STATE OF CONSERVATION REPORT FOR THE FOSSIL HOMINID SITES OF SOUTH AFRICA WPRLD HERITAGE SITE (THE STERKFONTEIN, SWARTKRANS, KROMDRAAI AND ENVIRONS COMPONENT) (C 915 BIS)

SOUTH AFRICA

BY THE GOVERNMENT OF THE REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF ENVIRONMENTAL AFFAIRS

Report development in partnership with the Management Authority and the Council for Scientific & Industrial Research (CSRI)

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PART I – IDENTIFICATION OF THE PROPERTY

Name of property: Fossil Hominid Sites of South Africa World Heritage Site (The Sterkfontein,

Swartkrans, Kromdraai and Environs component) (C 915 bis)

State Party and Province(s): South Africa, Free State and North West

PART II – STATE OF CONSERVATION

A. Response from the State Party to the World Heritage Committee's Decision, paragraph by paragraph

[Note: this information has to refer to developments over the past year or since the last Decision of the Committee for this property]

1. INTRODUCTION

This report is the State Party of South Africa's response to Decision 37 COM 7.B.44 of the World Heritage Committee that, amongst others, requested the State Party to submit to the World Heritage Centre, by **1 February 2015**, an updated report on the state of conservation of the property and and progress made in putting in place satisfactory systems to mitigate the impacts of the Acid Mine Drainage (AMD) on the property, for examination by the World Heritage Committee at its 39th session in 2015.

2. UPDATE ON THE STATE OF CONSERVATION OF THE PROPERTY.

This state of conservation report informs primarily the situation regarding the mine water impact on the water resources of the property, and the measures taken by various authorities to mitigate this impact. This however, cannot be seen in isolation, and the report therefore covers the full spectrum of water resources monitoring and management relevant to maintaining the outstanding universal value of the property.

The geographical location and geo-environmental characteristics of the property necessitate a range of monitoring efforts targeting precipitation, quality and quantity of surface water, mine water, municipal wastewater, and groundwater. These imperatives work through the cooperation of State authorities at national, provincial and local government level, industry and commercial organisations at a regional level, and private landowners at a local level. Efforts in this regard include the Department of Water Affairs and Sanitation, the mining house SibanyeGold (formerly Gold1) and Nedbank (industry and commerce) and numerous landowners on whose properties monitoring stations (boreholes and springs) are located. The Management Authority of the property has taken responsibility and ownership for drawing the monitoring efforts of these entities into a comprehensive water resources monitoring programme. This programme has produced five biannual water resources status reports since 2012, following completion of a comprehensive water resources situation report compiled over three years commencing in 2009. These circumstances indicate that the water resources of the property have enjoyed focussed attention over the past seven years.

The state of conservation of the Cradle of Humankind(CoH) World Heritage Site remains, for the greater part of the property, in an excellent position. This position remains exempt from the risk posed by acid mine drainage emanating from the West Rand Goldfield (a.k.a. the Western Basin). A small portion of the property, located in the south-western portion, remains at risk from the impact of acid mine drainage and municipal wastewater effluent.

The mine water risk has been largely contained through the implementation of immediate and short-term mine water control and management measures in accordance with recommendations put forward by the Inter-Ministerial Committee on AMD. Uncontrolled mine water discharges following exceptionally wet summer rainfall seasons have, since early-2010, resulted in excursions of poor quality mine water into the environment on two occasions. The first excursion, lasting ~2.5 years, was contained in July 2012. The second excursion, lasting five months, was contained in July 2014. The implementation of the Phase 2 mine water control and management measures currently in progress will further mitigate the threat of acid mine drainage to the receiving water resources environment.

3. PROGRESS MADE IN PUTTING IN PLACE SATISFACTORY SYSTEMS TO MITIGATE THE IMPACTS OF THE AMD ON THE PROPERTY.

3.1 Surface Water Resources

The Department of Water and Sanitation (DWS) is responsible for the management of surface water resources in the region. This function is shared by the Gauteng Province and the North-West Province regional offices of this authority. An Inter-Governmental Task Team (IGTT), chaired by the Director-General of the Department of Water and Sanitation has been established to coordinate water management efforts.

3.2 Mine Water

The State, through its Inter-Ministerial Committee (IMC) on AMD and the Inter-Governmental Task Team (IGTT), has taken responsibility for the management of mine water rising in the Western Basin upstream of the COH property. The MA of the COH is represented on the IGTT.

Initial (Phase 1) interventions have entailed the implementation of immediate measures comprising refurbishment of an existing high density sludge (HDS) mine water treatment plant in the mine area. Commissioned in mid-2012 with a capacity of 24 ML/d, this facility arrested raw mine water discharge to the environment, and produced a neutralised discharge that by late-2012 already manifested an improvement in the downstream aquatic environment. The capacity of the upgraded treatment plant was subsequently increased to 34 ML/d by June 2013, but still remains inadequate to control the volume of decant generated in exceptionally wet summer rainfall seasons. This limitation is addressed by Phase 2 of the Western Basin emergency works which is presently underway, and comprises the following:

- increasing the rate at which mine water is pumped to surface for treatment by constructing a new pump-station allowing for up to 60 ML/d to be abstracted from the flooded mine void; and
- increasing the capacity of the treatment facilities to 50–70 ML/d.

These interventions will successfully intercept decant during the wet season and create sufficient freeboard in the dry season to absorb abnormal recharge, resulting in significant mitigation of the raw mine water threat to the receiving environment.

3.3. Groundwater Resources

The Department of Water and Sanitation (DWS) is responsible for the management of groundwater resources in the region. This function is shared by the Gauteng Province and the North-West Province regional offices of this authority. The IGTT coordinates efforts aimed at ground water management.

3.4. Scientific Research

The water resources environment of the property has attracted substantial interest in the research community for the opportunity it offers to study the impact of mine water on a receiving aquatic environment that includes karst strata. Academic institutions that have recognised this opportunity include the University of the Witwatersrand, the University of Johannesburg and the University of Pretoria.

The CSIR has recently completed a 3-year research project aimed at understanding the impact of acid mine drainage on the receiving surface water resources environment. This study included ecotoxicological and human health considerations, and recorded the temporal impact of mine water discharges of varying quality on the macro-invertebrate populations in the receiving drainage systems. It also included an assessment of leaf spectral properties of *Phragmites australis* impacted by acid mine drainage (Van Deventer and Cho, 2014). A further benefit of the water resources assessment and monitoring activities carried out by the CSIR for and on behalf of the MA, is the generation of data that has shed light on the rate of solutional denudation of the karst landscape, as well as the hydrogeology of Sterkfontein Caves.

The research examples described above pertain only to the hydro-environment, under circumstances where anthropological and palaeo-anthropological research efforts enjoy much wider publicity and attention.

3.5. MONITORING

3.5.1. Introduction and Background

The service rendered by the CSIR to the MA entails the compilation of a water resources monitoring report every six months. These products require the aggregation of data sourced for the peripheral areas from entities such as the mining company SibanyeGold, with data generated for the property by the CSIR in conjunction with the Department of Water and Sanitation (DWS) for the area of common interest, and uniquely for the broader property, and incorporating monitoring data generated by private landowners such as Nedbank. The National Groundwater Archive (NGA) operated and maintained by the DWS serves as repository for the water resources monitoring data.

3.5.2. Precipitation

As mentioned above, the volume of mine water decant generated in exceptionally wet summer rainfall seasons exceeds the current capacity of the mine water treatment plant. Recognition of this relationship renders

precipitation monitoring a key element of the holistic water resources monitoring programme.

The subregion hosts five rainfall gauging stations. Two of these are operated and maintained by SibanyeGold, and generate a daily precipitation record. One of these stations is located at the mine water treatment plant on the continental divide, and the other further north at the point sources of active mine water decant. The DWS operates and maintains three rainfall stations located at Tarlton to the west, on portion 8/2 of the farm Sterkfontein 173IQ to the north of the mine area, and at Sterkfontein Caves. These are cumulative stations that incrementally record precipitation at 15-minute intervals.

The rainfall record reveals the wet 2009/10, 2010/11 and 2013/14 summers which experienced 689, 788 and 799 mm respectively, compared to the long-term mean annual precipitation (MAP) of 710 mm for the central and southern portion of the COH.

Some 52% (396/721 mm) of the 2013/14 summer rainfall at Sterkfontein Caves and the HDS plant (413/799 mm) occurred in February and March 2014. These circumstances explain the resumption of uncontrolled mine water discharge from the mine area in late-February 2014 similar to the situation that prevailed through the 2009/10 and 2010/11 wet seasons. The observed rise in potentiometric levels is therefore also not surprising under circumstances where natural (autogenic) recharge is estimated at 17 ± 5% of MAP across the COH property.

3.5.3. Surface Water Resources

The DWS is responsible for the monitoring of surface water resources in the region. This function is shared by the Gauteng Province and the North-West Province regional offices. It is envisaged that this function will collapse into the responsibility and jurisdiction of the Crocodile (West) and Marico Water Management Area once the establishment of this entity materialises.

3.5.3.1 Quantity

The southern and south-western portions of the property are drained by the Bloubank Spruit system, and the north-western portion by the Skeerpoort River system. These systems drain to the regionally important Hartbeespoort Dam impoundment via their respective main stems, the Crocodile River from the south and the Magalies River from the west. The discharge of the Skeerpoort and Bloubank drainage systems is gauged at the DWS gauging stations A2H034 and A2H049, respectively. Key

indicators of surface water quantity are the instantaneous flow records and monthly discharge associated with the gauging stations.

The flow gauging records reveal long-term median annual discharges of 9.9 and 22.7 Mm3 for the Skeerpoort River and the Bloubank Spruit drainage systems, respectively. These discharges represent 5.2% and 11.9% respectively of the ~190 Mm3 full supply capacity of Hartbeestpoort Dam. These metrics have not changed significantly in the 15 years since inscription of the COH property in 1999.

The long-term median annual discharge of the Skeerpoort River closely approximates the annual discharge of the high-yielding springs that feed this drainage. These circumstances adequately define and quantify the groundwater contribution as baseflow to the perennial discharge from this catchment. The long-term median annual discharge of the Bloubank Spruit system (22.7 Mm3) reflects a slight increase of 3.4 Mm3 over the 19.3 Mm3/a of the pre-2010 period of record. Under circumstances where karst springs in this catchment contribute 19.9 Mm3/a, the increase indicates the influence of greater mine water discharges from the upper reaches of this catchment since 2009.

3.5.3.2. Quality

Surface water quality is monitored at the DWS gauging stations A2H034 (Skeerpoort River) and A2H049 (Bloubank Spruit) on a monthly basis. The Nedbank Leadership and Management Development Centre at the Olwazini Estate in the lower reach of the Bloubank Spruit draws water from this drainage for purification and general domestic use. As a consequence, this facility maintains a weekly record of intake water quality. Together with the A2H049 record, this record provides a reference for the surface water quality impacted by mine water and municipal wastewater that is discharged from the Bloubank Spruit system.

Key indicators of surface water quality are pH, electrical conductivity (EC), sulphate (SO4) and the ratio of sulphate to total dissolved solids (SO4:TDS). The latter serves as a measure of the mine water impact on the quality of water resources under circumstances where this value ranges from ~62% in mine water resources to ~20–30% in impacted surface water resources to <2% in pristine karst groundwater resources.

The quality of surface water discharged by the Skeerpoort River system remains exceptionally good. This is exemplified in the long-term 95%ile EC value of 35 mS/m, and the long-term 95%ile SO4:TDS ratio value of 6%. The Bloubank Spruit system, on the other hand, has experienced poorer quality discharges since the commencement of uncontrolled raw mine water discharge in early-2010. The slightly 'better' pre-2010 long-

term 95%ile EC value of 71 mS/m compared to the subsequent record 95%ile value of 96 mS/m illustrates these circumstances. Similarly, the pre-2010 long-term 95%ile SO4:TDS ratio value of 21% is considerably 'better' than the subsequent record 95%ile value of 47%.

3.5.4. Mine Water

The mining company Sibanye Gold (formerly Gold1) has been tasked by the DWS to monitor mine water in the headwaters of the Bloubank Spruit catchment. The results contribute to the body of information reviewed by the Hydrological Monitoring Committee (HMC) of the Inter-Governmental Task Team on AMD. The MA of the COH is represented on the HMC.

3.5.4.1 Quantity

Mine water discharges from the Western Basin located in the headwaters of the Bloubank Spruit drainage system are monitored daily by SibanyeGold. The discharge comprises a raw mine water (RMW) and a treated/neutralised mine water (TMW) component. The latter is readily quantified as the daily volume of raw mine water processed in and discharged from the high density sludge (HDS) treatment facility. The current capacity of this facility is ~34 ML/d. The raw mine water discharge component is readily quantified at discharges below ~20 ML/d, but loses accuracy as the volume of raw mine water increases above this discharge. These circumstances are influenced mainly by rainfall recharge of the flooded underground mine workings.

Key indicators of mine water discharges are therefore the respective volumes of raw and treated/ neutralised mine water leaving the mine area, and the ratio of these volumes in the mixture that enters the receiving environment.

The long-term median total mine water discharge of ~23 ML/d is bracketed by 5%ile and 95%ile values of ~13.6 and ~42.8 ML/d, respectively. At the 95%ile level, raw mine water amounts to ~31.4 ML/d and treated/neutralised mine water to ~18.1 ML/d.

3.5.4.2 Quality

Mine water quality discharged from the Western Basin is monitored daily by SibanyeGold. Comprising both a raw mine water and treated/neutralised mine water component, the ratio of these two components determines the quality of the aggregate mine water mixture discharged northwards into the environment.

The surface water quality downstream of the mine area is monitored by SibanyeGold at six sites on a weekly basis for the variables/analytes. The last of these sites, station F11S12, is located ~3.5 km upstream of the COH boundary. The quality of the mine water mixture entering the COH property as surface flow is best characterised by the record associated with this station. Key indicators of the mixed mine water quality are pH, electrical conductivity (EC), sulphate (SO4) and the metal analytes iron (Fe) and manganese (Mn). The pattern and trend of these indicators reflects the quality of this allogenic source of surface water entering the COH.

The quality of the mine water mixture recently entering the COH as surface flow under conditions of fully controlled mine water discharge is characterised by a 95%ile EC value of ~395 mS/m, a 5%ile pH value of ~5.9, and 95%ile sulphate, iron and manganese values of 2 770 mg SO4/L, 3 mg Fe/L and 56 mg Mn/L. Excursions from these levels occurred in the periods February 2010 to July 2012 and March to July 2014, the former characterised by a 95%ile EC value of ~440 mS/m, a 5%ile pH value of ~2.8, and 95%ile sulphate, iron and manganese values of 3 220 mg SO4/L, 365 mg Fe/L and 95 mg Mn/L. This excursion was arrested with commissioning of the refurbished mine water treatment facility to gain full control of mine water discharge to the environment. The March to July 2014 excursion has similarly been contained. The excursions are unequivocally associated with increased mine water discharges reflecting exceptional recharge following wetter than average summer rainfall seasons. These discharges exceeded to varying degrees the capacity of the mine water treatment plant, resulting in poorer quality mine water discharges into the environment.

3.5.5. Groundwater Resources

The DWS is the national authority responsible for monitoring the groundwater resources in the region. This responsibility is shared by the MA of the COH property. Whereas the DWS monitoring activity is focused on the area of mine water impact, that of the MA spans the broader expanse of the property. A particular focus of the MA contribution is the numerous high-yielding (>20 L/s) karst springs distributed across the WHS property, some of which are located in remote and pristine areas such as the John Nash Nature Reserve.

3.5.5.1 Quantity

Groundwater quantity monitoring data are represented by water levels measured in 16 dedicated monitoring boreholes and by spring discharge measurements. The measurements range from manually obtained readings to electronic data logger readings captured at a high frequency.

The monitoring data are captured in the NGA operated and maintained by the DWS. Key indicators are the magnitude and vector (rise or fall) of changes in water level and spring discharges. Groundwater levels in the south-western portion of the property are at their highest elevation in the almost 30-year period of record and inform, amongst others, the similar situation in regard to the water level in Sterkfontein Caves.

The rise of nearly 3 m in the cave water level has necessitated rerouting of the tourist path through the caves to successively higher elevations on three occasions since early-2010. More importantly, these circumstances have generated concern for their possible association with a mine water impact.

3.5.5.2 Quality

Groundwater quality monitoring data are represented by chemical analyses of groundwater obtained quarterly from 16 dedicated monitoring boreholes, and from less frequent sampling of private water supply boreholes and springs. The quality at these stations is monitored quarterly. Key indicators of groundwater and springwater quality are pH, electrical conductivity (EC), sulphate (SO4) and total alkalinity (CaCO3).

The quality of the karst groundwater resources of the COH is compromised by a mine water impact in an area of ~12 300 ha in the south-western portion of the property. This impact is manifested as high electrical conductivity values (100–300 mS/m) and sulphate levels (400–2 000 mg/L), although pH values in the range 6.5–7 reflect the neutralising capacity of the dolomitic strata. The groundwater in Sterkfontein Caves reflects a muted impact from mine water, evidenced mainly in a recent (May 2014) sulphate concentration of 126 mg/L and salinity of 69 mS/m, but with a pH value of 7.5.

The Zwartkrans Spring water reveals a more severe impact with a recent (May 2014) sulphate concentration of 304 mg/L, salinity of 105 mS/m and pH of 7.1. The remainder of the property continues to deliver good to excellent quality groundwater, primarily via springs, characterised by salinities <40 mS/m, sulphate levels <10 mg/L and pH values >7.5.

4. SUMMARY OF CONCLUSIONS AND RECOMMENDED ACTIONS

The state of conservation of the Cradle of Humankind World Heritage Site remains, for the greater part of the property, in an excellent position. This position remains exempt from the risk posed by acid mine drainage emanating from the West Rand Goldfield (a.k.a. the Western Basin). A small portion of the property remains at risk from the impact of acid mine drainage.

Systems have been put in place to manage the impacts of AMD on water resources. The water resources of the property have enjoyed focused attention in the last five years leading to their improved overall state.

However, the mine water risk has been largely contained through the implementation of immediate and short-term mine water control and management measures in accordance with recommendations put forward by the Inter-Ministerial Committee on AMD. Uncontrolled mine water discharges following exceptionally wet summer rainfall seasons have, since early-2010, resulted in excursions of poor quality mine water into the environment on two occasions.

The water resources monitoring programme implemented by the Management Authority will be maintained in its current scope and form as it has proved to be effective. The State Party hereby expresses its satisfaction with the overall improved State of Conservation of the property. The State Party submits to the World Heritage Committee that the Outstanding Universal Value of the property is currently not under threat.

B. Other current conservation issues identified by the State Party

There are currently no other state of conservation issues identified by the State Party

C. In conformity with paragraph 172 of the Operational Guidelines, please describe any potential major restorations, alterations and/or new construction(s) within the protected area (core zone and buffer zone and/or corridors) that might be envisaged.

There is currently no major developments planned within the protected area.

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