane 678 are situated 38km and 21km to the south. This suggests that the present study area was located north of the boundary line between the Griqua and the Thlaping as defined in the treaty. As such, the study area was defined within this treaty as forming part of the land of the Thlaping. However, it must be noted that this boundary line was not cast in stone. This boundary was very similar to an earlier one that was thought to have been agreed to during the 1820s as a boundary between the Griqua and the Thlaping (Legassick, 2010).
1850	During this time a Thlaro leader by the name of Molete and his baThlaro baga Keakopa moved away from the Korannaberg and established themselves at Gathlose, some 10.9km south-east of the study area. Breutz (1963) states that the land around Gathlose and Maremane used to belong to the Kora (Koranna) people and that they gave permission to Molete to settle here. After his death between 1885 and 1890, Molete was succeeded by Holele who ruled until his death during the Langberg Rebellion of 1897. Holele was succeeded by Kebiditswe John Holele who filled the post until 1912 when he was succeeded by his younger brother Kgosieng. Kgosieng ruled until he was pensioned on 28 February 1937, and was succeeded by Kebiditswe's son, Kgosietsiele Smous. Kgosietsiele died on 30 June 1956 and was succeeded by his son Frank Motsewakgosi Holele (Breutz, 1963). Likely between 1850 and 1860 the area known as Maremane (located directly north of Gathlose) was an outpost grazing area of the BaThlaro chief Makgolokwe and his son Toto. The first designated leader of this area was Isaak Thupane Thupane, followed by Toto's son Robanyane who fled to present-day Namibia after the Langberg Rebellion of 1897. He was succeeded by his father's brother Jan Molebane Toto. However, the government only recognised him as chief in 1912 up to which point John Holele of the Gathlose Reserve was appointed by the government to act for the Maremane area as well. Molebane was dismissed in 1925 and was succeeded in 1926 by his brother David Makgolokwe. David Makgolokwe remained at his post until his death in 1942 when he was succeeded by Puso Togelo who remained as leader until his death in 1954. He in turn was succeeded by Felix Kgosithebe Toto (Breutz, 1963).

DATE	DESCRIPTION
1850 – 1855	During this period a Thlaro chief by the name of Isaak Thupane Thupane established himself at Logageng (Gatkoppies) near Postmasburg. He subsequently moved with his followers to Groenwater 453. During the time that Thupane was living at Logageng, Kgangeng discovered the fountain at Metsematale. Subsequently, the land was ceded by Waterboer to the Thlaro and Kgangeng and his followers settled at Groenwater as well. The farm Groenwater 453 is located 54km south-east of the present study area.
13 December 1852	After the death of Andries Waterboer, his son Nicolaas Waterboer became the leader of Griquatown. He ruled Griquatown until the annexation of the area by the British in 1871 (see below) (Legassick, 2010). It was during the rule of Nicolaas Waterboer that diamonds were discovered in the area which led to a period of claims and counter-claims between the Griqua, the Orange Free State as well as the Zuid-Afrikaansche Republiek and which eventually led to the annexation of the area.

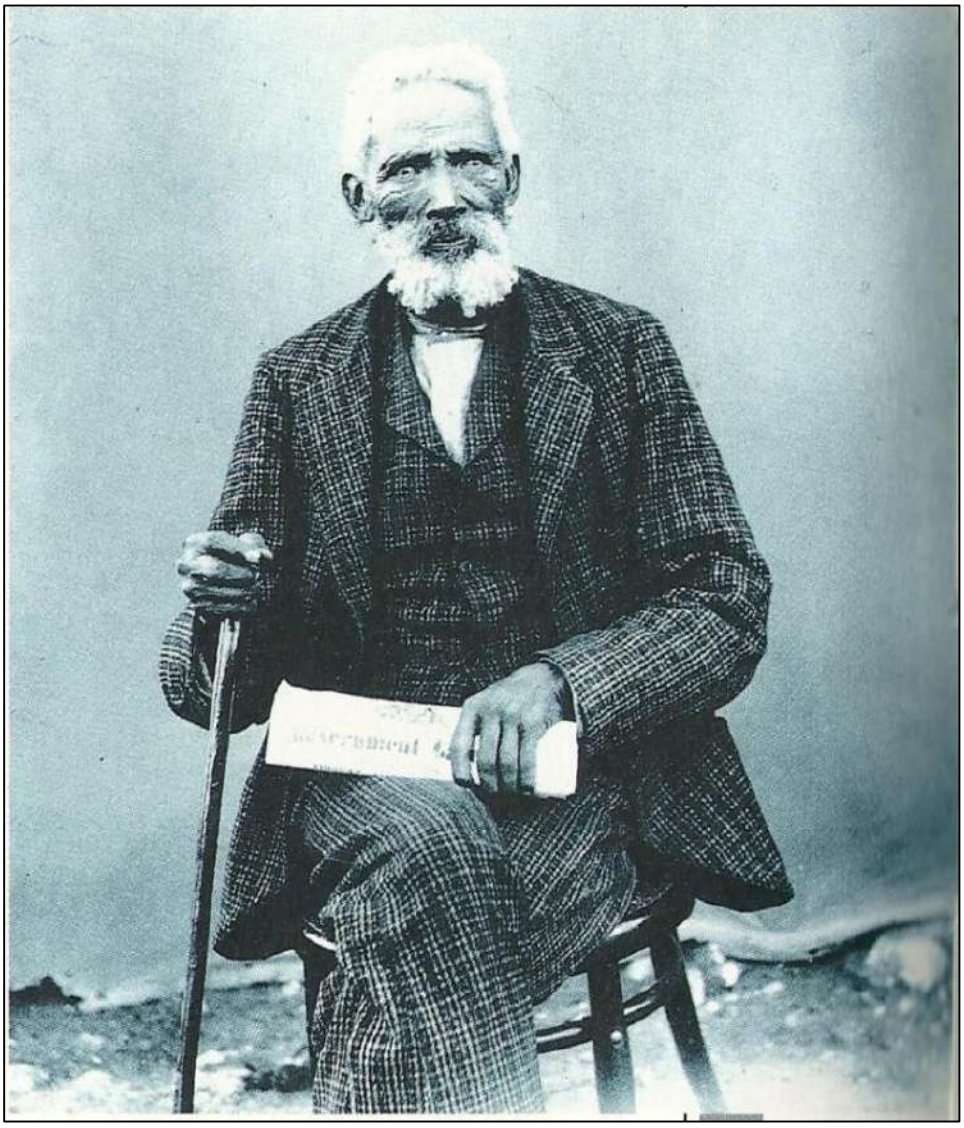


Figure 7 - Nicolaas Waterboer, who succeeded as leader of Griquatown in 1852 after the death of his father Andries Waterboer (Reader's Digest, 1994:168).

DATE	DESCRIPTION
Before 1856	During the period before 1856 the Thlaro leader Masibi occupied the area known as Skeyfontein, which is located 73km south of the study area.
1867	Diamonds were discovered for the first time in South Africa near Hopetown. Alluvial diamonds were also discovered along both banks of the Orange River (Van Staden, 1983).
27 October 1871	The area located in general terms between the Orange and Vaal Rivers and south of Kuruman was proclaimed as British Territory and named Griqualand West (www.wikipedia.org). The study area fell outside and to the north of this territory at the time.
1878	A rebellion broke out amongst some of the Tswana communities living in Griqualand West. This rebellion, which was a response to British expansion and colonialism, spread to the Langberg. A British force left Griqualand West in October 1878 and defeated the "rebels" at the Langberg (Snyman, 1986).
30 September 1885	Sir Charles Warren proclaims the area between the Molopo River and the northern boundary of Griqualand West as the Crown Colony of British Bechuanaland. Its western boundary was defined by the Molopo River and its eastern extremity reached as far as Mafeking. The proclamation followed on a military operation under Warren's command to occupy the Boer Republics of Stellaland and Goosen. As a result, the Crown Colony of British Bechuanaland included the lands of the two republics as well as the land of various Tswana groups. (www.wikipedia.org). At the time the study area was located near the southern boundary of this newly proclaimed territory.

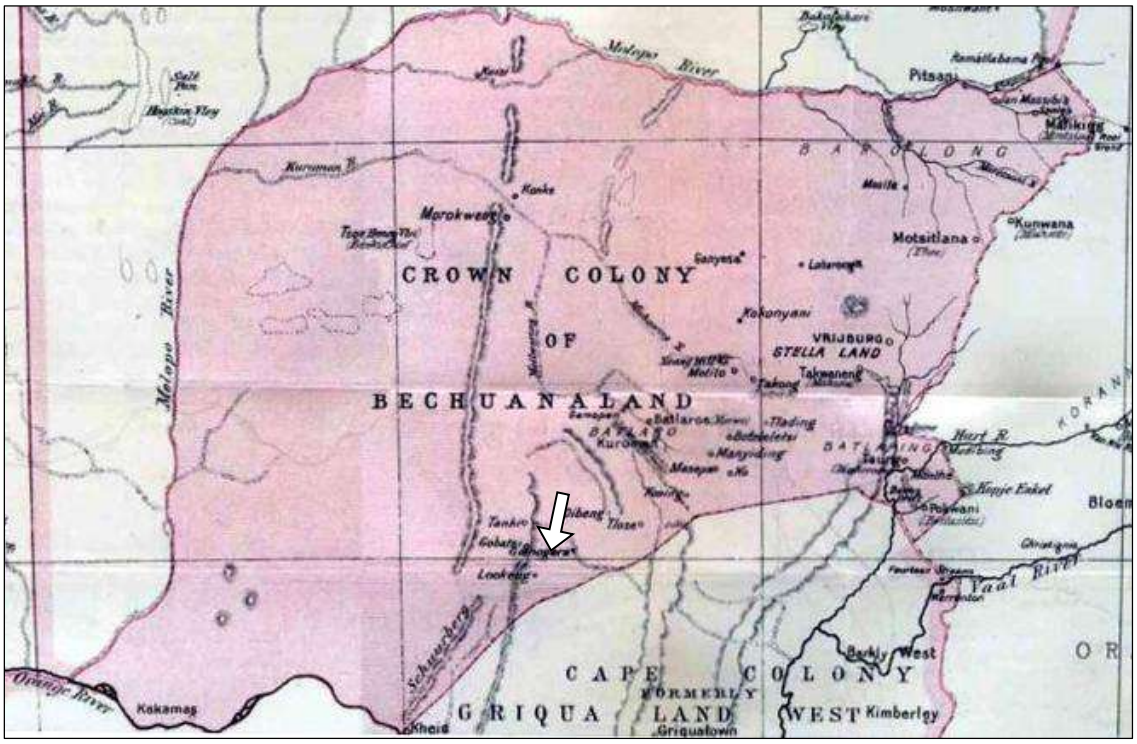


Figure 8 - Section of a map titled "Sketch Map of British Bechuanaland" which is dated to May 1887 (www.wikipedia.com) (www.kaiserscross.com). The approximate position of the study area is shown.

DATE	DESCRIPTION
1886	As a result of the work of a commission appointed by the British rulers of the Crown Colony of British Bechuanaland, a number of so-called "native reserves" were established in this area. These included Deben (between 21 and 30km north-west of the study area), Gatlhose (14 and 16km east of the study area), Maremane (23 and 30km south-east of the study area), Langberg (directly south-west of the farm Sekgame) as well as Kathu (directly west of the farm Sekgame) (Snyman, 1986). The establishment of so many "native reserves" in close proximity to the study area clearly support the suggestion made earlier that the study area was centrally located in the historic and prehistoric territories of Tswana groups such as the Thlaro and Thlaping. In the same year a trader by the name of John Ryan established a shop on the farm Bishop's Wood. This farm is located 18km north-west of the study area.
16 November 1895	The Crown Colony of British Bechuanaland was annexed by the Cape Colony (www.wikipedia.org).
September 1896	During this time a viral disease affecting cattle (and some other species of even-toed ungulates) known as Rinderpest swept through Southern Africa (www.wikipedia.org). Although attempts were made to halt the spread of the disease from the north by erecting a fence between the boundaries of Griqualand West and Bechuanaland, this proved unsuccessful. Incidentally, only three gates were placed in the above-mentioned fence, namely at Gatlhose, Nelsonsfontein and Blikfontein (Snyman, 1988). Of these three places, Gatlhose is the closest and is situated 14km east of the study area.

Figure 9 - An everyday scene during the Rinderpest Epidemic (Snyman, 1983:20).

1897	The Rinderpest epidemic did not only have a massive socio-economic impact on the landscape, it also resulted in the Langberg Rebellion of 1897. During this time

DATE	DESCRIPTION
	conflict broke out between the authorities and a Thlaping leader from Taung, namely Galeshiwe. The conflict arose after infected cattle belonging to him were destroyed by representatives of the government as a way of kerbing the spread of the disease. After killing an officer, Galishewe fled to the Thlaro leader Toto of the Langberg. Subsequently, a full-scale rebellion broke out (Breutz, 1963). The British authorities eventually mustered a military force which included sections of the Cape Mounted Rifles and Bechuanaland Field Force and which on 14 March 1897 stood at roughly 1,000 men. Opposing this formidable and well equipped force supported by artillery the Tswana rebels possessed an army of roughly 1,500 men who from the start of the rebellion already experienced serious shortages in the way of provisions and ammunitions (Snyman, 1986). Although most of the activities associated with the rebellion took place some distance to the west of the study area, the impact of the rebellion was felt throughout the surrounding landscape. Some noteworthy skirmishes took place on 9 May 1897 at Puduhush (some 31.8km south-west of the study area) and on 30 July 1897 at Gamaluse and Gamasep (29.9km west of the study area). Furthermore, the main British force under the overall command of Lieutenant-Colonel E.H. Dalgety used the farm Bishop's Wood as a base of operations (Snyman, 1986). The farm Bishop's Wood is located 11.9km west of the study area. The rebellion was suppressed and came to an end with the surrender of rebel leader Toto, his son Robanyane and their Thlaro followers on 2 August 1897 (Snyman, 1986).

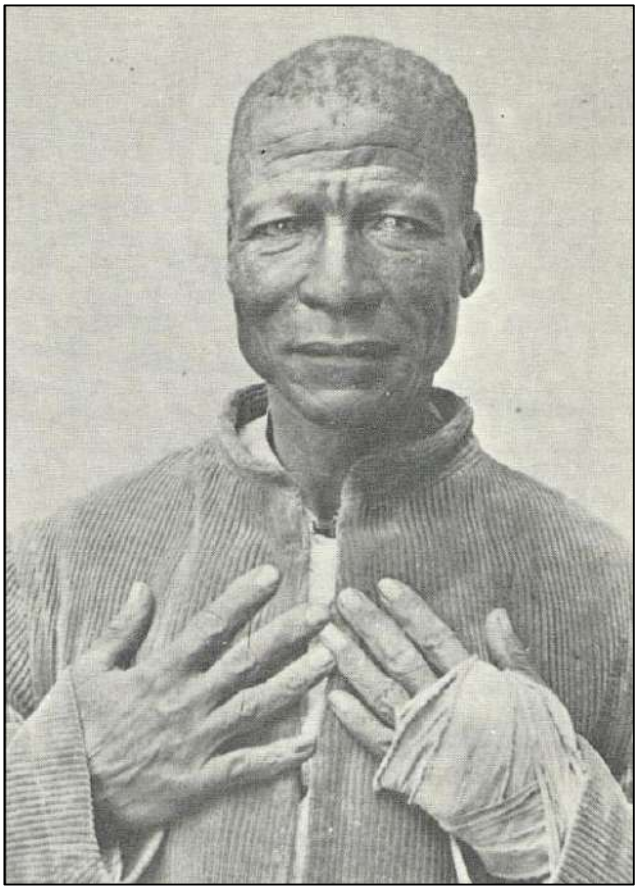
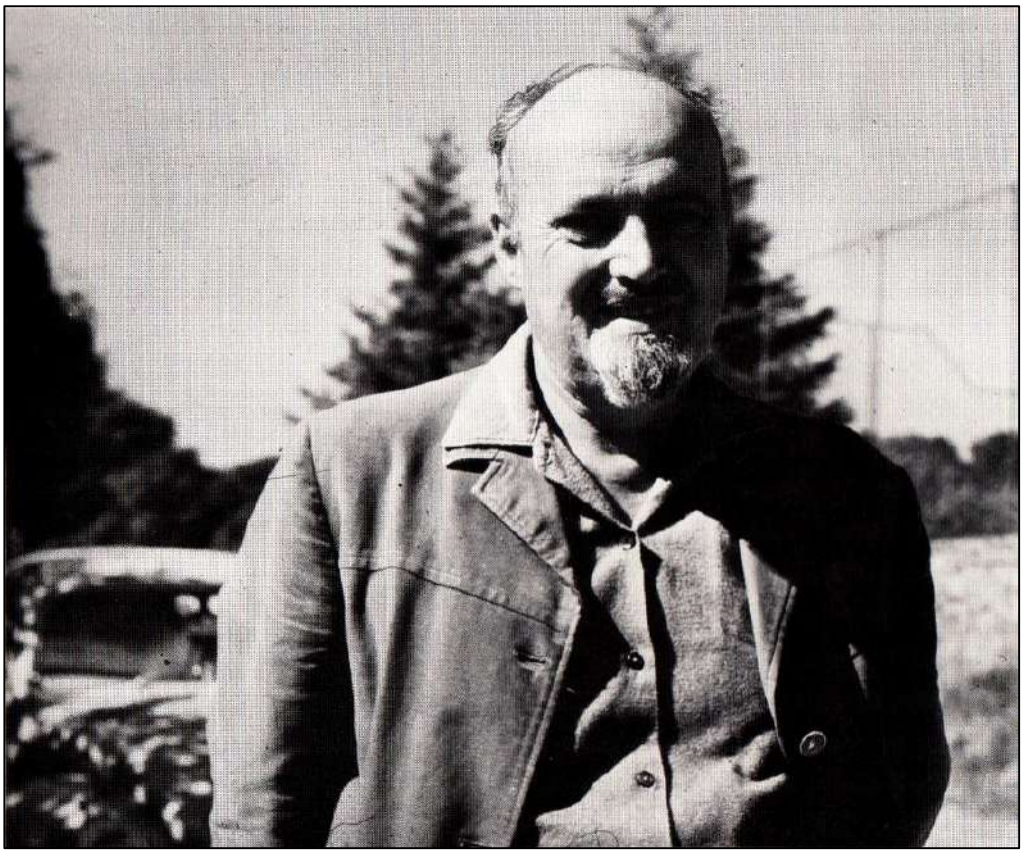


Figure 10 - Toto, leader of the Thlaro along the Langberg (Snyman, 1986:17).

DATE	DESCRIPTION
1899 - 1902	The South African War was fought between Great Britain and the Boer republics of the Zuid-Afrikaansche Republiek and Orange Free State. However, no skirmishes or battles from this war are known from the direct vicinity of the study area. The closest known battles and skirmishes to the present study area include Kareepan on 10 August 1901 and Doornfontein in February 1902 (Snyman, 1983). These farms are located roughly 52 to 61km south and 52 and 59km south-east of the study area, respectively.
1907	A number of trekboers from the southern Free State arrived in the general vicinity of the present study area (Erasmus, 2004).
1913	In this year the so-called "Native Locations" of Skeyfontein and Groenwater were established by Proclamation 131 of 1913 (Breutz, 1963).
1914	The town of Dibeng was laid out in 1914 on the banks of the Ga-Mogara river. This followed on the establishment of the Dibeng Dutch Reformed Church parish in 1909 (Erasmus, 2004).
1927	Gamagara Manganese Corporation Ltd and Central Manganese Ltd obtained options on farms in the vicinity of Lomoteng and Sishen (Snyman, 1988).
4 November 1930	On this day the extension of the railway line from Koopmansfontein to Postmasburg was officially opened by the Minister of Railways, C.W. Malan. This meant that Postmasburg was now one of the few towns in the Northern Cape which boasted a direct rail link. While the extension of the railway line to Beeshoek was built by the Manganese Corporation further extensions to Lohatla and Manganore (1936), Sishen (1953) and Hotazel (1961) were undertaken by the South African Railways (Snyman, 1983).
1930 - 1932	During 1930 an Englishman by the name of Pringle-Smith was appointed by S.A. Manganese to devise and execute a "...*thorough prospecting programme of S.A. Manganese's properties*..." (S.A. Manganese, 1977:46). This meant that the prospecting work undertaken in 1927 and which had been halted due to the poor financial climate and the lack of a railway link could now be proceeded with. Within a relatively short spate of time Pringle-Smith started opening up the beds on the farms Kapstewel and Doornput. However, the company did not have the market, which for example the Manganese Corporation possessed at the time, and as a result the ore was stockpiled at these two farms. Pringle-Smith left the Postmasburg area in 1932 after the financial implications of the Great Depression worsened the situation for S.A. Manganese to such an extent that he was asked to agree to a much lower salary (S.A. Manganese, 1977).
Early 1930s	Due to the financial impacts of the Great Depression, a number of smaller manganese mining companies were closed down. A period of amalgamation followed which resulted in the South African Manganese Limited as well as the Associated Manganese Miners of South Africa Limited becoming the leaders in the manganese mining industry (Snyman, 1983).
c. 1932 - 1937	During this approximate period a geological assessment of the minerals and ore deposits of the Postmasburg District was undertaken by the South African Geological Survey. One member of the geological team was Dr Leslie Gray

DATE	DESCRIPTION
	Boardman. His responsibility was to work on manganese and haematite deposits in the district. Apart from the manganese deposits near Postmasburg, Dr Boardman also identified large deposits of iron ore deposits on farms along the northern end of their area of study including Sishen, Bruce and King (S.A. Manganese, 1977). The Aldag component of the study area is located on the farm Sishen 543, with the farms Bruce and King located in close proximity to the Lylyveld component of the study area.
	 *Figure 11 - Dr Leslie Gray Boardman, the geologist who during the 1930s realized the immense potential of the Sishen area for iron ore mining (S.A. Manganese, 1977:65).*
c. 1936	After the willingness of the South African Railways Administration to extend the railway line from Postmasburg to Kapstewel and Lohatla became known, the entire manganese industry north of Postmasburg changed for the better. An example of this was that S.A. Manganese stepped up operations on the farm Kapstewel. The work here was overseen by Captain T.L.H. Shone (S.A. Manganese, 1977). The promise of railway extensions to this area also resulted in other mining activities such as the establishment of a mining company by the name of Gloucester Manganese. This company was established to mine the manganese deposits on the farm Gloucester. Shortly thereafter an amalgamation took place between Gloucester Manganese and the Manganese Corporation which resulted in the formation of the Associated Manganese Mines of South Africa Limited (Ammosal). Ammosal re-erected the old ore handling plant from Beeshoek on the farm Gloucester and the operations here represented a large portion of the total manganese production of 250,000 tons (S.A. Manganese, 1977). The farm Gloucester is situated about between 23 and 30km south of the study area.

DATE	DESCRIPTION
1937	The farm to the east of Gloucester, named Lohatla, was now being viewed more favourably by S.A. Manganese. During this year they reached an agreement with the owner, which eventually resulted in the acquisition of the farm (S.A. Manganese, 1977). During the same year the company bought the freehold of the farm Klipfontein and also bought 600 morgen of the farm Kapstewel in order to build a staff village. This village was named Manganore (S.A. Manganese, 1977). The Lohatla mine village was also established during this time (Snyman, 1983). Furthermore, the African Metals Corporation Limited (Amcor) was established "…*to manufacture semi-processed iron and steel products*…" and in 1937 obtained the farm Demaneng for this purpose. However, this venture was a failure (Snyman, 1988:84). The farm Demaneng is located 18km south-east of the study area.
Late 1940s	During this time the decision was made by two of the bigger role players in the manganese mining industry around Postmasburg for the mining of haematite iron ore to commence in earnest. S.A. Manganese in conjunction with the African Metals Corporation (Amcor) established a new company known as Manganore Iron Mining Ltd. to work on the iron ore deposits owned by them. These deposits were *inter alia* located on the farms Klipfontein, Kapstewel and Doornput (S.A. Manganese, 1977). All three these farms are located roughly 35km south of the present study area.
c. 1950	At the time D. L.G. Boardman was assessing the ore reserves at Manganore and Lohathla as well as the farm Lylyveld for S.A. Manganese. He found that the latter farm contained large quantities of haematite iron ore and persuaded the directors of S.A. Manganese to acquire the farm (S.A. Manganese, 1977). The component of the study area known as Lylyveld is located on the farm Lylyveld 545.
1953	Iscor commenced iron production at Sishen (Snyman, 1983). In the same year the railway line from Postmasburg to Sishen was extended to haul ore to Iscor's plants in Pretoria, Vanderbijlpark and Newcastle (Erasmus, 2004).
1958	At least by 1958 Manganore Iron Mining also owned mineral and surface rights on the farm Sekgame, approximately 5km to the east.
1973	In this year a second mine was opened at Sishen to supply export iron ore to Saldanha Bay. During the same year the town of Kathu was established to accommodate employees for the new mine (Erasmus, 2004).
1976 - 1977	During this time the Gatlhose and Maremane Communities were removed from their land and taken to the Shipton Farms in the then homeland of Bophutatswana. After their removal, the South African Government decided to establish a Battle School here. As the Khosis Community was still staying on the land, they were moved to a section of the original land roughly 14 000 hectares in extent. The Lohatla Battle School was subsequently established (www.lrc.org.za/Docs/Judgments/khosis.doc).
1977	During this year the 860km long Sishen-Saldanha railway line was completed (Erasmus, 2004).
1980	In 1980 the town of Kathu received municipal status (Erasmus, 2004).

5.3 Cartographic Evidence

5.3.1 First and Second Editions of the 2722DB Map depicting the Backbone Extension Pipeline

The figures below comprise sections of the First and Second Editions of the 2722DB Topographical Sheets, depicting the proposed Backbone Extension Pipeline. The proposed pipeline, including a 50m buffer on either side of the line, are shown on these map sheet depictions.

The First Edition of the 2722DB sheet was based on aerial photography conducted in 1972, was surveyed in 1974 and drawn in 1975 by the Director-General of Surveys. The Second Edition of the same sheet was compiled in 2001.

The following observations can be made from these depictions:

- No heritage sites or features are shown within the northern component of the present study area as depicted on these two map sheets.
- The First Edition shows a number of dry pans in the surroundings of the study area. The Second Edition shows only a few of these pans still in existence.
- The First Edition shows a railway line immediately east of the study area, and the proposed pipeline ends where a railway station named Emil was located at the time. The Second Edition shows the same railway line and station, although the station is shown further to the south. This railway line and associated station do not exist anymore. From the desktop study undertaken for this project, it is known that the railway line was extended from Manganore to Sishen in 1953. The railway line between Sishen and Hotazel was built in 1961. It is therefore clear that the section of the railway line shown on these two map sections, was built in 1961.
- The most prominent feature depicted in the surroundings of the study area on the First Edition, is a repetitive sequence of dotted lines referred to on the map as ‘cutlines’. These cutlines were likely associated with early prospecting work. The Second Edition also shows these ‘cutlines’, but also the development of roads as well as a canal in the surroundings of the study area.

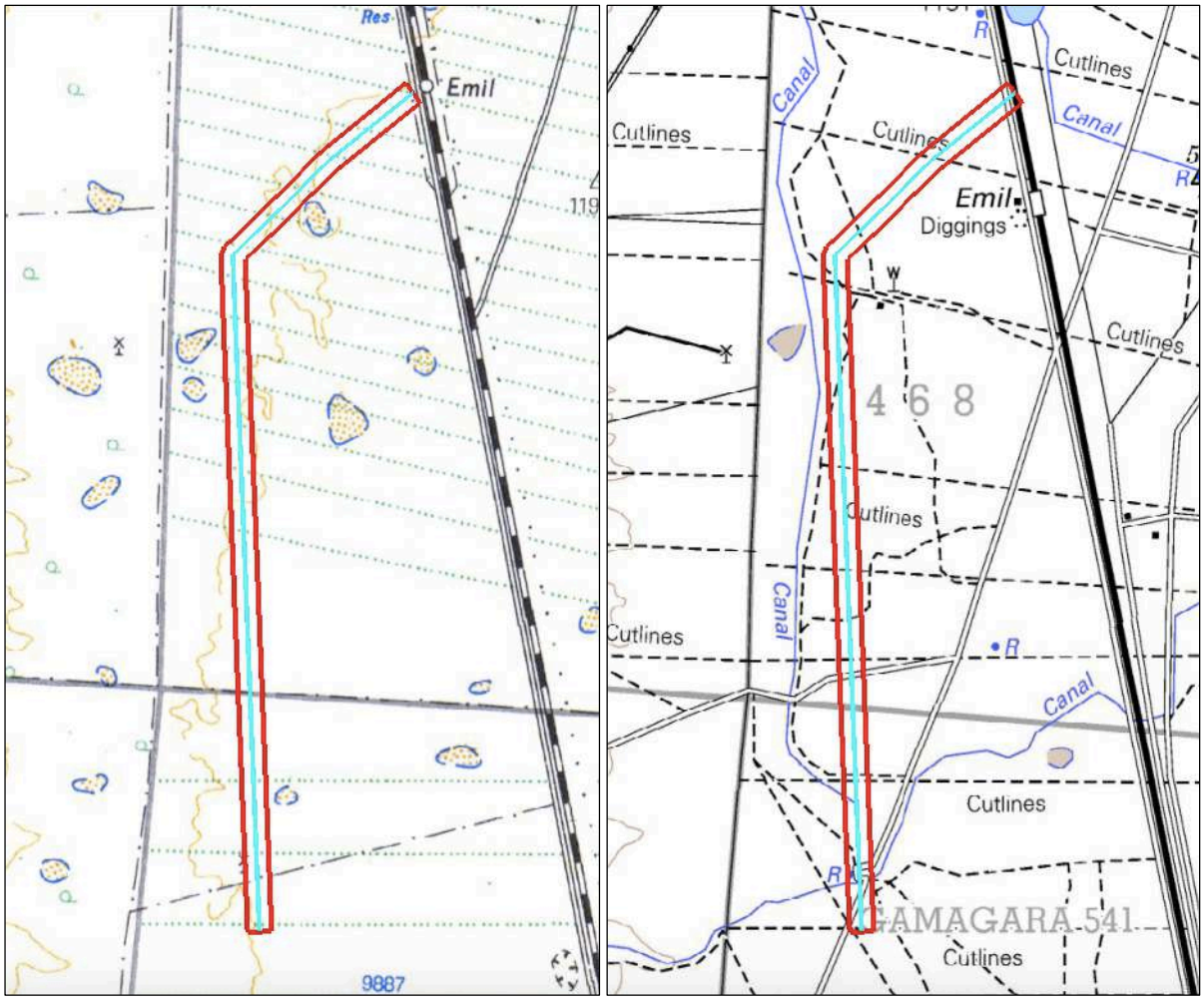


Figure 12 – The image on the left depicts a section of the First Edition of the 2722DB Sheet and the image on the right depicts a section of the Second Edition of the same map. The northern half of the study area is depicted on both sheets, with the proposed Backbone Extension Pipeline in light blue and the associated buffer area of 50m on each side of the proposed pipeline depicted in red.

5.3.2 First and Second Editions of the 2722DB Map depicting the Dewatering Curtain Pipeline

The figures below comprise sections of the First and Second Editions of the 2722DB Topographical Sheets, depicting the proposed Dewatering Curtain Pipeline. As requested by the client, a 100m wide area located south of the road, and including the proposed pipeline route, was included in the study. The First Edition of the 2722DB sheet was based on aerial photography conducted in 1972, was surveyed in 1974 and drawn in 1975 by the Director-General of Surveys. The Second Edition of the same sheet was compiled in 2001. The following observations can be made from these depictions:

- No heritage sites or features are shown within the southern of the present study area as depicted on these two map sheets.
- Both map editions show a railway line cutting across the site. This line was built in 1961.

- A repetitive sequence of dotted lines referred to on the map as ‘cutlines’, are depicted in the surroundings of the study area on the First Edition. The Second Edition does not show these ‘cutlines’, but does depict tracks, buildings and mining activities.

Figure 13 – Section of the First Edition of the 2722DB Sheet. The proposed Dewatering Curtain Pipeline is shown in yellow with the study area boundaries in red.

Figure 14 – Section of the First Edition of the 2722DB Sheet. The proposed Dewatering Curtain Pipeline is shown in yellow with the study area boundaries in red.

5.4 Palaeontology

A palaeontological desktop study was completed by Dr. Matthew Caruana (**Annexure B**).

The study found that the proposed development site is completely underlain by sediments of the Early Precambrian, Transvaal Supergroup, Ghaap Group and Campbell Rand Subgroup. The Campbell Rand Subgroup sediments were deposited on the shallow submerged Kaapvaal Craton, approximately 2.6 to 2.5 Ga (billion years ago).

The development site near Kathu consists of a flat-lying terrain and vegetation cover of grassy thornveld.

The PalaeoMap (SAHRA website) indicates that the palaeontological significance of the Transvaal Group, Campbell Rand Subgroup is moderate and thus the overall impact of the proposed developments is rated as negative moderate significance.

6 FIELDWORK FINDINGS

The fieldwork conducted on the 4th of October 2018 found no significant concentrations of archaeological materials. Further, the landscape in both the north and south study areas were heavily disturbed by previous developments (see below).

6.1 Backbone Extension Pipeline Route (Northern Section)

The northern section of the study area was located within the active boundary of the Sishen Iron Ore Mine, which is significantly disturbed by on-going mining activities.

Per the instruction of the client, a buffer area 50m on either side of the proposed pipeline route was included in the fieldwork.

A 50m buffer was marked in a handheld Garmin 60S GPS unit and surveyed, should alternatives for the proposed pipeline route be considered (**Figure 15**). The entire area within the 50 m buffer of the proposed backbone extension route and the surrounding vicinity was heavily disturbed by previous and current mining activities (**Figure 16**).

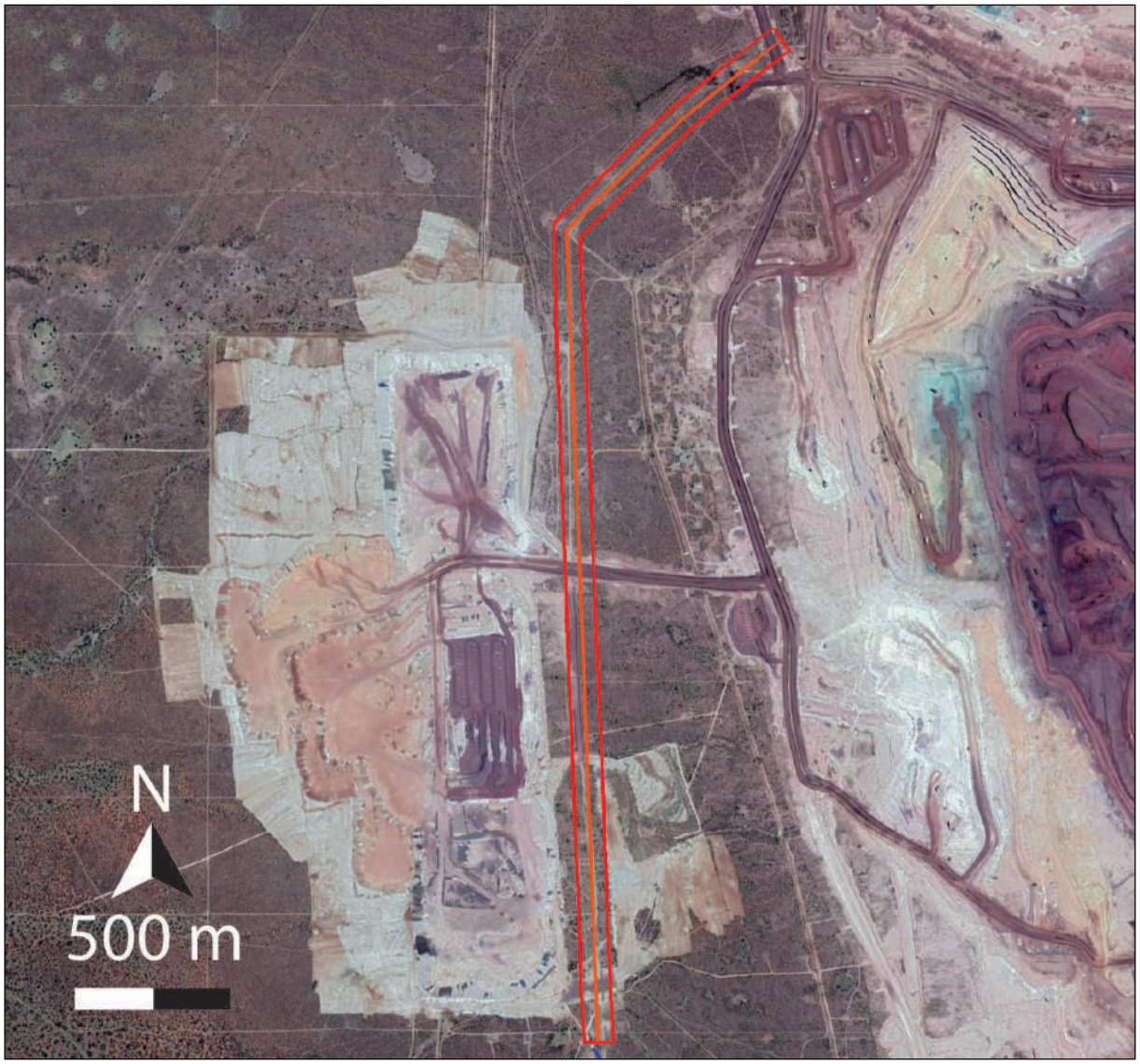


Figure 15 - Northern section of the study area. Proposed route of the backbone extension pipeline highlighted in orange; 50 m buffer outlined in red.

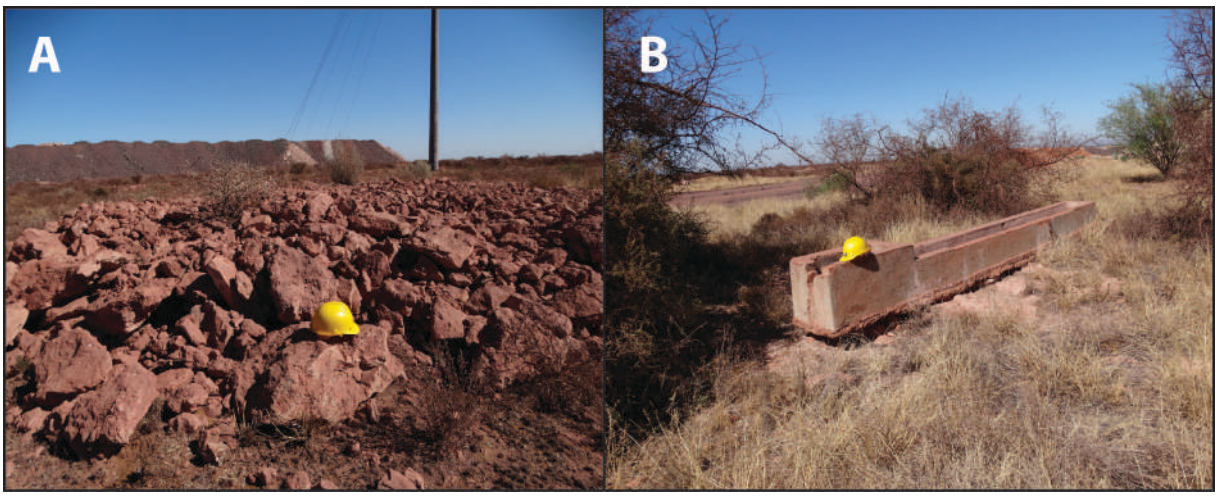


Figure 16 - Evidence of disturbance. A. Tillage heap resulting from road construction. B. Cement trough.

The survey was conducted within the 50m buffer to assess any potential damage or disturbance to archaeological occurrences, as well as to assess a wider area should alternative routes for the proposed Backbone Extension Pipeline be required (**Figure 17**).

The eastern border of the buffer zone was covered by an existing light-duty vehicle road (**Figure 18**).

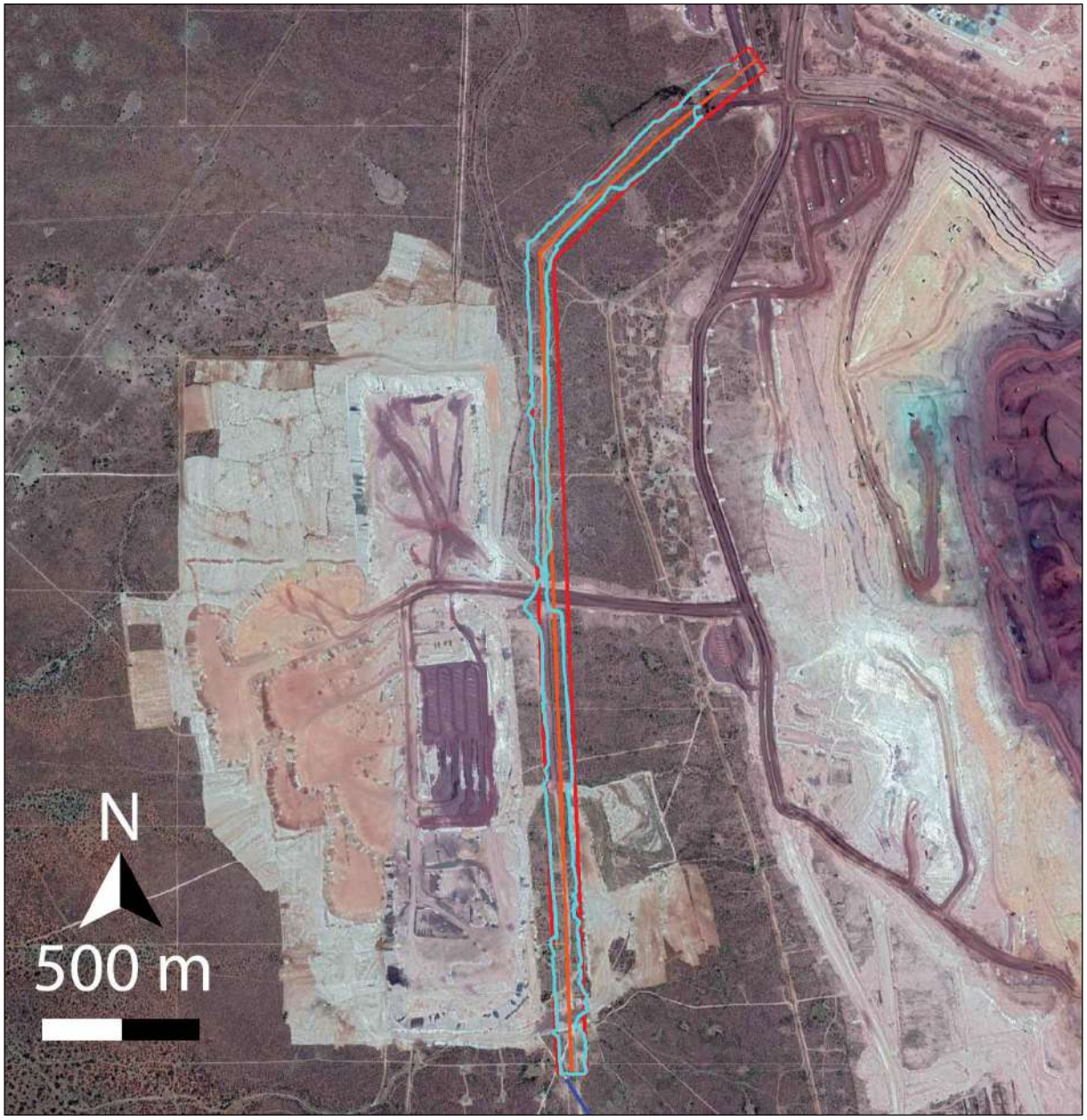


Figure 17 - Survey tracks (blue) within the 50 m buffer zone associated with the proposed Backbone Extension Pipeline route.

Figure 18 - The light-duty vehicle road overlapping the eastern side of the 50 m buffer bordering the proposed Backbone Extension Pipeline route.

6.2 Dewatering Curtain Pipeline Route (Southern Section)

Results of the southern section of the study area mirrored the results found in the survey of the northern section. No archaeological occurrences were found, although the property was heavily disturbed by previous farming activities. A 100 m buffer was plotted with a handheld Garmin 60S GPS unit and surveyed for archaeological occurrences, as well as to assess a wider area should alternative routes for the proposed Dewatering Curtain Pipeline Route be required (**Figures 19 & 20**).

Figure 19 – Depiction of the southern end of the study area. Red = 100 m buffer; Orange = Proposed Curtain Dewatering Pipeline route; Yellow = Fence.

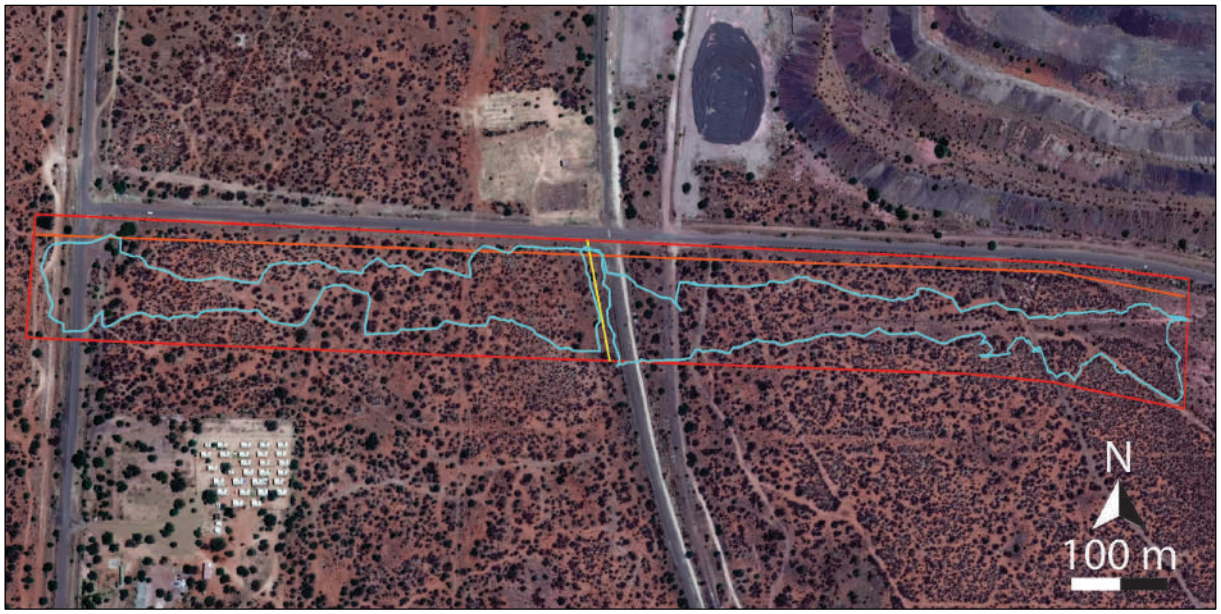


Figure 20 – Depiction of the southern end of the study area showing the track logs recorded during the fieldwork in blue, with the 100m buffer area in red.

All open areas were inspected although blackthorn bushes and acacia trees impeded the survey. Despite this, visibility was approximately 25 m, which allowed for good visual inspection of the land surface. This area was found to be heavily disturbed (**Figure 21**).

Figure 21 – General view of a section of the southern component of the study area showing evidence of disturbance. The disturbance shown here appears to be field or vegetation clearance.

Further, a large trench was noticed in the eastern portion of the survey area (**Figure 22**).

Figure 22 - A large trench observed in the eastern section of the survey area.

6.3 Conclusions of the Archaeological Survey

The following conclusions can be made from the archaeological surveye:

- From an archaeological perspective, the northern section of study area (the proposed Backbone Extension Pipeline route) is located on the Sishen Iron Ore Mine, which has been heavily altered by previous and current mining activities. While the survey results did not locate any archaeological occurrences, any artefactual materials would be greatly diminished in their significance because of the disturbed contexts.

- In terms of the southern section, no archaeological occurrences were identified, although recent farming and settlement activities have disturbed this area and would also diminish the significance of any artefactual materials.

7 IMPACT OF PROPOSED DEVELOPMENT ON HERITAGE RESOURCES

7.1 Archaeological Resources

Based on the results of the survey presented above, the probability of development impact of the Western Dewatering Infrastructure project, comprised of the Backbone Extension and Curtain Dewatering Pipeline routes, on archaeological resources, is rated as VERY LOW. However, because this area is a continuous cultural landscape there is a possibility that a concentration of artefacts could be found, although very unlikely. In this case, recommendations are made in the conclusions, which adhere to the minimum standards for the mitigation of archaeological occurrences by SAHRA (see Section 8). Based on the findings of this report and the conclusions of Fourie et al. (2018), it is unlikely that any significant sub-surface archaeological despots will be located during any of the proposed development projects outlined in this report. As such, no site-specific measure of mitigation is needed before the proposed development may proceed.

Table 11 - Impact Evaluation – Development of the Proposed Backbone Extension Pipeline

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on archaeological deposits	Very Low	Study Area	Incidental	Unlikely	**Very Low**
0	1	2	1	2	0.5

Table 12 - Impact Evaluation – Development of the Proposed Borehole Curtain Pipeline

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on archaeological deposits	Very Low	Study Area	Incidental	Unlikely	**Very Low**
0	1	2	1	2	0.5

7.2 Palaeontological Resources

Refer **Annexure B** for the Palaeontological Desktop Study.

Significance - The entire study area is underlain by the Ghaap Group (Campbell Rand Subgroup). Stromatolites are known (from the literature) to be present in the region, although these fossils are

only found at depth, within stratigraphic units below the Kalahari Sands substrate of this area (~100 m) in thickness. The construction of above-ground pipelines proposed for the backbone extension and borehole curtain routes connecting to the existing Vaal-Gamagara pipeline in this area is extremely unlikely to expose or disturb any fossil resources in this area. Therefore, the potential impact on fossil heritage in these areas is considered to be VERY LOW.

Spatial Scale – Any potential impact (although extremely unlikely) on fossil materials and thus palaeontological heritage would be limited to the study area when new developments of the proposed pipelines occur. Since the impact would be restricted to the areas where the pipelines would be built, the spatial scale is categorised as 'study area'.

Temporal Scale - The expected duration of any impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent.

Probability - Stratigraphic and geographical distribution of Archaean stromatolites within the Campbell Rand Subgroup has been documented in palaeontological literature. Stromatolite assemblages may be present within the development areas, albeit only at depth. Because the pipeline development will take place above ground, it is unlikely that any fossil materials will be exposed or disturbed during any proposed development activities.

Table 13 - Impact Evaluation – Impact on Palaeontological Resources Related to the Backbone Extension Pipeline

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on palaeontological resources	Very Low	Study Area	Incidental	Unlikely	**Very Low**
0	1	2	1	2	0.5

Table 14 - Impact Evaluation – Impact on Palaeontological Resources Related to the Borehole Curtain Pipeline

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
Impact on palaeontological resources	Very Low	Study Area	Incidental	Unlikely	**Very Low**
0	1	2	1	2	0.5

8 MITIGATION MEASURES AND GENERAL RECOMMENDATIONS

As concluded above, it is unlikely that any of the proposed developments will impact archaeological or palaeontological resources. Nevertheless, if any archaeological or palaeontological materials should be discovered during development, the following recommendations are suggested:

- If a deposit is identified, a controlled sampling of the material found should be done;
- This work must be done in such a way as to augment the current research questions and field work such as the excavations at the Kathu Townlands Site and Kathu Pan;
- These test excavations and sampling must be done after a permit has been granted under Section 35 of the NHRA (Act 25 of 1999) to a qualified and experienced Stone Age archaeologist;
- In the event that substantive material is uncovered, it is recommended that a display is considered in a convenient location;
- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project. The appointed archaeologist will be responsible for the following:
    - Provide training to the project ECO in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during Construction Phase with the appointed archaeologist visiting every two weeks.
    - Conduct an archaeological monitoring program whereby the construction site is visited once every two weeks for at least the first three months of the project.
    - On-site assessment of Stone Age material exposed during construction and the provision of recommendations for the way in which the exposed material must be mitigated.
    - Compile and submit an archaeological monitoring report at the end of the process.
- During the monitoring undertaken everyday on-site by the ECO and once every two weeks by the appointed archaeologist, all construction work must be closely monitored. Should any Stone Age material or any archaeological material be identified, all construction work in that area must immediately stop and the ECO or archaeologist (if already present on site) must demarcate a construction free area around the discovery. If the ECO made the discovery, the archaeologist must be contacted immediately to visit the construction site to assess the exposed material. After assessing the exposed material, the archaeologist would provide recommendations for the exposed material that may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

9 CONCLUSIONS

Introduction

PGS Heritage (Pty) Ltd was appointed by EXM Advisory Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), including a palaeontological desktop study, which forms part of the Basic Assessment (BA) for the proposed Western Dewatering Infrastructure Project associated with the Vaal-Gamagara pipeline that services current mining activities within the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

Proposed Development

The study area is comprised of two parts located north and south of the existing Vaal-Gamagara pipeline. Development in the northern section will involve the construction of an above-ground, backbone extension of the current Vaal-Gamagara pipeline that will transport water to the Kathu Reservoir, located north of the Shishen Iron Ore Mine. Development in the southern section will involve the construction of an above-ground, borehole pipeline curtain that will pump water northwards from existing boreholes to the Vaal-Gamagara pipeline and into the backbone extension.

Archaeological and Historical Desktop Study

An archaeological and historical desktop study was undertaken and was used to compile a historical layering of the study area within its regional context. This component indicates that the landscape within which the project area is located has a rich and diverse history. The proposed National Heritage Site Nomination of the Kathu Archaeological Complex demonstrates the importance of the archaeological heritage of the region (Walker et al, 2013; SAHRIS accessed August 2014). The scientific and heritage significance as well as the occurrence of archaeological material was taken into account in the HIA under review (Beaumont, 1990, 2004, 2013; Porrat et al, 2010; Herries, 2012; Chazan et al, 2012; Wilkins & Chazan, 2012; Walker et al, 2013; Walker et al 2014).

Fieldwork

Due to the significance of the Stone Age sites from the surrounding landscape, and in adherence to the recommendation made by SAHRA in their letter of response to the initial submission of the proposed development on SAHRIS, Dr. Matt Caruana was appointed by PGS Heritage to conduct an archaeological survey of the proposed pipeline routes as well as a buffer area around each of the

pipeline routes should alternatives to the existing pipelines be considered. Dr. Caruana was also appointed to perform the palaeontological desktop study for this area. The methodology comprised a detailed walk through of the study area by Dr. Caruana.

Recommendations resulting from Fieldwork

Based on the survey results of this project, no archaeological or heritage items were identified and the landscape within the study area and surrounding regions were found to be heavily disturbed by previous farming and/or mining activities. However, the following recommendations are made, based on the significance of archaeological sites within the vicinity of Kathu:

- If an archaeological or fossil deposit is identified, a controlled sampling of the material found should be done;
- This work must be done in such a way as to augment the current research questions and fieldwork such as the excavations at the Kathu Townlands Site and Kathu Pan;
- These test excavations and sampling must be done after a permit has been granted under Section 35 of the NHRA (Act 25 of 1999) to a qualified and experienced Stone Age archaeologist;
- In the event that substantive material is uncovered, it is recommended that a display is considered in a convenient location;
- An archaeologist suitably qualified in Stone Age fieldwork and research must be appointed to undertake an Archaeological Watching Brief during the Construction Phase of the project. The appointed archaeologist will be responsible for the following:

    - Provide training to the project Environmental Control Office (ECO) in Stone Age archaeology and the identification of Stone Age artefacts and sites. The ECO will be responsible for daily on-site monitoring during the Construction Phase with the appointed archaeologist visiting the site every two weeks.
    - Conduct an archaeological monitoring program whereby the construction site is visited once every two weeks for at least the first three months of the project.
    - On-site assessment of any Stone Age material exposed during construction and the provision of recommendations for the way in which the exposed material must be mitigated.
    - Compile and submit an archaeological monitoring report at the end of the monitoring process.

- Monitoring undertaken everyday on-site by the ECO will ensure that all construction work is closely monitored. Should any Stone Age material or any archaeological material be identified, all construction work in that area must immediately stop and the ECO must demarcate a construction free area around the discovery. If the ECO made the discovery, a professional archaeologist must be contacted immediately to visit the construction site to assess the exposed material. After assessing the exposed material, the archaeologist must provide recommendations for the exposed material, which may range from destruction without mitigation (if the exposed material is found to be of little significance) to archaeological mitigation (if the exposed material is found to be significant).

Palaeontology

As per the palaeontological desktop assessment (**Annexure B**), the proposed development is unlikely to pose any substantial threat to local fossil heritage and developments should go forward. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist. The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (*e.g.* museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

Conclusions

The proposed development may continue if the recommendations as outlined in this report are adhered to.

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10.5 Historic Topographic Maps

All the historic topographic maps used in this report were obtained from the Directorate: National Geo-spatial Information of the Department of Rural Development and Land Reform in Cape Town.

ANNEXURE A – LEGISLATIVE REQUIREMENTS: TERMINOLOGY AND ASSESSMENT CRITERIA

General principles

In areas where there has not yet been a systematic survey to identify conservation worthy places, a permit is required to alter or demolish any structure older than 60 years. This will apply until a survey has been done and identified heritage resources are formally protected.

Archaeological and palaeontological sites, materials, and meteorites are the source of our understanding of the evolution of the earth, life on earth and the history of people. In terms of the heritage legislation, permits are required to damage, destroy, alter, or disturb them. Furthermore, individuals who already possess heritage material are required to register it. The management of heritage resources is integrated with environmental resources and this means that, before development takes place, heritage resources are assessed and, if necessary, rescued.

In addition to the formal protection of culturally significant graves, all graves which are older than 60 years and are not located in a cemetery (such as ancestral graves in rural areas), are protected. The legislation also protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honour.

Anyone who intends to undertake a development must notify the heritage resources authority and, if there is reason to believe that heritage resources will be affected, an impact assessment report must be compiled at the construction company's cost. Thus, the construction company will be able to proceed without uncertainty about whether work will have to be stopped if an archaeological or heritage resource is discovered.

According to the National Heritage Act (Act 25 of 1999 section 32) it is stated that:
An object or collection of objects, or a type of object or a list of objects, whether specific or generic, that is part of the national estate and the export of which SAHRA deems it necessary to control, may be declared a heritage object, including –

- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects, meteorites and rare geological specimens;
- visual art objects;

- military objects;
- numismatic objects;
- objects of cultural and historical significance;
- objects to which oral traditions are attached and which are associated with living heritage;
- objects of scientific or technological interest;
- books, records, documents, photographic positives and negatives, graphic material, film or video or sound recordings, excluding those that are public records as defined in section 1 (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996), or in a provincial law pertaining to records or archives; and
- any other prescribed category.

Under the National Heritage Resources Act (Act No. 25 of 1999), provisions are made that deal with, and offer protection to, all historic and prehistoric cultural remains, including graves and human remains.

Graves and cemeteries

Graves younger than 60 years fall under Section 2(1) of the Removal of Graves and Dead Bodies Ordinance (Ordinance no. 7 of 1925) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the National Department of Health and the relevant Provincial Department of Health and must be submitted for final approval to the Office of the relevant Provincial Premier. This function is usually delegated to the Provincial MEC for Local Government and Planning, or in some cases the MEC for Housing and Welfare. Authorisation for exhumation and reinternment must also be obtained from the relevant local or regional council where the grave is situated, as well as the relevant local or regional council to where the grave is being relocated. All local and regional provisions, laws and by-laws must also be adhered to. In order to handle and transport human remains, the institution conducting the relocation should be authorised under Section 24 of Act 65 of 1983 (Human Tissues Act).

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissues Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resources Agency (SAHRA). The procedure for

Consultation regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorisation as set out for graves younger than 60 years, over and above SAHRA authorisation.

If the grave is not situated inside a formal cemetery but is to be relocated to one, permission from the local authority is required and all regulations, laws and by-laws set by the cemetery authority must be adhered to.

ANNEXURE B – PALAEONTOLOGICAL DESKTOP STUDY

A Palaeontological Desktop Study for the Proposed Expansion of the Western Dewatering Infrastructure Project on the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

This portion of the report has been prepared by:

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1 EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

PGS Heritage (Pty) Ltd was appointed by EXM Advisory Services (Pty) Ltd to undertake a Heritage Impact Assessment (HIA), including a palaeontological desktop study, which forms part of the Basic Assessment (BA) for the proposed expansion of the western dewatering infrastructure associated with the Vaal-Gamagara pipeline that services current mining activities within the Sishen Iron Ore Mine, Kathu, Northern Cape Province.

The study area is comprised of two parts located north and south of the existing Vaal-Gamagara pipeline. Development in the northern section will involve the construction of an above-ground, backbone extension of the current Vaal-Gamagara pipeline that will transport water to the Kathu Reservoir, located north of the Shishen Iron Ore Mine. Development in the southern section will involve the construction of an above-ground, borehole pipeline curtain that will pump water northwards from existing boreholes to the Vaal-Gamagara pipeline and into the backbone extension.

Due to the significance of the fossil-bearing lithostratigraphic units found within the Northern Cape region, and in adherence to the recommendation made by SAHRA in their letter of response to the initial submission of the proposed development on SAHRIS, Dr. Matthew Caruana was also appointed to perform the palaeontological desktop study for the study area where proposed developments would occur.

The scientific and heritage significance as well as the occurrence of palaeontological material were taken into account in the following report (see Eriksson & Altermann, 1998; McKee, 1994).

The findings of the palaeontological desktop study were:

- No previous palaeontological studies overlapped with the study area
- Three palaeontological impact assessments (PIAs) were conducted in the vicinity of Kathu, none of these impact assessments recorded important fossils nor recommended mitigation.

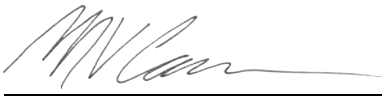
Recommendations:

- The proposed developments are unlikely to pose a substantial threat to local fossil heritage
- Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately.

2 TABLE OF CONTENTS

3 DECLARATION OF INDEPENDENCE

I, Matthew Caruana (HRMS) declare that the report has been compiled by myself on behalf of PGS Heritage, the appointed Heritage Specialist for EXM Advisory Services (Pty) Ltd. The views stipulated in this report are purely objective and no other interests are displayed in the findings and recommendations of this Heritage Impact Assessment.



Dr. Matthew Caruana

4 PROJECT BACKGROUND

The Sishen Iron Ore Company (Pty) Ltd has applied for the Western Dewatering Infrastructure Project, which involves pipeline extensions to the current extent of the Vaal-Gamagara pipeline (see **Figure 2** in the main text). In effort to reduce the number of boreholes needed to dewater active mining pits on the Sishen Iron Ore Mine, new boreholes are being established at the southern end of the current mining operation to dewater pits by taking advantage of the natural north-to-south flow of the aquifer underlying this area. As such, this will reduce the need to create boreholes within open mining pits. The proposed pipelines (backbone extension and curtain) will extend the capacity of the existing Vaal-Gamagara pipeline to dewater mining operations within the western portion of the Sishen Iron Ore Mine.

Within the southern section of the study area, a new Borehole Curtain Pipeline (a 250 mm diameter HDPE above ground pipeline) is proposed for construction along the D3333 road to transport water to a redundant section of the Vaal-Gamagara pipeline (an existing 700 mm underground pipeline) which runs parallel to the D328 road. The Vaal-Gamagara pipeline will then feed into the proposed backbone extension (a 350 mm above ground steel pipeline) via the Sishen Sedibeng pump station to a proposed Backbone Extension Pipeline, which terminate into the Kathu Reservoir, north of Sishen Mine.

5 DESCRIPTION OF THE STUDY AREA

Coordinates	Backbone Extension Pipeline: 27°43'39.34"S; 22°57'27.36"E Borehole Curtain Pipeline: 27°48'51.35"S; 22°59'5.67"E
Property	Backbone Extension Pipeline: Farms Woon 469 & Fritz 540 Borehole Curtain Pipeline: Farm Gamagara 541
Location	The proposed areas of development are situated north and south of the existing Vaal-Gamagara Pipeline within the boundaries of the Sishen Iron Ore Mine. The northern section is approximately 7.9 km northwest of Dingleton and 9.6 km southwest of Kathu; the southern section is approximately 72.8 km south of Dingleton and 14.8 km south by southwest of Kathu.
Extent	The northern section of the study area is approximately 0.37 km^2 and the southern section is approximately 0.13 km^2.
Land Description	The northern section of the study area is located within the Sishen Iron Ore mining rights boundary. The southern section runs outside the mining right border, albeit the property where the borehole curtain route has been proposed is owned by the Sishen Iron Ore Company (Pty) Ltd. The entire study area has been heavily disturbed by current mining activities. The nature of this disturbance has affected the local environment, but it is characterised by flat plains with mixed wooded and shrub savannah and a Kalahari Sand substrate.

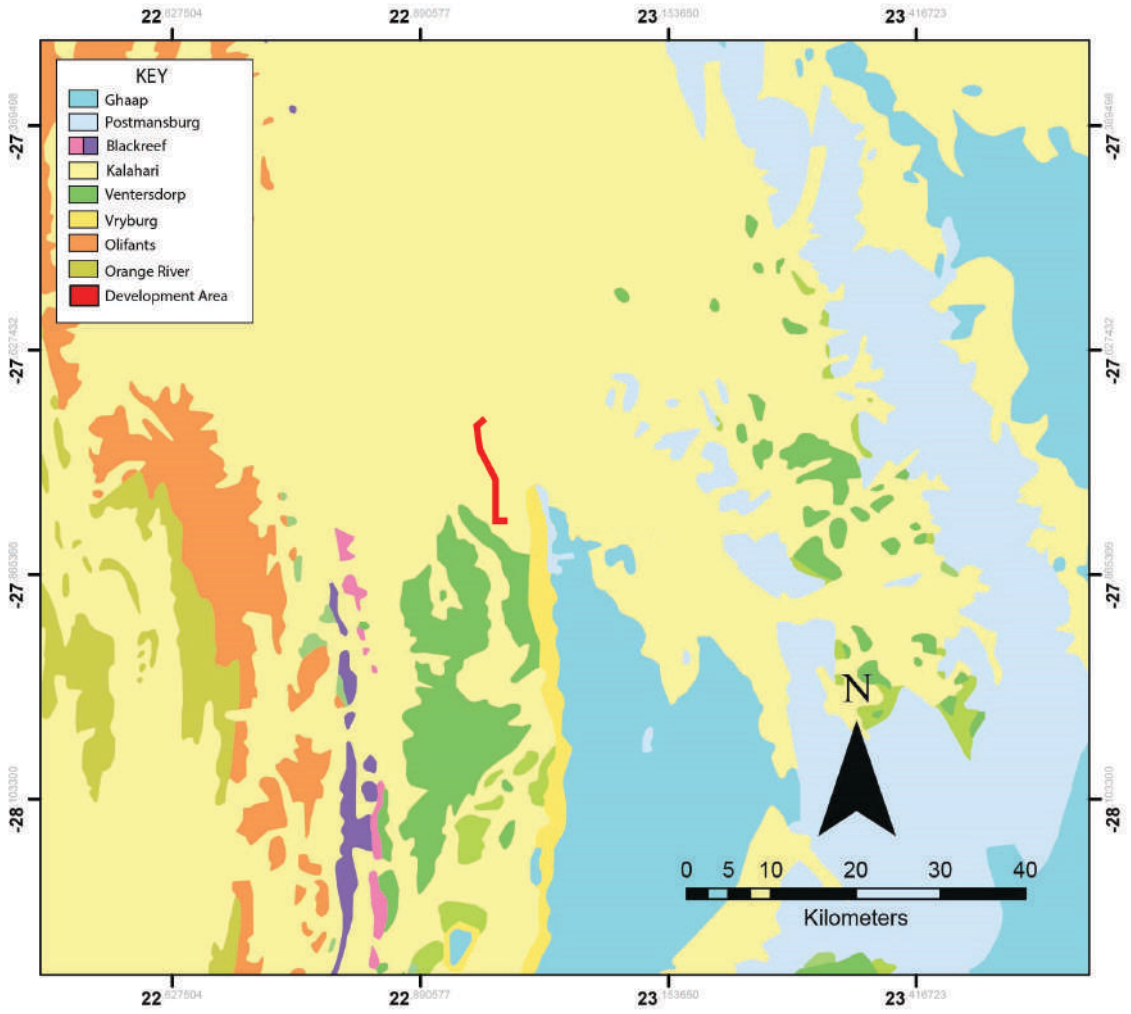


Figure 1. Geological Map of study area (1: 750 000). Red line denotes the entire pipeline route within the study area.

6 METHODOLOGY

The main method used in this desktop study is a literature review and a review of archival resources. The literature review summarises scientific research conducted within the relevant geological formations near surrounding the study area in the Northern Cape. The archival review involved a rigorous search on the SAHRIS website for similar research conducted within or near the area. Further, the SAHRIS Palaeo-Sensitivity Map (http://www.sahra.org.za/sahris/map/palaeo) was inspected for any recorded palaeontological sites in this area.

7 RESULTS

7.1 Literature Review: Palaeontological Significance

The region surrounding the study area in the Northern Cape is underlain by a complex geological sequence, including the Kalahari Group sediments from the Mesozoic Era to the Holocene period

(~200Ma – 10ka), with outcrops of much older Transvaal Supergroup from the Archean Eon (~4 – 2.4Ga) (Eriksson & Altermann, 1998; Sumner & Bowring, 1996). The Transvaal Supergroup in this area is represented by the Ghaap Group (~2.5 – 2.4 Ga), which includes numerous sedimentary units including the Vryburg Formation (Alterman & Schopf, 1996). Further, ore deposits associated with the Ghaap Group are also prevalent in this area including banded ironstone formations (BIF) (Hälbich et al., 1993; Eriksson & Altermann, 1998; Altermann & Schopf, 1996). Most of this basement rock has been overlain by the sedimentary formation of the Kalahari Group in recent geological history, which are mostly comprised of sand and clay deposits (Thomas & Shaw, 1990).

Ghaap Group (Griqualand West Sequence)

The Ghaap Group is largely composed of sedimentary formations rich in diamictites, silicates and iron (Beukes, 1980; Kendall et al., 2013). In the region south of the Kuruman hills, where Kathu is located, a complex stratigraphic sequence of the Ghaap Group is exposed, including the Campbellrand, Asbestos, Kuruman, Schimdtsdirft and Koegas Subgroups (Altermann & Nelson, 1998; Beukes, 1980; Hälbich et al., 1993). In general, these subgroups were formed through shallow, low-energy seas occupying the interior of Gondwanaland (Eriksson & Altermann, 1998). The carbonate-rich formations of the Ghaap Group have also influenced the modern setting of the landscape in the Kathu area, which is known for its superficial duricrust formations, including calcrete and ferricrete pans. These features are formed as groundwater leaches carbonates from the Ghaap Group and then precipitates these minerals through evaporation, typically around freshwater springs. In terms of palaeontology, The Ghaap Group only preserves trace, microbal fossils including stromatolites, oolites and other eukaryotes from the Vryburg, Boomplaas, Monteville, Fairfield, Klipfontein, Papkuil and Kogelbeen Formations (Wright & Altermann, 2000). These fossils have been important for understanding the formation of the Transvaal Supergroup, having only been significantly exposed due to drilling at depths of over 100m (Altermann & Nelson, 1998; Altermann & Schopf, 1996; Waldbauer et al., 2009).

Kalahari Group

The Kalahari Group is comprised of sandy and clay-rich sediments that have been deposited in the Griqualand West basin, over the ancient Ghaap Group in the area near Kathu. The Kalahari Group is comprised of Jurassic to Holocene sedimentary formations, including alluvial and aeolian sands, terrace gravels, surface limestones, calcretes and silcretes. This geological group was largely formed through fluvial and aeolian processes, depositing sediments from the Kalahari Basin in central southern Africa. In general, the Kalahari Group is low in fossil content and diversity (Almond, 2016). Recent palaeontological impact assessments in the Northern Cape have found trace fossils including

termite mounds, as well as gastropods (Almond, 2016). However, most academic sources confer that fossils-bearing deposits in the Kalahari Group sediments are rare.

7.2 Literature Review: Northern Cape Palaeontological Sites

Taung World Heritage Site

The most well-known palaeontological locality near the Kathu area is the Taung World Heritage site (hereafter Taung) outside of Kuruman (Kuhn et al., 2016). This is where the type specimen for *Australopithecus africanus* (Taung Child) was discovered and soon after described by Dart (1925). The Taung locality is comprised of successive tufa formations (Thabaseek, Norlim, Oxland and Blue Pools carapaces) that house 22 palaeontological and archaeological sites spanning the late Pliocene to the Holocene (McKee, 1994; Kuhn et al., 2016). These tufa formations developed from freshwater springs leaching carbonates from nearby dolomites comprising the Ghaap Plateau. The type site within Taung is comprised of two pinnacles (Dart and Hrdlicka), which have been dated to 3.03 - 2.58 Ma and are rich in faunal fossil remains (Kuhn et al., 2016). There are numerous other localities within the Taung site complex that are constrained to the Middle Pleistocene to Holocene (~1Ma - 2ka) by tufa formations, including Oxland Large Mammal site, Satan's Cave, Equus Cave, Tobias's Pinnacle and Black Earth Cave (McKee, 1994; Kuhn et al., 2016). Of these lesser known sites, only Equus Cave and Black Earth Cave have produced human remains (Kuhn et al., 2016).

Groot Kloof

Groot Kloof is another palaeontological site, dated to the Middle Pleistocene 100km southwest of Taung (Curnoe et al., 2006). U-Th produced a date of ~248ka with faunal remains derived from the Florisian Land Mammal Age. Groot Kloof is geologically comprised of tufa formed by a waterfall complex stemming from the Ghaap Plateau (Curnoe et al., 2006). While Groot Kloof has been preliminarily described as a fossil locality that is equal in age to Florisbad, it has yet to be systematically investigated and thus its palaeontological significance remains unknown.

Previous Palaeontological Studies in the Kathu Area

- Almond, J.E. 2010a. Proposed 100 MW concentrating solar power (CSP) generation facility: Copperton, Northern Cape Province. Palaeontological impact assessment: desktop study.
- Almond, J.E. 2010b. Proposed photovoltaic power generation facility: Prieska PV Site 1, Copperton, Northern Cape Province. Palaeontological impact assessment: desktop study.
- Pether, J. 2011. Brief Palaeontological Impact Assessment Proposed Kathu & Sishen Solar Energy Facilities Portions 4 & 6 of the Farm Wincanton 472 Kuruman District, Northern Cape. Palaeontological impact assessment.

- Almond, J.E. 2011a. Proposed Plan 8 wind energy facility near Copperton, Northern Cape Province. Palaeontological impact assessment: desktop study.

- Almond, J.E. 2011b. Proposed Mainstream wind farm near Prieska, Pixley ka Seme District Municipality, Northern Cape Province. Palaeontological impact assessment: desktop study.

- Almond, J.E. 2012a. Proposed photovoltaic energy plant on Farm Klipgats Pan (Portion 4 of Farm 117) near Copperton, Northern Cape Province. Palaeontological specialist assessment: combined desktop & field assessment study.

- Almond, J.E. 2012b. Proposed photovoltaic energy plant on Farm Hoekplaas (Remainder of Farm 146) near Copperton, Northern Cape Province. Palaeontological specialist assessment: combined desktop & field assessment study.

- Almond, J.E. 2013. Proposed PV2 to PV11 photovoltaic energy plants on the Farm Hoekplaas near Copperton, Northern Cape. Palaeontological specialist assessment: combined desktop & field assessment study.

- Birkholtz, P. 2015. Palaeontological Desktop Assessment of Portion of the Farm Marsh 467, Kathu, Northern Cape. Heritage Impact Assessment.

- Banzai Environmental 2017. Palaeontological desktop assessment for the proposed development of a new cemetery, near Kathu, Gamagara Local Municipality and John Taolo Gaetsewe District Municipality, Northern Cape. Palaeontological impact assessment.

7.3 Archival Review

The SAHRIS Palaeo-Sensitivity Map (http://www.sahra.org.za/sahris/map/palaeo) shows a moderate to high rating for fossil deposits for the study area. These ratings indicate that fieldwork will likely be necessary after the desktop study is complete. After researching the SAHRA APM Report Mapping Project records and the SAHRIS online database (http://www.sahra.org.za/sahris) it was determined that no previous palaeontological studies overlapped with the study area, although three palaeontological impact assessments (PIAs) were conducted in the vicinity of Kathu. None of these impact assessments recorded important fossils nor recommended mitigation. Furthermore, most of these reports confer with the academic sources discussed above that the potential for significant fossil deposits being discovered in this area, outside of core drilling, is unlikely. Based on literature for the Transvaal Supergroup (including the Vryburg Formation [Ghaap Group] represented in the study area), the only significant fossil to be discovered in the Kathu area are microbal and only exposed at significant depth (~100 m) (Altermann & Nelson 1998). In terms of the Kalahari Group, very few fossil deposits have been located in general and most of those relate to insects and gastropods that are not found in large concentrations. In conjuncture with the fact that the pipelines proposed for development are above-ground infrastructure, it is unlikely that construction in the study area will expose or disturb any fossil resources. In conclusion, because the study areas have been previously disturbed and development will not penetrate the Kalahari Group substrate in the

area, there is a VERY LOW chance of uncovering significant fossil deposits and no mitigation is recommended or needed at this time.

8 STATEMENT OF SIGNIFICANCE

The geological formations in this area, the Ghaap Group (Transvaal Supergroup) and the Vryburg Formation (a sedimentary unit of the Ghaap Group) have not yielded valuable palaeontological finds within the area surround the study area. Further, the study area is overlain by the Quaternary Kalahari Group sands at extensive depth. Therefore, it is unlikely that alternation of the landscape encompassed within the boundaries of Farm Lilyveld 545 pose any major threat on palaeontological resources. Therefore, the study area is of low palaeontological significance and recommendations for development are proposed below.

9 RECOMMENDATIONS

The proposed developments are unlikely to pose a substantial threat to local fossil heritage. However, should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably in situ) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

The specialist involved would require a collection permit from SAHRA. Fossil material must be curated in an approved collection (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.

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Scientific Terrestrial Services

Applying science to the real world

29 Arterial Road West, Oriel, Bedfordview, 2007
Tel 011 616 7893
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admin@sasenvgroup.co.za

Name: Marelie Meintjies
Reviewer: Nelanie Cloete
Date: Tuesday, 04 September 2018
Ref: STS 180053

EXM Advisory Services
Office 1013, Ground Floor Block 1,
Bryanston Gate Office Park,
C/O Main Road & Homestead Avenue,
Bryanston, Johannesburg, 2191
Email: kerry@exm.co.za
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Attention: Mrs K. Fairley

Dear Madam,

DATA CAPTURING AND ANALYSIS OF PROTECTED FLORAL SPECIES IN SUPPORT OF THE PERMIT APPLICATION PROCESS FOR REMOVAL OF PROTECTED SPECIES AS PART OF SITE CLEARANCE FOR THE CONSTRUCTION OF THE DEWATERING PIPELINE AND STORMWATER CUT-OFF CANAL AT SISHEN MINE, KATHU, NORTHERN CAPE PROVINCE

Scientific Terrestrial Services (STS) was appointed by EXM Advisory Services to undertake a field assessment, in order to capture all protected floral species situated within a 50m corridor of the proposed Dewatering Pipeline and Stormwater cut-off canal at the Anglo American Kumba Iron Ore Sishen Mine by means of a Global Positioning System (GPS). Following the field assessment, the data were analysed in order to provide concise and practical data for use during the permit applications. Permit applications will be required to remove these species during site clearance prior to construction of the dewatering pipeline and Stormwater cut-off canal.

The tables below indicate all protected species which were identified and marked, and for which permits needs to be obtained prior to site clearance. Table 1 below indicates all protected trees identified, and which are protected under Section 15 (1) of the National Forests Act, 1998 (Act No. 84 of 1998) (NFA), together with the number of individuals identified, the condition of the species at the time of assessment,

as well as the range in height. Table 2 below are all species identified and marked which are protected under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA).

Table 1: Trees identified which are protected under the NFA, 1998

Species	No of individuals	Height range (m)	Condition
Vachellia erioloba	**Dewatering Pipeline:** 1143 **Stormwater cut-off canal:** 12	0.5m to 8m with an average height of between 2.5m and 4m	Predominantly in good condition with a few considered to be in poor condition as due to cut branches or being burned. Some of the trees, were growing in clumps
Vachellia haematoxylon	**Dewatering Pipeline**: 1	0.8m to 1m	Good
Boscia albitrunca	**Dewatering Pipeline**: 31	0.3m to 2.5m (average height: 1.5m to 2m)	Good

Table 2: Species protected under the NCNCA, 2009

Scientific Name	Common Name	No. of Individuals	Schedule
Lessertia frutescens subsp. *frutescens*	Cancer Bush	**Dewatering Pipeline:** 31	Schedule 1*
Aloe grandidentata	Kleinbotaalwyn	**Stormwater cut-off canal:** Growing in large clumps under and between the shrubs. An estimation would be inaccurate and as such apply to all individuals within the area identified in Figure 5 below. Final numbers should be provided once species have been removed.	Schedule 2
Boscia albitrunca	Shepherd's Tree	**Dewatering Pipeline**: 31	Schedule 2

*Protected species as listed in NCNCA 2009.

Large portions where the dewatering pipeline and Stormwater cut-off canal are to be located were heavily infested with *Senegalia mellifera* (Black Thorn) at the time of the assessment, which rendered movement within these areas difficult. It is therefore possible that some individuals of the species identified above might have been missed, although this number is considered minimal. It is therefore advised that a 10 to 20% factor be implemented for all species when applying for the respective permits.

Figure 1: The protected trees *Vachellia erioloba* (left), *V. haematoxylon* (middle) and *Boscia albitrunca* (right) identified during the field assessment in August 2018.

Figure 2: Species protected under the NCNCA, 2009 identified during the field assessment: *Lessertia frutescens* subsp*. frutescens* (left and middle), and *Aloe grandidentata* (right).

We trust that we have interpreted your requirements correctly. Please do not hesitate to contact us if there are any aspects you would like to discuss further.

Yours Faithfully,

Nelanie Cloete
SACNASP REG.NO: 400503/14

Marelie Meintjies
MSc. Medicinal Plant Science

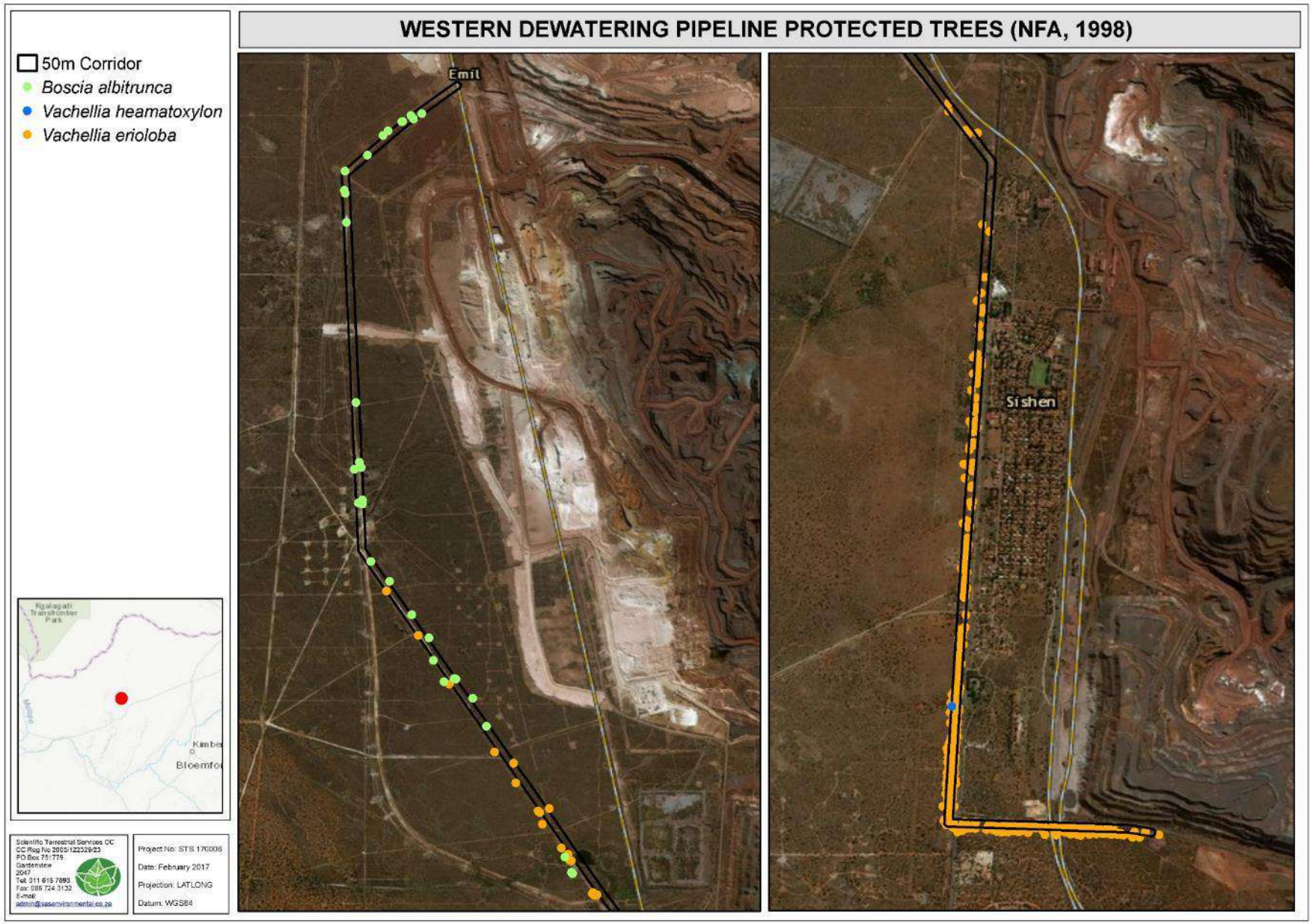

Figure 3: Tree species protected under the NFA (1998) associated with the dewatering pipeline.

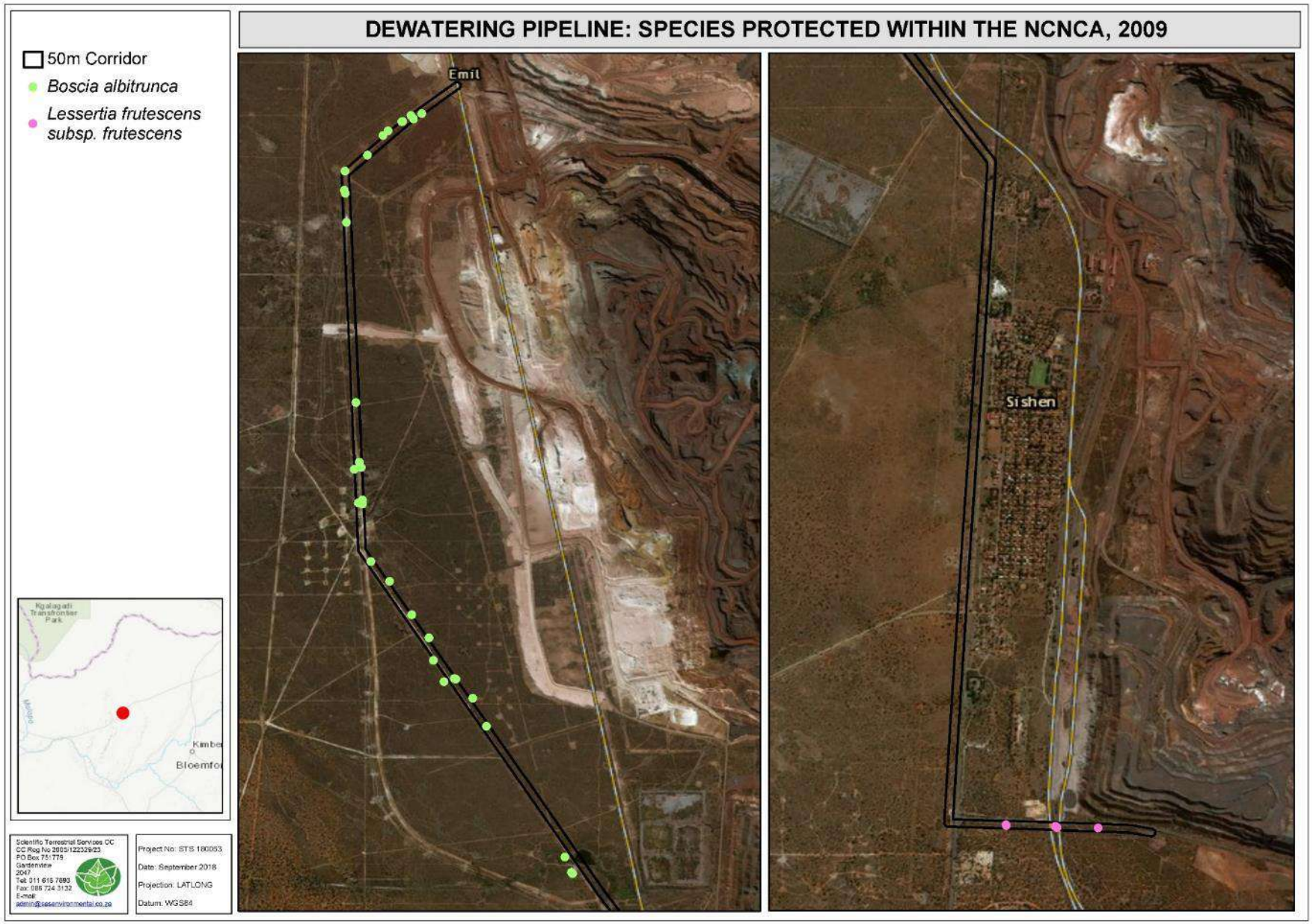

Figure 4: Floral species protected within the NCNCA (2009) associated with the dewatering pipeline.

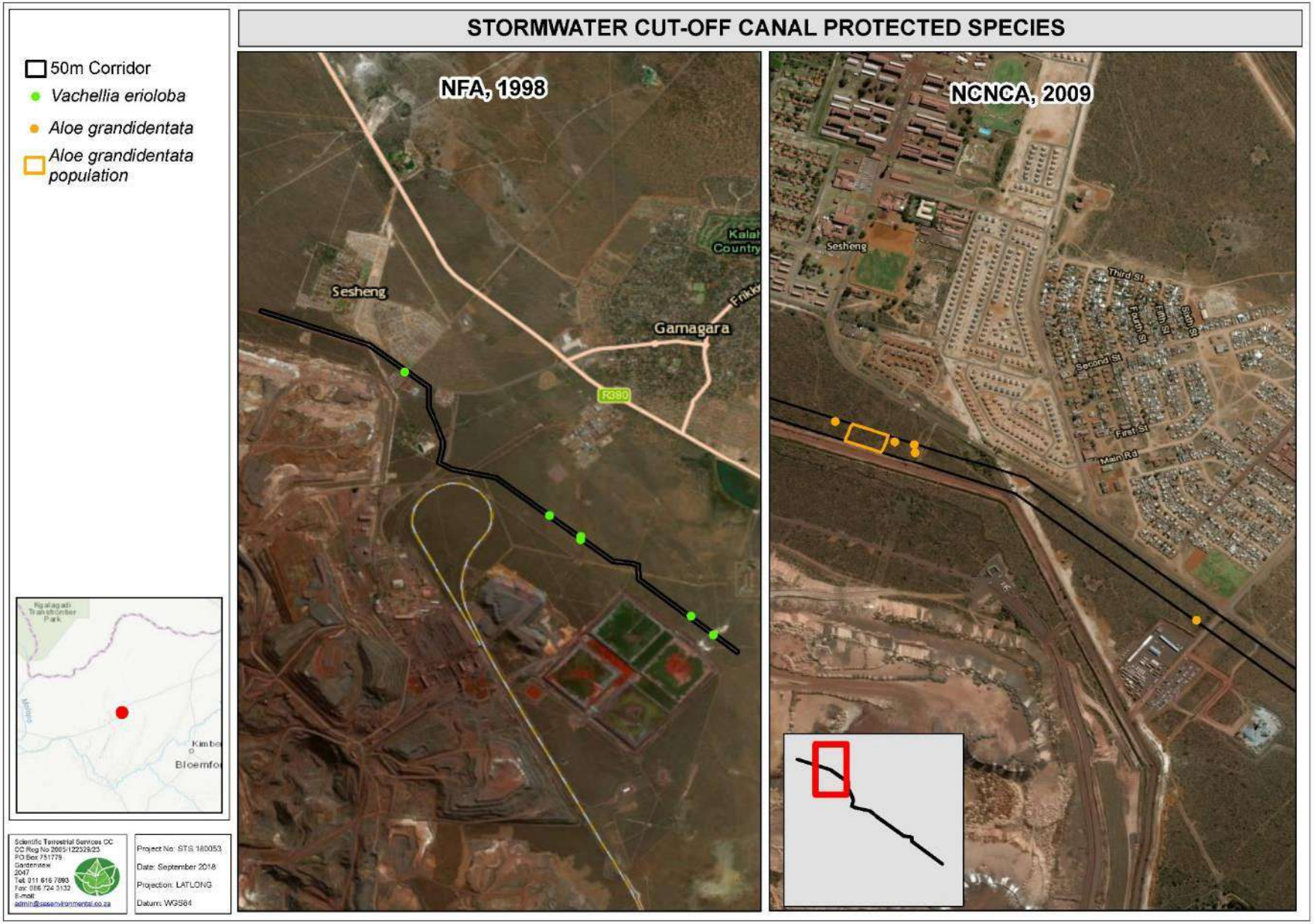

Figure 5: Floral species associated with the stormwater cut-off canal, protected under the NFA, 1998 (left) and the NCNCA, 2009 (right)

EXM Advisory Services

SOLUTIONS | PROGRESS | PARTNERS

Sishen WDIP Financial Provision Assessment, 2018	
Date:	11-Jun-18
Assessor:	Roelof Letter
Reviewer:	Kerry Fairley
Operation	**Total Provision LOM (at Dec 2018)**
Area 1: Borehole Curtain Pipeline	**R53,145.45**
Area 2: Backbone Extension Pipeline	**R168,293.92**
Total (Excl VAT); incl contingency @10%	**R221,439.37**

		Calculation Area				Rehab & Closure Provision 2018			
Ref.	Description	Class	Unit	Quantity	Rates 2018	Final Closure Cost	Annual Rehab Cost	Latent Risk Cost	
Area 1	**Borehole Curtain Pipeline**								
	Demolition of Infrastructure								
1.1	Small dia pipe on surface (<300mm)	5.1	km	1.2	25,127.94	R 30,153.53			Assumed that this is a steel pipeline. Precautionary rate which assumed 20 kg per meter
	Demolition Cost					R 30,153.53	R -	R -	
	Footprint Rehabilitation								
1.14	Rip compacted level areas	13.2	ha	0.48	7,469.20	R 3,585.22			Assuming 80% of the area will require ripping
1.15	Cover prepared areas with growth medium; import material 1km	12.3	m3	450.00	12.04	R 5,418.74			Load from stockpile, haul & Spread. Assume a 150mm topsoil layer is required. 50 % to be covered with growth medium
1.16	Establish indigenous grass (level areas - mechanical); incl supply of material, spreading & cultivation	14.2	ha	0.24	30,427.36	R 7,302.57			Fertilizer and organic matter over the entire disturbed area and seeding of the ameliorated area. 50 % to be covered with growth medium
1.17	Aftercare and Maintenance	14.90	ha	0.18	10,300.00			R 1,854.00	Follow-up inspections and re-seeding of poorly vegetated and/or bare areas; 25% (Allow for three (3x) years' monitoring after rehabilitation)
	Rehabilitation Cost					R 16,306.52	R -	R 1,854.00	
	Demolition and Rehabilitation Cost					R 46,460.04	R -	R 1,854.00	
									R 77,433.41
	Contingency @ 10%							R 4,831.40	
	Area 1 Total; incl 10% contingency							**R 53,145.45**	
Area 2	**Backbone Extension Pipeline**								
	Demolition of Infrastructure								
2.1	Large dia pipe on surface (>300mm)	5.2	km	3.8	25,127.94	R 95,486.17			Steel pipe. Precautionary rate which assumed 70 kg per meter
	Demolition Cost					R 95,486.17	R -	R -	
	Footprint Rehabilitation								
2.3	Rip compacted level areas	13.2	ha	1.52	7,469.20	R 11,353.18			Assuming 80% of the area will require ripping
2.4	Cover prepared areas with growth medium; import material 1km	12.3	m3	1425.00	12.04	R 17,159.33			Load from stockpile, haul & Spread. Assume a 150mm topsoil layer is required. 50 % to be covered with growth medium
2.5	Establish indigenous grass (level areas - mechanical); incl supply of material, spreading & cultivation	14.2	ha	0.76	30,427.36	R 23,124.79			Fertilizer and organic matter over the entire disturbed area and seeding of the ameliorated area. 50 % to be covered with growth medium
2.6	Aftercare and Maintenance	14.90	ha	0.57	10,300.00			R 5,871.00	Follow-up inspections and re-seeding of poorly vegetated and/or bare areas; 25% (Allow for three (3x) years' monitoring after rehabilitation)
	Rehabilitation Cost					R 51,637.30	R -	R 5,871.00	
	Demolition and Rehabilitation Cost					R 147,123.47	R -	R 5,871.00	
									R 77,433.41
	Contingency @ 10%							R 15,299.45	
	Area 2 Total; incl 10% contingency							**R 168,293.92**	