SOCIO-ECONOMIC IMPACT ASSESSMENT OF THE PROPOSED CESSATION OF PUMPING AND ASSOCIATED CLOSURE OF THE UNDERGROUND WORKINGS OF THE EZULWINI OPERATIONS OF SIBANYE GOLD, GAUTENG PROVINCE

July 2017

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For

Jones & Wagener
Engineering & Environmental Consultants

on behalf of

Sibanye
we are one

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LIST OF ABBREVIATIONS

Abbreviation	Description
ABET	Adult Basic Education Training
ANC	African National Congress
C&M	Care and Maintenance
Comm/Mat/Peri/Nutr	Communicable Diseases with Perinatal, Maternal and Nutritional Conditions
CPP	Central Processing Plant
CV	Curriculum Vitae
DA	Democratic Alliance
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme
FWRDWA	Far West Rand Dolomitic Water Association
GAAP	Gold Alliance Agricultural Project
GWCRA	Greater Westonaria Concerned Residents Association
HDI	Historically Disadvantaged Individual
I/O	Input/Output
ICMM	International Council for Mining and Metals
IDP	Integrated Development Plan
LED	Local Economic Development
LM	Local Municipality
LM	Local Municipality
MOA	Memorandum of Agreement
MPRDA	The Mineral and Petroleum Resources Development Act (Nr 28 of 2002)
NEMA	National Environmental Management Act 107 of 1998
PHC	Primary Health Care
PPP	Public Participation Process
SDF	Spatial Development Framework
SEAT	Social and Economic Assessment Toolbox
SEIA	Social and Economic Impact Assessment
SLP	Social and Labour Plan
SMME	Small, Micro and Medium Enterprises
TSF	Tailings Storage Facilities
VSP	Voluntary Separation Package
WFS	Wonderfonteinspruit
WR	West Rand
WRTRP	West Rand Railings Retreat Project
YYL	Years of Life Lost

EXECUTIVE SUMMARY

The socio-economic impact assessment forms part of the environmental authorisation required for the proposed decommissioning of the underground workings of the Ezulwini Mining Corporation (Pty) Ltd (Ezulwini Operations), a subsidiary of Sibanye Gold Limited, situated in the West Rand District, 45 km southwest of Johannesburg in the Gauteng Province. The decommissioning of Ezulwini mainly refers to the closure of the Cooke 4 underground shaft and only considers the implications of the termination at pumping the water from Cooke 4 shaft and the resultant re-watering of the mine shaft. This study does not include the socio-economic impacts of closure of the operations itself since this was dealt with under the Section 52 process of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA, 2002).

The table below provides a high level quantification and summary of the socio-economic impacts that is predicted due to the decommissioning of the underground workings of Ezulwini Operations (Cooke 4 shaft).

Potential costs	**job losses**	**income losses (Rm per annum)**
Community safety (flooding of adjacent mine, dolomitic instability, seismic activity, illegal mining) – low probability	-	unknown
Loss of income of irrigated farming and suppliers due to available water	310	51.0
Loss in income to workers involved in care and maintenance	155	23.0
Loss of income of workers at golf club and higher golf club membership fees	12	0.8
Damage to public infrastructure (dolomitic instability) – uncertain probability	-	unknown
Potential benefits	**job gains**	**income gains (Rm per annum)**
Lower losses for Sibanye related to pump costs	-	156
Lower ecological (energy related) footprint due to lower energy consumption	-	2
Availability of ground water for borehole extraction (area dependent, starting from 7 years; North of Ezulwini shaft. South of Ezulwini shaft – no change).	-	unknown
Natural state of surface water availability (15 years)	-	unknown

The highest potential social costs related to the decommissioning of Cooke shaft 4 at Ezulwini potentially involve the loss of life due to the flooding of adjacent mines, dolomitic

instability and increased seismic activity. The probability of these events occurring or the loss of life resulting from these activities due to these impacts is however considered low.

Other negative impacts include potential income losses of farmers due to the decreased in levels of surface water mainly in the Kleinwes Rietspruit, loss of income to workers and suppliers currently involved in care and maintenance activities at the shaft as well as losses related to the potential closure of the Waterpan Golf Club. All the cost estimates for the farmers and the golf club are based on the worst case scenario where business activities is projected to close down to the lack of available surface water and therefore represents high end estimates of potential costs.

Potential positive impacts include lower costs and losses for Sibanye, lower energy consumption and a lower ecological footprint as well as the gradual recovery of the environment to its natural (pre-mining) state.

Based on the expectation that the known socio-economic benefits of the project will exceed the known costs, it is recommended that the environmental authorisation for the proposed closure of the underground workings of the Ezulwini Mining Company (Pty) Ltd of Sibanye Gold Limited should be granted. A number of socio-economic mitigation measures are furthermore recommended to further reduce the negative impact of the project. These include:

- Prioritising and preparing affected workers and suppliers for engagement in future Sibanye projects
- Barricade access to shaft entry points
- Continue forum in collaboration with local development agents to discuss potential impacts on the local farming community
- Engage with Golf Club to discuss potential impacts and mitigation measures
- Implement a transparent communication strategy to inform the local community on the monitoring results related to dolomitic instability as well as the potential mitigation measures available

CHECKLIST FOR NEMA EIA REGULATIONS 2014 - Contents of a Specialist Report

Regulation 982 December 2014	Description	Section in the Report
Appendix 6 (1) (a)(i)	Details of the specialist who prepared the report;	Sections 1, 12
Appendix 6 (1) (a)(ii)	Details of the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 12
Appendix 6 (1) (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 2
Appendix 6 (1) (c)	An indication of the scope of, and the purpose for which, the report was prepared	Section 4
Appendix 6 (1) (d)	The date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5, season N/A
Appendix 6 (1) (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 5
Appendix 6 (1) (f)	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	N/A
Appendix 6 (1) (g)	An identification of any areas to be avoided, including buffers;	N/A
Appendix 6 (1) (h)	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;	N/A
Appendix 6 (1) (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6
Appendix 6 (1) (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Sections 8,10
Appendix 6 (1) (k)	Any mitigation measures for inclusion in the EMPr;	Sections 8, 10
Appendix 6 (1) (l)	Any conditions for inclusion in the environmental authorisation;	Section 10
Appendix 6 (1) (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
Appendix 6 (1) (n)(i)	A reasoned opinion as to whether the proposed activity or portions thereof should be authorised;	Section 11
Appendix 6 (1) (n)(ii)	A reasoned opinion 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;	Sections 8, 10
Appendix 6 (1) (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	Sections 5, 13
Appendix 6 (1) (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Part of PPP
Appendix 6 (1) (q)	Any other information requested by the competent authority.	N/A

1. DETAILS OF SPECIALIST

An Kritzinger is the main specialist responsible for the socio-economic assessment. A detailed CV is provided in the section 12 of the report.

An Kritzinger *(Masters Economics)* has been working as a consultant in the economic development field for the past seventeen years. She has extensive experience in the socio-economic assessments of projects in various countries in Southern Africa. Her work has also focussed on applied economic modelling in South Africa, Namibia, Botswana and Mozambique including economic impact analysis, economic cost benefit analysis, social incidence studies and macroeconomic forecast modelling.

2. DECLARATION OF INDEPENDENCE

This report has been prepared as per the requirements of Appendix 6 of Government Notice No. R982 dated 4 December 2014 (Environmental Impact Assessment Regulations) under sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998). I, Anna Sophia Kritzinger declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Environmental Affairs (DEA).

Anna Sophia Kritzinger

Signature of the specialists

Southern Economic Development

Name of group (trading name):

5 November 2016

Date:

3. PROJECT BACKGROUND

Ezulwini Mining Company (Pty) Ltd (Ezulwini Operations) is a subsidiary of Sibanye Gold Limited, one of the major gold mining companies in South Africa that was formed after an unbundling of Gold Fields Mining South Africa (a subsidiary of Goldfields Limited) in 2012. Ezulwini Operations is situated in the West Rand District, 45 km southwest of Johannesburg in the Gauteng Province.

Activities at Ezulwini Operations (firstly known as North Shaft) commenced in 1969 under the control of the former Western Areas Gold Mining Company Limited. The mine was subsequently acquired by the Randfontein Estates Mining Company. Harmony Gold Mining Company Limited acquired Randfontein Estates Mining Company in January 2000. Harmony stopped the shaft's mining operations in July 2001, stopping production activities while still pumping water from the mine shaft. Simmer and Jack Mines Limited acquired the operation from Harmony in 2005 who sold it to First Uranium in 2006, changing the company name to Ezulwini Mining Company (Pty) Ltd. Ezulwini Operations was incorporated into Sibanye Gold in 2014 following a deal in which Sibanye Gold acquired Cooke Underground and Surface Operations from Gold One International Ltd.

Ezulwini Operations comprise the underground mining operations as well as the Ezulwini gold and uranium metallurgical processing operations. The shaft has experienced severe financial losses since it resumed mining operations in December 2006. In September 2014, due to sustained loss-making operations, a Section 189 process (Labour Relations Act, 1995) was initiated which resulted in a Retrenchment Avoidance Measures Agreement being signed with the intention of restoring Ezulwini Operations to an acceptable financial performance. Despite implementation of the retrenchment avoidance measures (and despite the gold price having risen to higher levels used for planning purposes) Ezulwini Opertaions have failed to achieve the financial position that was targeted. This situation can largely be ascribed to the difficult geology related to mining activities, high water pumping costs as well as high re-capitalisation costs of Ezulwini Operations. Sibanye Gold has subsequently entered into a Section 52 (MPRDA, 2002) process and a further Section 189 agreement to close the underground workings of Ezulwini Operations.

This study forms part of the environmental authorisation required for the proposed decommissioning of the underground workings of the Ezulwini Operations of Sibanye Gold Limited. The decommissioning of Ezulwini mainly refers to the closure of the Cooke 4 underground shaft and only considers the implications of the termination at pumping the water from Cooke 4 shaft and the resultant re-watering of the mine shaft. This study does not include the socio-economic impacts of closure of the operations itself since this was dealt with under the Section 52 process of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA, 2002).

4. SCOPE OF THE REPORT

The report focuses on the potential socio-economic impacts of the closure of the underground workings of Ezulwini Mining Company (Pty) Ltd as part of the environmental authorisation process required under the National Environmental Management Act 107 of 1998 and an update to the existing Environmental Management Programme (EMPR). The different sections of the report include:

1. Identification of major socio-economic issues in the local area

2. Establishing the potential local socio-economic impacts and risks due to the mine closure
3. Identification of potential mitigation measures to reduce the socio-economic risks related to the closure of the underground workings of Ezulwini Mining Company (Pty) Ltd

The study is based on the following guidelines:

National Environmental Management Act 107 of 1998 (NEMA) **as amended by Government Notice** ***43 (2014)*** that requires the identification, prediction and evaluation of the impact of specified projects (including mining projects) on the environment, socio-economic conditions and cultural heritage of a local area through all project cycles (including construction, operations and closure) with a view to minimising negative impacts and maximise project benefits. The 'polluter pays principle' also applies namely that the costs of remedying pollution, environmental degradation and consequent health effects must be paid for by those responsible for harming the environment.

The Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA, 2002) amended by the Minerals and Energy Laws Amendment Act 11 of 2005 and Act 49 of 2008 section 54 states that environmental risks and residual environmental impacts must be quantified and managed proactively and that the land is rehabilitated, as far as is practicable, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development.

In the absence of legal guidelines in terms of assessing the socio-economic impacts of mine closures, the assessment will be based on good practice principles as, inter alia, recommended by the International Council for Mining and Metals (ICMM) and Anglo's Social and Economic Assessment Toolbox (SEAT).

5. METHODOLOGY AND SOURCES

The assessment was based on the primary and secondary data sources including:

- Financial information supplied by Sibanye Gold Limited
- Information supplied by Sibanye Gold Limited related to the Section 189 (Labour Relations Act, 1995) and Section 52 (MPRDA, 2002) processes;
- The Environmental Impact Assessment report for Ezulwini Mining Company (Pty) Ltd conducted in 2014;
- Historic information of the proposed 2006 Closure Plan of Shaft 4;
- The Social and Labour Plan (SLP) of Ezulwini Mining Company (Pty) Ltd;
- Environmental Management Programmes of Ezulwini Mining Company (Pty) Ltd prepared for the MPRDA;
- Structured interviews with:
    - Mine management

    - Representatives of adjacent communities
- Integrated Development Plans (IDPs) (including Local Economic Development (LED) plans and Spatial Development Frameworks) relevant to the different local areas;
- Report of the specialist responsible for the ground and surface water report; and
- National and international literature of impacts of related projects.

A detailed reference list is provided in section 13 and the list of persons interviewed in section 14 below.

Apart from the sources listed above, an input-output (I/O) model was used to assess the mine closure's potential impact on employment and economic output in the local area. The I/O analyses is based on i) direct impacts (income and employment created due to employment by the project itself) ii) indirect impacts (backward linkages to local suppliers) and iii) induced impacts due to the overall increase in income levels and increased spending on goods and services. A basic input-output model was used based on information obtained from the Social Accounting Matrix of Gauteng (2006 prices) as well as National Accounts for South Africa.

6. LIMITATIONS AND ASSUMPTIONS

The following assumptions and limitations apply to the socio-economic impact assessment:

- The social and economic impacts in this report were based on the alternative closure scenario where pumping activities are terminated and the shaft is allowed to return to the pre-mining water levels;
- The potential external costs associated with the project was based on information supplied by sub-specialists for the Environmental Impact Assessment of the project as well as information supplied by the developer;
- The economic impact model was based on information supplied by Sibanye Gold Limited; and
- Economic multipliers, average salaries and wages and value added as a percentage of total income were based on provincial and national averages.

7. SOCIO-ECONOMIC BASELINE OF THE LOCAL AREA

7.1. DEFINING THE LOCAL AREA

Ezulwini Operations are located in the Gauteng Province, in the magisterial district of the West Rand District Municipality, in the local municipal area of Westonaria (ward 6) that amalgamated with Randfontein Local Municipality (LM) in 2016 to form Rand West City LM. The mine falls under ward 26 of the newly formed Rand West City LM. The mine is situated approximately 3 km south of the R29 (Johannesburg – Potchefstroom) and 3 km east of the R28 (Randfontein – Vereeniging) and is also serviced by the R41.

The influence zone of the mine in terms of socio-economic impacts covers various areas depending on the type of socio-economic impact considered:

- In terms of direct employment impacts, the main influence zones cover the local communities of Bekkersdal, Simunye, Poortjie, Mohlakeng (Randfontein/Westonaria) Protea Glen and Lenasia where the majority of workers live;
- In terms of the LED programmes of Ezulwini Operations, the impact falls on the larger Westonaria and Randfontein areas as well as regions in the Eastern Cape as other labour sending regions of the mine;
- In terms of suppliers of goods and services to the mine the influence sphere of the mine extends to the larger West Rand district and to the rest of Gauteng and South Africa in terms of the indirect impact on local suppliers;
- In terms of external costs related to potential residual environmental impacts the influence zone covers the area of the underground mining right as well as parties currently receiving water pumped from the underground mining activities. These parties include farming communities in the vicinity of the Ezulwini Operations as well as South Deep mine south west of Ezulwini Operations; and
- In terms of the impact of public income (taxes and royalties) received from the mine, the influence zone includes the wider national area.

Figure 1 below shows the location of Ezulwini Operations in South Africa as well as the immediate influence zone of the mine.

Figure 2 below shows that the areas surrounding the mine have largely been modified by agricultural activities, residential areas and mining activities. Pre-mining land capability within the mining lease area consists mainly of grazing and arable land (Shangoni Management Services, 2015).

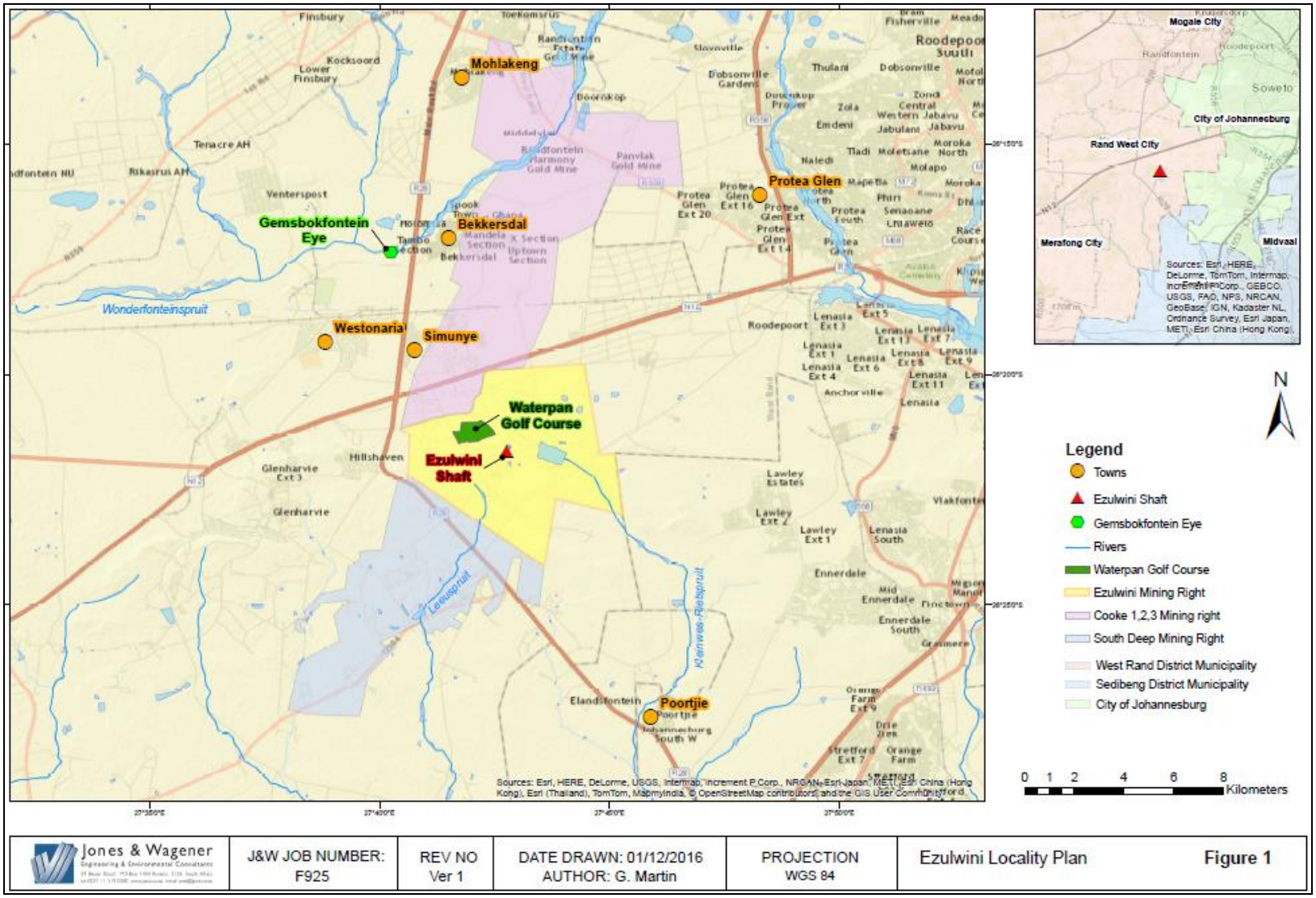


Figure 1: Socio-Economic Sensitive Areas Adjacent to Ezulwini Operations

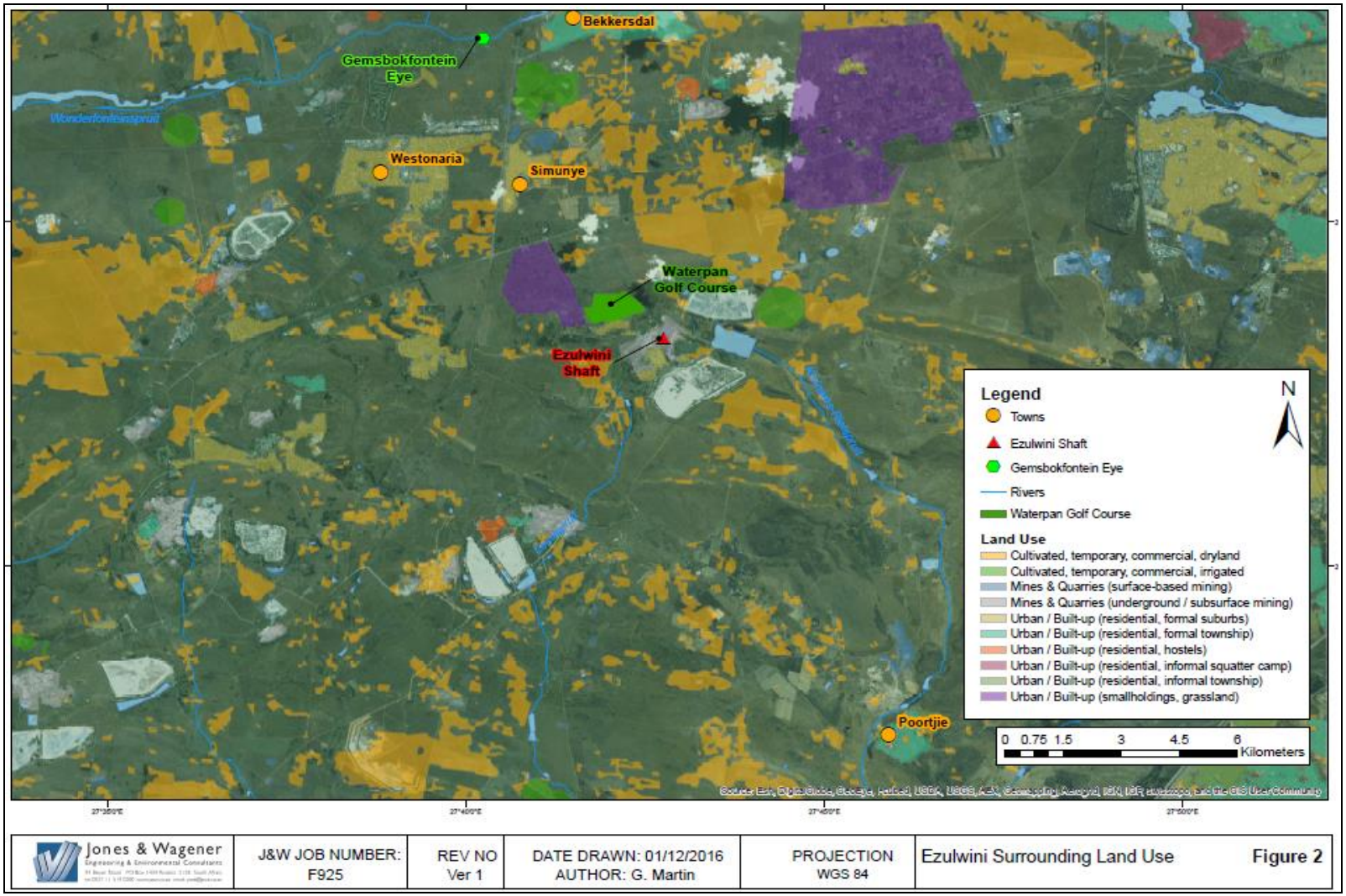


Figure 2: Land-use Patterns Close to Ezulwini Operations

7.2. MAIN SOCIO-ECONOMIC CHARACTERISTICS OF THE LOCAL AREA

The local economy: In 1887, only 1 year after the first gold was discovered in Johannesburg, gold mining had moved 30 km west of Johannesburg to operate the newly-established goldfield known as 'West Rand' (WR). Gold-mining activities in the Wonderfonteinspruit (WFS) or Far West area initiated rapid urbanisation and the formation of many towns such as Randfontein, Westonaria and Carletonville. Gold mining is still the most important source of direct or indirect income for many of these towns and although busy declining is expected to continue playing a large role in the future (Demacon, 2015).

The role of gold production in the South Africa has steeply declined since the 1970's as has fallen by 85% since 1980 due to internal pressures on the gold industry, rising costs the increased costs of mining ever-deeper gold reefs, labour demands and the slow-down in the Chinese economy (Statistics South Africa, 2015). Over the past decade the gold and uranium industry's contribution to the GDP in SA has reduced from 4% in 2001 to 1% in 2014 whereas the sector's employment declined from 230 000 jobs (in 2001 to 120 000 - 200 000 jobs in 2014. The contribution to South African export income remains relatively significant for a single group of commodities although it declined from close to 17% in 2001 to 5% in 2014 (Wesgro, 2016).

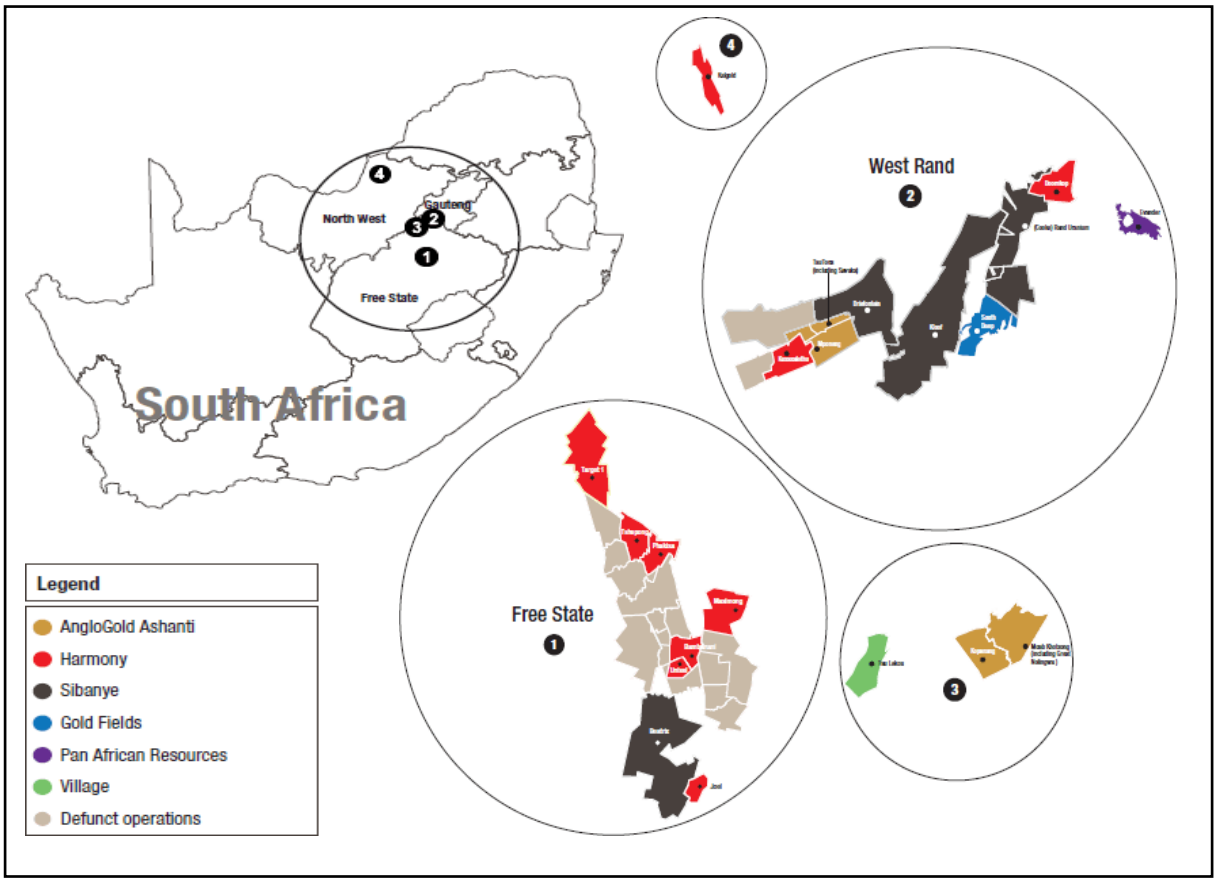
The Witwatersrand Basin remains South Africa's largest gold resource and still dominates the local economies of the West Rand, especially Westonaria where the mine is situated. Mining's contribution towards the local economy of Westonaria declined sharply the past decade from 62% to 53% of output whereas its contribution towards local employment declined from 26% to 10% between 2005 and 2014, (from an estimated 9000 jobs in 2005 down to 3 000- 4000 job opportunities in 2014) Following the declining mining sector, economic output produced by Westonaria declined on average by 2% per annum since 2005 resulting in a steep rise in unemployment levels in Westonaria from 27% in 2010 to 45% in 2014 (compared to the national unemployment rate of 25% in 2014) (Westonaria Local Municipality, 2016 and Rand West City Local Municipality, 2016). Table 1 below illustrates the high incidence of unemployment and poverty in the municipal wards just north of the mining area.

Table 1: Unemployment and poverty in Westonaria wards close to Ezulwini, 2011

Westonaria ward close to Ezulwini	Official unemployment	Expanded unemployment	% of households receiving less than R1 600 per month
Westonaria town (ward 4)	18%	22%	23%
Mining area including Hillshaven (ward 6)	16%	22%	20%
Simunye (wards 7 - 8)	41%	49%	47%
Bekkersdal (wards 9 - 15)	42%	49%	60%

Source: Statistics South Africa, Census 2011 Super Cross Data

Through successive consolidation, most mines in the West Rand District are currently owned by 5 major mining houses including Sibanye Gold, Gold Fields, Harmony Gold, AngloGold Ashanti or Pan African Holdings. The distribution of West Rand gold mines according to ownership is illustrated in Figure 3 below.

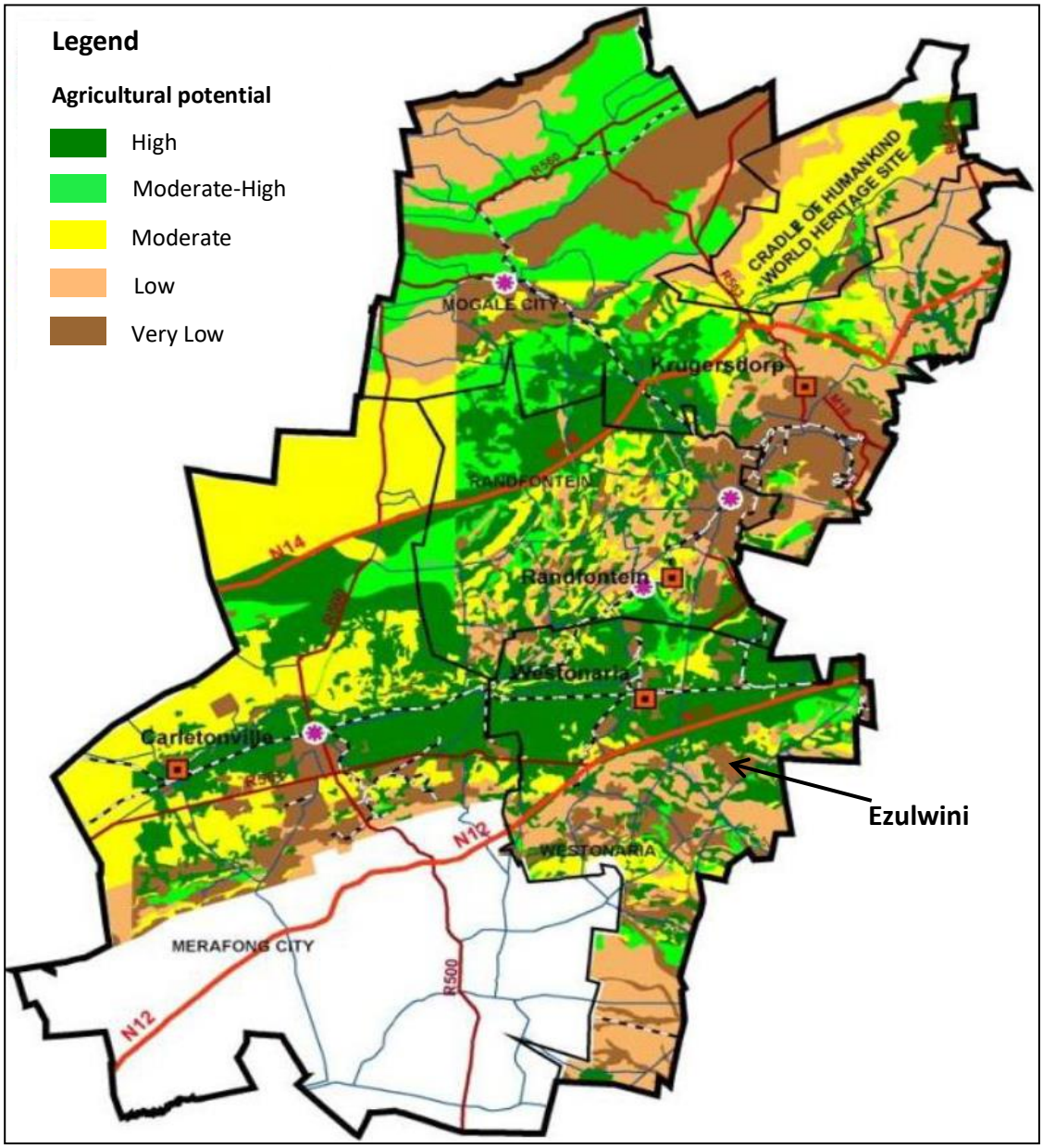


Source: Chamber of Mines, 2016

Figure 3: Ownership of Gold Mines in South Africa

Apart from the mines shown above, Sibanye Gold has initiated the West Rand Tailings Retreatment Project (WRTRP) that is expected to start operations in 2018. The final project involves the construction of a large-scale Central Processing Plant (CPP) for the recovery of gold, uranium and sulphur from the tailings (waste material) from Tailings Storage Facilities (TSFs) at Sibanye mines in the West Rand mainly in the Westonaria and Merafong LMs. The project is expected to make a total contribution (direct and flow-on) to economic output between R500m to R3bn per annum over a project lifespan of 17 years. Employment opportunities (direct and flow-on) from the project is expected to vary from 550 in the initial phase, peaking at close to 4 000 job opportunities over the medium term and close to 2 300 jobs over the long run (Urban Econ, 2015). At the peak of the project, jobs created by the WRTRP will represent almost 2% of current employment opportunities in the West Rand District and 12% of current jobs in Westonaria - a much needed boost to the declining economy of the West Rand. Currently (in 2017) the project was however stalled and its future remains uncertain.

The agricultural sector plays a small role in both the larger West Rand district as well as in Westonaria, i.e. representing 1.7% of the economy of West Rand and 0.7% towards the output of Westonaria. Being more labour intensive, the sector contributes 2.4% towards employment in both the West Rand and Westonaria. As indicated in Figure 4 below, the agricultural potential (dark green) varies across the district with agricultural land downstream of Ezulwini Operations revealing significant patches of high potential amidst areas with low agricultural potential especially further south.



Source: Demacon, 2013

Figure 4: Agricultural Potential of the West Rand District

Farming activities in the areas downstream from Ezulwini Operations (including the Leeuspruit and Kleinwes Rietspruit) includes rain-fed grain crops (mainly maize) and some cattle farming, as well as intensive irrigated vegetables and fruit farming.

In terms of output the manufacturing sector plays a small role in the Westonaria economy (8% of output) but indicates to a relative labour intensive nature (especially compared to the mining sector), contributing to close to 15% of jobs in the area. Manufacturing in the West Rand district is mainly concentrated in the Randfontein and Krugersdorp (Mogale City) municipal areas, contributing to 16% to output in Randfontein. The leading manufacturing industries in the WRDM include food and textiles, non-metallic mineral products, metal products, motor vehicle accessories (Demacon, 2013). In Westonaria the manufacturing sector's linkages to the mining sector appear to be more limited than in Randfontein, with closer linkages suggested with the local agriculture and construction sectors. Being close to the larger Johannesburg area it could be that the West Rand's manufacturing sector also draws from the market potential outside the local area's boundaries.

The tertiary sector (finance, trade and services) plays the dominant role in Westonaria in terms of employment opportunities (55% of employment) although it only produced 25% of output in 2014. This underlies the relative important role of non-mining sectors in job creation in the area. It is interesting to note that the tertiary sector as well as the manufacturing sector experienced positive albeit low growth since 2005 which suggest that while the economic well-being of Westonaria is influenced by the mining sector, it is not entirely reliant on the mining sector (based on information of Westonaria Local Municipality, 2016; Rand West City Local Municipality, 2016; Demacon, 2013).

Demographic trends: Due to the declining mining sector in the West Rand, population growth remained below the national average between 2011 and 2016, i.e. growing at an annual rate of 0.4% compared to the national population growth of 1.5%. Table 2 below clearly illustrates the negative growth rates in the mining dominated areas of Westonaria and Merafong (the Caltonville area south west of the mine) compared to the slightly higher although still low growth rates of Mogale City (the Krugersdorp area) and Randfontein (both north of the mine).

Table 2: Population trends in the West Rand District and Gauteng, 2011 and 2016

Area	Total population	Total Population	average population growth
	2011 (nr)	**2016 (nr)**	**2011-2016 (% p.a.)**
Mogale City	362,422	383,864	1.2%
Randfontein	149,286	156,985	1.0%
Westonaria	111,767	108,902	-0.5%
Merafong	197,520	188,843	-0.9%
Total West Rand	**820,995**	**838,594**	**0.4%**
Gauteng	**12,272,263**	**13,399,725**	**1.8%**

Source: Statistics South Africa (2016a and b)

Despite the negative population growth, male ratios in the West Rand remained at levels higher than the national average, i.e. 52% of the population in the West Rand were males in 2016 (54% in Westonaria) compared to 49% in South Africa on average. In addition, despite low population growth in the West Rand, households grew at a high rate of 4.5% per annum resulting in declining household sizes below national averages from 3.1 people per household in 2011 to 2.5 in 2016. This situation suggests that the negative population growth could largely be ascribed to families moving out of the West Rand while migrants stayed behind (and even increased) in the area (based on Statistics South Africa, 2016 (a)).

It is also interesting to note that while the portion of youth (people between 15-34 years of age) was higher in the West Rand than in South Africa in 2011 (39% compared to 38% nationally), their share in the total population of the West Rand fell below the national average in 2016 (34% compared to 36% nationally) suggesting that is was mostly younger families and possible younger migrants moving out of the area while older migrants stayed behind and could even have moved into the area (based Statistics South Africa, 2016 (a) and (b)).

The more populous areas close to Ezulwini Operations lie north of the mine mainly in Bekkerdal (formal and informal areas) and in the closer Simunye area just across the N12 from the mine. As indicated in Table 3, in 2011 close to 42% of the total population of Westonaria resided in Bekkersdal (a former township of Westonaria where Black migrants had to settle as part of the segregation policy under Apartheid).

The table also suggests that most migrants from outside the area settled in the Bekkersdal area and to a lesser extent in Simunye. The lower male ratios and larger household sizes in Simunye suggest that in-migration into the area has a more stable pattern, i.e. families could have joined the main household bread winner over time.

Table 3: The Population in the Westonaria Wards adjacent to Ezulwini Operations, 2011

Westonaria ward	Population size 2011	% of Westonaria population	Males as % of total population	Average household sizes	% population speaking African languages not traditionally spoken locally
Westonaria town (ward 4)	5,028	4%	51%	3.1	40%
Mining area including Hillshaven (ward 6)	7,791	7%	50%	3.3	34%
Simunye (wards 7.8)	18,354	16%	47%	3.6	52%
Bekkersdal (wards 9-15)	46,686	42%	52%	2.5	72%

Source: Statistics South Africa, Census 2011 SuperCross Data

Service delivery: As indicated in Table 4 below the percentage of households living in informal settlements in the West Rand and Westonaria in particular have declined slightly since 2011 although still far above national averages. In 2016 a housing backlog of close to 18 000 houses were recorded in Westonaria (Stats SA, 2016(a)). As indicated in Table 4 below, most of the informal settlements are located in the Bekkersdal area of Westonaria (in

existence or more than 25 years) as well as Thusanang south west of Ezulwini (Westonaria Municipality, 2016):

Table 4: The Population in the Westonaria Wards adjacent to Ezulwini Operations, 2011

AREA	2011	2016	2011	2016	2011	2016
	living in informal houses	living in informal houses	with no access to piped water	with no access to piped water	no access to flush or chemical toilet	no access to flush or chemical toilet
West Rand	29%	23%	2%	10%	20%	14%
Westonaria	39%	38%	1%	8%	37%	34%
South Africa	14%	13%	13%	38%	38%	32%
Westonaria town (ward 4)	0%	n.a.	0%	n.a.	0%	n.a.
Mining area including Hillshaven (ward 6)	0%	n.a.	0%	n.a.	0%	n.a.
Simunye (wards 7 - 8)	0%	n.a.	0%	n.a.	0%	n.a.
Bekkersdal (wards 9 - 15)	71%	n.a.	0.4%	n.a.	58%	n.a.

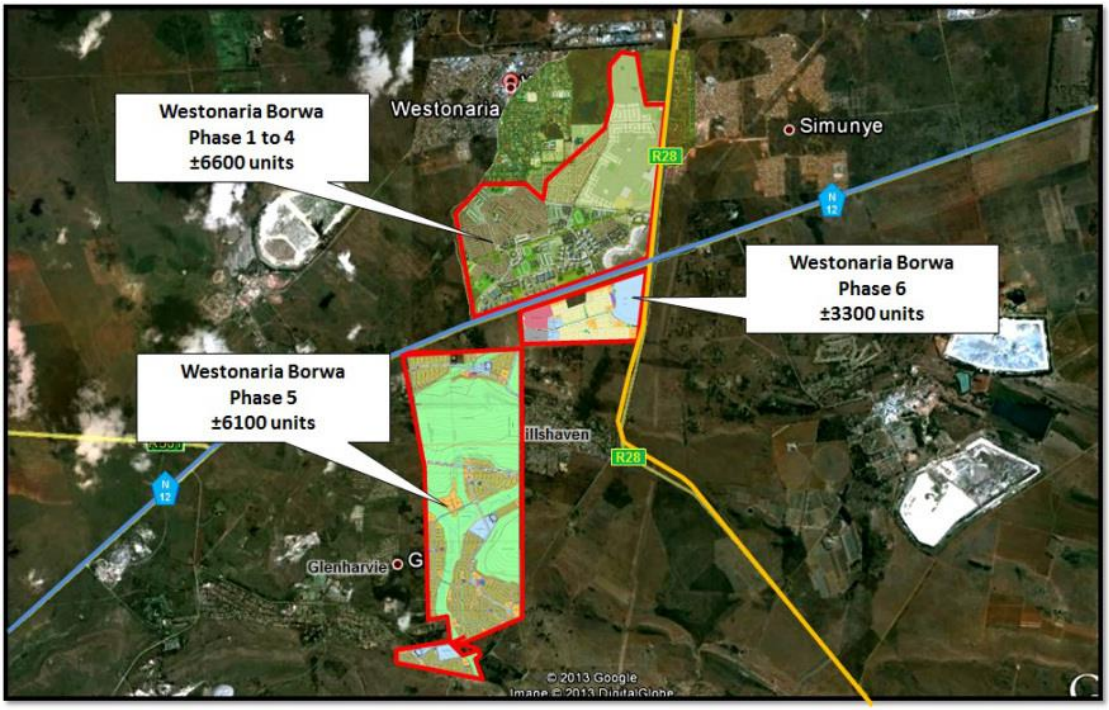
Source: Statistics South Africa, Census 2011 SuperCross Data, Statistics South Africa, Community Survey 2016

It is worth noting that despite the large percentage of households in informal houses, the percentage of households with access to piped water and improved sanitation is higher in the West Rand than the South African average. However, based on the results of the survey conducted by the Gauteng City Region Observatory 34% of households were dissatisfied with government services in Westonaria, the highest percentage in Gauteng. Respondents were most dissatisfied with services related to waste removal followed by sanitation and energy (Westonaria Municipality, 2016).

The municipality collaborated with the Provincial Department of Human Settlement in implementing two major housing projects (Westonaria Municipality, 2015):

- Westonaria Borwa Housing Development in Bekkersdal – 1 500 houses (1st phase); and
- Thusanang Housing Development – 6 300 houses.

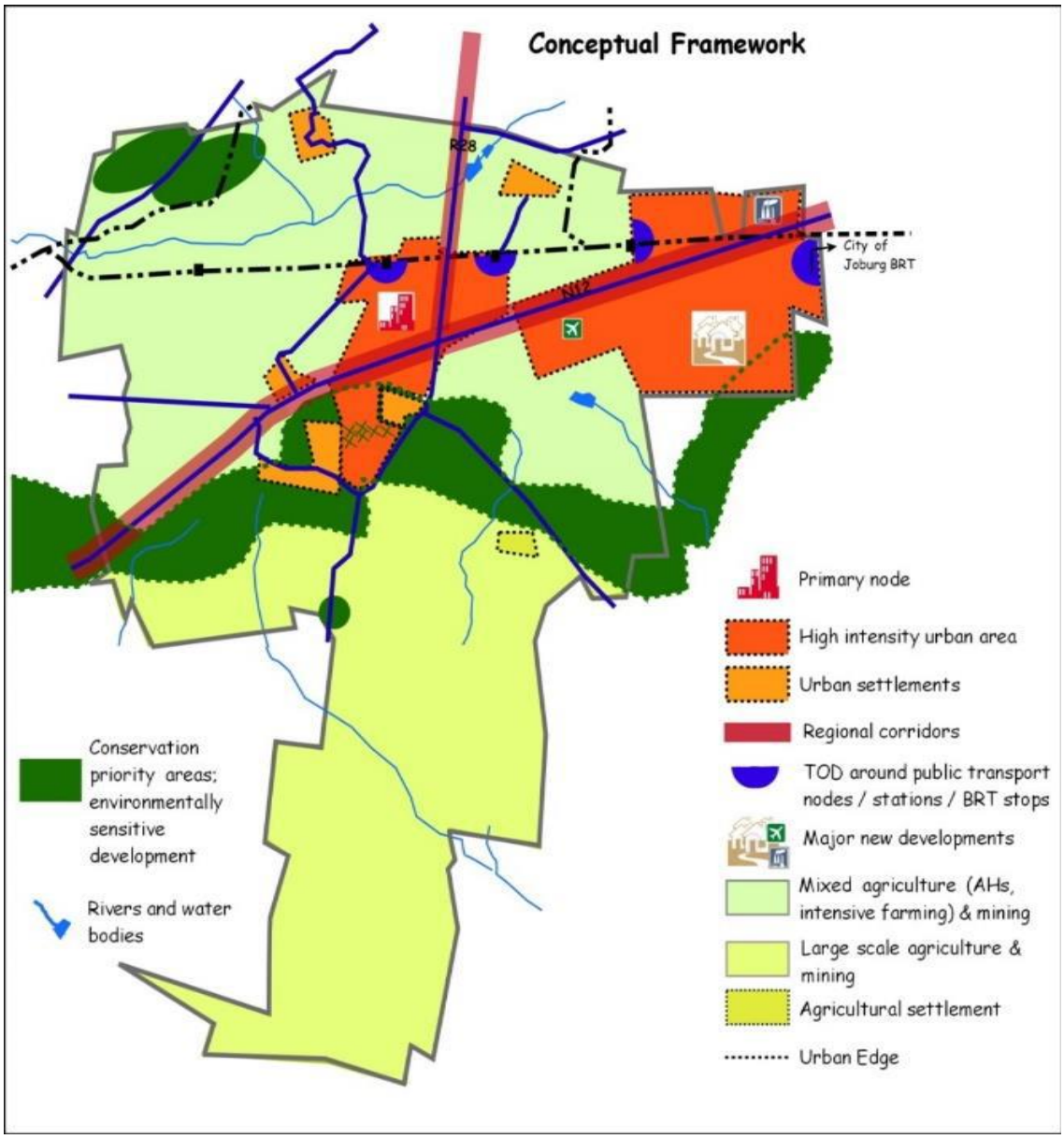
The Westonaria Borwa Mega Project (a joint venture between a private developer, Westonaria Municipality and the Gauteng and National Department of Human Settlements) is a mixed land-use development is planned to eventually comprise of approximately 16 000 housing units and will consists standard fully subsidised housing, bonded / gap market and social housing / rental stock as well as economic, social and other communal facilities. The construction of the first phase started in 2012 and the first houses were handed over in 2015. The project conforms to the compact city design and is planned to provide access to secure social and economic opportunities within walking distance (including schools, a tertiary educational institution, clinics and recreational spaces) consequently reducing travel distances and costs. The location and the phasing of the project are provided in Figure 5 below.



Source: https://westonariaborwa.co.za/project-overview/

Figure 5: The Westonaria Borwa Mega Project

The Westonaria Borwa Mega Project conforms to the Spatial Development Framework (SDF) of the Westonaria Municipality (indicated in Figure 6 below) that foresees urban densification around the Westonaria CBD and to the east of Westonaria CBD to link to developments in the greater Johannesburg area.



Source: Westonaria Municipality, 2016

Figure 6: The Westonaria Spatial Development Framework, 2016

The Westonaria IDP (2016) specifically mentions the following challenges in terms of local municipal service delivery:

- An ageing and dilapidated water infrastructure network;
- Inadequate infrastructure maintenance;
- Refuse removal service delivery challenges in Bekkersdal;
- Illegal dumping;
- Insufficient waste management capacity;
- Insufficient Bulk Services capacity for electricity;
- The culture of non-payment of services and the unavailability of financial resources;
- Vandalism of infrastructure;

- Illegal connections leading to risks (water, electricity); and
- Geo-technological complexities related to the distribution of dolomitic areas that poses risks for construction of infrastructure due to the potential for sinkhole formation

Health: Mining areas are traditionally associated with high HIV/AIDS rates due to in-migration of single family job-seekers into the local area. This trend is also observed in the West Rand where the economies of Merafong and Westonaria are more reliant on mining activities with the highest HIV/AIDS rates in the district in 2013, namely of 12% and 10% respectively compared to Mogale City's and Randfontein's 8%. There are indications that the HIV/AIDS rate is slowly declining in all West Rand municipalities as is the case in South Africa in general. Despite the higher prevalence of migrants in Westonaria, it is interesting to note that the HIV/AIDS rate of the area (at 10%) was slightly below the national rate of 12% in 2013 (Westonaria Municipality, 2016).

Based on the percentage of child headed households in the ward areas adjacent to the mine, it could be that the HIV/AIDS incidence is the highest in Westonaria town and Bekkersdal compared to the mine area and Simunye as indicated in Table 5 below.

Table 5: Child Headed Households, 2011

AREA	% of households with household heads 17 years old and younger (2011)
West Rand	0.3%
Westonaria	0.6%
South Africa	0.6%
Westonaria town (ward 4)	0.6%
Mining area including Hillshaven (ward 6)	0.3%
Simunye (wards 7 - 8)	0.1%
Bekkersdal (wards 9 - 15)	0.6%

Source: Statistics South Africa, Census 2011 SuperCross Data, Statistics South Africa, Community Survey 2016

Selected health indicators (in Table 6 below) confirm the relatively lower incidence of HIV/AIDS in the West Rand than in South Africa in general. HIV/AIDS contributed to 23% of early deaths or Years of Life Lost (YYL) in 2013 compared to 28% nationally. However, the incidence of communicable diseases among the young and early deaths due to injury was higher in the West Rand than is the case nationally.

There are 8 clinics in Westonaria located in Bekkersdal, Simunye, Venterspos, Zuurbekom, Westonaria town, Glenharvie and Bellavista. As indicated in Table 6 below, PHC in the West Rand fares relatively well compared to national averages in terms of general management, maternal, neonatal care and childcare. In terms of HIV/AIDS prevention and reproductive health though (cervical cancer screening, HIV testing coverage and male condom coverage) the performance of the district is below the national average indicating to the need to increase HIV/AIDS awareness campaigns in the area.

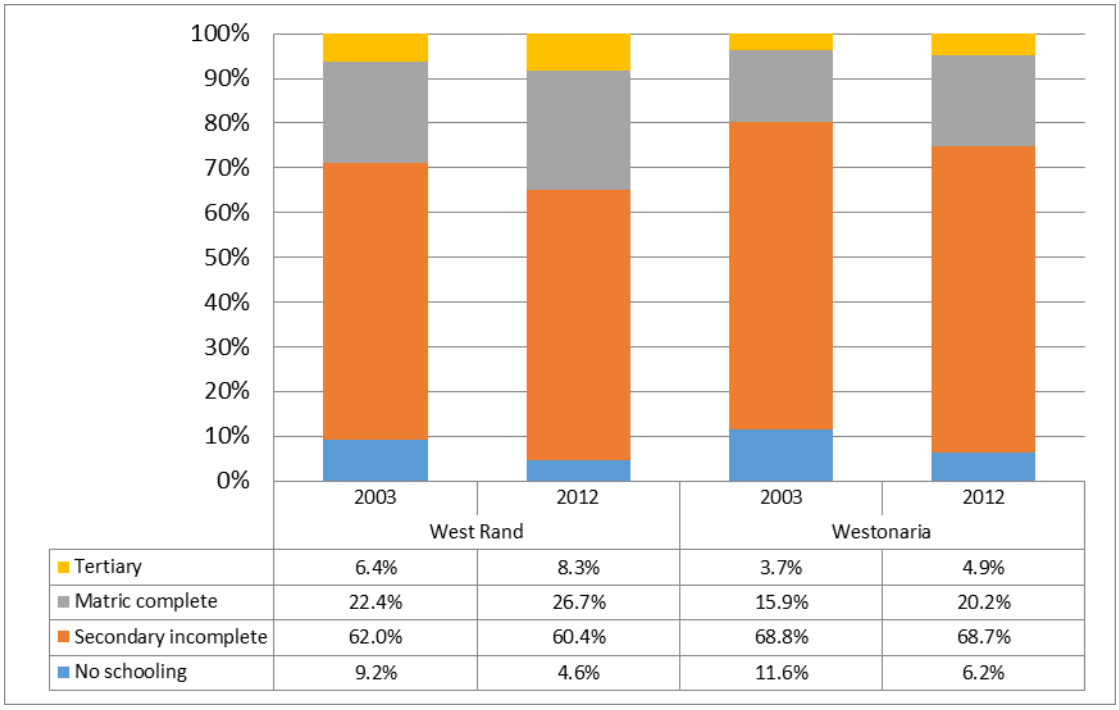
Table 6: Selected Health Indicators, 2013/2014

Indicator	Westonaria	South Africa
Years of life lost (YYL) due to HIV/AIDS (%), 2013	23%	28%
Years of life lost (YYL) due to communicable diseases together with perinatal, maternal and nutritional conditions (Comm/Mat/Peri/Nutr)	24%	22%
Years of life lost (YYL) due to non-communicable diseases	37%	37%
Years of life lost (YYL) due to injury	16%	13%
Primary health Care (PHC) supervisor visit rate (%)	84	74
PHC doctor clinical workload (Clients per doctor per day)	25.3	26.9
PHC nurse clinical workload (Clients per doctor per day)	26.1	29.4
Inpatient early neonatal death rate (per 1 000 live births)	5.4	10.1
Maternal mortality in facility ratio (per 100 000 live births)	128.6	132.5
Grade 1 screening coverage %	52.2	23.2
Immunisation coverage for children under 1 year (%)	111.6	89.8
Cervical cancer screening (%)	41.8	54.5
Male condom distribution coverage (%)	28.5	38.4
HIV testing coverage (%)	25.1	32.1

Source: Massyn et.al. (2015)

Westonaria has no hospitals but are served by private hospitals in Lenasia, Randfontein and Krugersdorp as well as the Chris Hani Baragwanath Hospital (the largest public hospital in South Africa and teaching hospital for the University of Witwatersrand) just east of Soweto and approximately 30km north east from Westonaria CBD. The Westonaria Borwa Mega project furthermore makes provision for a number of health facilities including a community health centre and 16 primary health clinics (in https://westonariaborwa.co.za/project-overview).

Education: The low levels of education of the labour force (indicated in Figure 7 below) is a large contributing factor to the high unemployment rates in Westonaria. The low educational attainment of the labour force could also be ascribed to the relatively high number of migrants still residing in the West Rand and especially in Westonaria. Figure 8 shows that close to 75% of the labour force in Westonaria still did not complete secondary schooling in 2012 (compared to 65% in the West Rand) despite some increase in the percentage of the labour force that completed matric and obtained tertiary qualifications since 2003.



	West Rand 2003	West Rand 2012	Westonaria 2003	Westonaria 2012
Tertiary	6.4%	8.3%	3.7%	4.9%
Matric complete	22.4%	26.7%	15.9%	20.2%
Secondary incomplete	62.0%	60.4%	68.8%	68.7%
No schooling	9.2%	4.6%	11.6%	6.2%

Source: Westonaria Municipality, 2016

Figure 7: Education Attainment, Persons Aged 15+, West Rand District, 2003 & 2012

The lack of post matric educational infrastructure is mentioned as a challenge for the area in the Westonaria IDP (2016). In order to address the challenges, the municipality in collaboration of various stakeholders (especially through the Social and Labour Plans of mines in the area), is implementing a number of educational initiatives, namely:

- Portable Skills Programme, focusing on Electrical Domestic Installer, Basic Carpentry, Basic Building Techniques, Mechanical Maintenance, Welding Cutting Techniques, Broiler Production, Garment Marking, and Home Textiles;
- Mayoral Bursary Scheme assisting the top 10 Matric performers;
- Learnerships in collaboration with LGSETA focusing on engineering, ICT, etc.; and
- Library Outreach Programmes, which include programmes that target Grade 3 to Grade 7 learners.

South Deep Gold Mine is also collaborating with Sibanye's Kloof operation to construct a campus of Westcol, a Technical, Vocational Education and Training (TVET) College in Westonaria. Other partners include the Gauteng Department of Education and Rand West City Local Municipality.

Situated in Westonaria the Sibanye Gold Academy skills workers and community members through vocational training programmes. Some of the programmes offered through the academy include electric domestic installation, welding and cutting techniques, mechanical repairs, carpentry, masonry, plumbing and chicken farming, among others (Matsilele, 2014).

The Westonaria Borwa Mega Project also makes provision a tertiary education facility (in https://westonariaborwa.co.za/project-overview/).

Crime levels: Although lower than in Gauteng, per capita crime rates are higher in Westonaria than in the South Africa on average, i.e. 45 crimes/1000 people recorded in 2015 compared to 41 nationally and 49 in Gauteng**.** Since 2005 the total number of crimes has decreased by 19% in Westonaria compared to a 10% decline nationally (Crime StatsSA, 2016).

Table 7 shows the high prevalence of drug-related crimes in the area, followed by burglary at residential premises, general theft and robbery with aggravating circumstances. While most of the crime categories declined since 2005, burglary at non-residential premises, theft of and out of motor vehicles and drug-related crimes are on the increase in the area.

Table 7: Trends in Major Crimes in Westonaria, 2005 - 2015

Crime category	2005 nr	2015 nr	% of total	Increase
Murder/attempted murder	126	114	2.3%	-9.5%
Sexual offences	218	134	2.7%	-38.5%
Assault with the intent to inflict grievous bodily harm	724	292	6.0%	-59.7%
Common assault	471	390	8.0%	-17.2%
Common robbery	290	109	2.2%	-62.4%
Robbery with aggravating circumstances	430	431	8.8%	0.2%
Malicious damage to property	344	260	5.3%	-24.4%
Burglary at non-residential premises	95	168	3.4%	76.8%
Burglary at residential premises	983	602	12.3%	-38.8%
Theft of motor vehicle and motorcycle	179	144	2.9%	-19.6%
Theft out of or from motor vehicle	139	189	3.9%	36.0%
Drug-related crime	116	760	15.5%	555.2%
All theft not mentioned elsewhere	1 360	681	13.9%	-49.9%

Source: Crime StatsSA, 2016

Local farmers in the vicinity of the mine mentioned a high incidence of stock theft of crops that go unrecorded due to minors being the perpetrators (north of Ezulwini). In areas south of Ezulwini some farmers mentioned the high risk of stock theft due to the proximity to low-income urban areas as a reason why they do not keep livestock on their farms.

Geological instability: The West Rand district is known to be underlain by extensive dolomite rock formations. As soluble carbonated bedrock, the constant exposure of dolomite to rainwater as well as human-related activities, such as ground water extraction, leakage from water pipes and sewerage systems, dissolves the rock over time which may result in sinkholes. The West Rand is the area hardest hit by sinkholes, an issue dating back more than 50 years to gold mines pumping water out of the underground compartments. While roughly

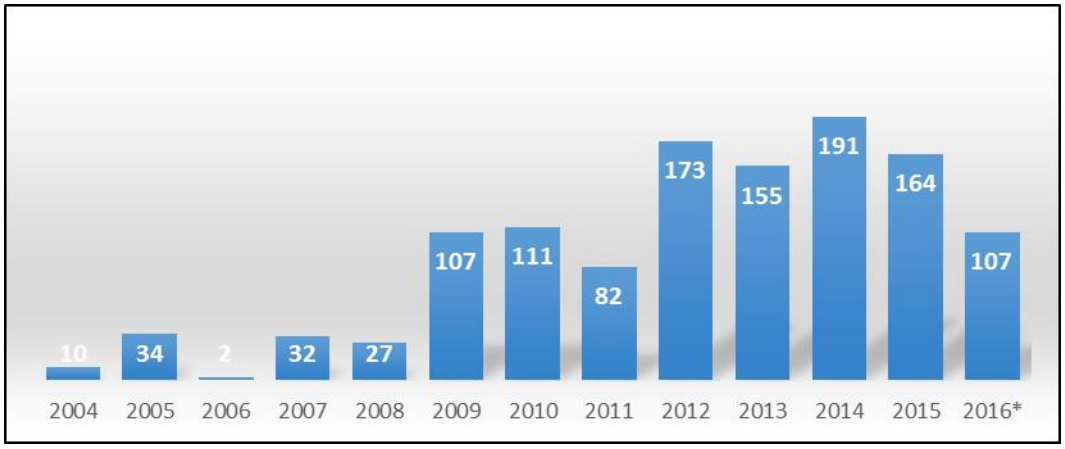
2 500 sinkholes have been identified in South Africa, nearly half occur in the West Rand alone. Initial studies during the late 1980's accounted for approximately 375 sinkholes in this area which have subsequently increased to an estimated 1 100 events 25 years later. In the West Rand sinkholes are mainly associated with the dewatering of underground mining compartments to enable deep level gold mining (Heath and Oosthuizen, 2008).

Through the years, sinkholes had a dramatic impact on the social, economic and infrastructure elements. The most dramatic example is the sinkhole disasters in 1962 when a three-storey crusher plant building was swallowed into a sinkhole on the West Driefontein Mine close to Caltonville, killing 29 people (Ngcobo, 2006). Due to the high risks related to sinkhole formation since the 1950's when mines started the de-watering the Far West Rand area, a specialist geotechnical committee was set up by government which in turn required mining houses to establish a fund to compensate for seismic and sinkhole-related damage caused by the dewatering of mine shafts. Mining companies that operated in the West Rand formed the Far West Rand Dolomitic Water Association (FWRDWA) in 1964. The purpose of the association was to mitigate the impacts of mining's water use with the obligation to purchase buildings and land affected by de-watering. New urban developments in Westonaria like Simunye and the new Borwa mega project are required by law to undergo geotechnical tests to assure that developments occur on safe land. However older townships such as Bekkersdal, Venterspost and parts of Westonaria town were established before these regulations. Most of the cases that were investigated in Westonaria related to property damage due to seismic activity. In later years the situation appeared to have stabilised (Interviews with Westonaria Municipality, November 2016).

Assuming that the geological risks related to dewatering would subside after 40 years, the arrangement of mines' liability for geological instability in the West Rand ended in 1999, and no new amendments have been passed to continue mines' liability for sinkholes. The response to sinkholes is also without a central governing body, as the State Co-ordinating Technical Committee, formed in 1963 to control de-watering, is defunct. There are concerns that the re-watering of the Far West Rand when mines stop pumping will probably reactivate many filled sinkholes (Heath and Oosthuizen, 2008).

Although Simunye and other new urban developments in Westonaria were tested in terms of geological stability, there are also concerns that the geological dynamics related to re-watering might differ from dewatering which could imply a new risk for Simunye and other later developments in Westonaria. There is currently a lot of uncertainly related to the compensation for potential damage that could be caused by dolomitic instability during the re-watering phase when mines in the West Rand increasingly close down. A central compensation fund is not in place and there is no clear identification of who will be responsible for compensation in the case of damages caused by seismic instability or sinkhole formation.

Social unrest: As indicated in Figure 8 below, service delivery protests have shown persistently higher levels in South Africa since 2009. Service delivery protests also began to surface in the Bekkersdal area of Westonaria since the 2009, erupting in violent protests in 2013 when protesters looted foreign owned spaza shops in Bekkersdal during a series of violent service delivery protests (Fakir, 2014).



Source: Municipal IQ

Figure 8: Major Service Delivery Protests by Year (2004 –31st August 2016)

The main trigger for the 2013 protests came from the community's perception of poor governance of a R1.2 billion Urban Renewal Project (a Presidential Lead Project that was designated to Bekkersdal under the Mbeki administration in 2001) with accusations of corruption, malfeasance, maladministration and unaccountability associated with its implementation. Bekkersdal is considered a hot-spot area for social unrest in the Westonaria due to the high prevalence of informal settlements coupled with low service delivery levels (Fakir, 2014).

In 2016 violent protests once again emerged in Westonaria when community members from Bekkersdal and Simunye marched against the municipality to protests against the lack of municipal jobs being made available to locals – the repeat of a similar protest launched in 2011 in the area (Randfontein Herald, 2016).

Due to the declining economy, high levels of unemployment and poverty coupled with lack of local government capacity (discussed below), Westonaria is a high risk area in terms of social protest actions.

Illegal mining: Illegal gold mining is a growing concern in the Johannesburg and West Rand area. An estimated 350 illegal miners (Zama-Zamas) operate in the West Wits area at any one time potentially supporting in the region of 5 000 people. Most Zama-Zamas (literally meaning those willing 'to have a go', 'try your luck' or 'take a chance') work shallow portions of long abandoned mines where they abseil and slide down and up underground tunnels to extract gold. The mining industry estimate that overall there may now be as many as 15 000 Zama-Zamas with deaths numbering at least 65 in 2015, a high death rate

especially compared to 33 fatalities for the estimated 120 000 people employed in South Africa's formal gold mines (Mills, 2016).

The bulk of illegally mined gold is from the Zama-Zamas operating in commercial mines. Sibanye Gold arrests 'between 30 to 40' illegal miners each quarter (Mills, 2016). Sibanye Gold made headlines in 2016 when an illegal miner died after entering a barricaded area during a shift at Cooke 1 mine in Westonaria (ENCA, 2016).

Local government capacity: The Rand West City LM has been established as Category B municipality after the 2016 local government elections. It is an amalgamation of Randfontein LM and Westonaria LM. The ANC won the majority of seats (54%) followed by the DA (28%). As is the case with many Gauteng municipalities the influence of the ANC has also diminished in the Rand West City LM (Electoral Commission South Africa, 2016).

Before the amalgamation, Westonaria municipality received a qualified audit in 2013/14 after it received unqualified audits from 2009/10 to 2012/13. Problem areas that were identified by the auditor general include a lack of action plans, lack of oversight and controls and poor record keeping (Auditor General, 2014). The West Rand District Municipality, Randfontein Municipality and the West Rand Development Agency all deteriorated in their audit outcomes and Westonaria municipality failed to submit financial statements for auditing in 2014/15. The Westonaria municipality faces debt and the Auditor General estimated that approximately R300m of municipal expenditure could specifically be associated with unauthorised, irregular or wasteful expenditure, i.e. 34% of operating expenditure for the financial year 2013/14 (Housing Development Agency, 2014).

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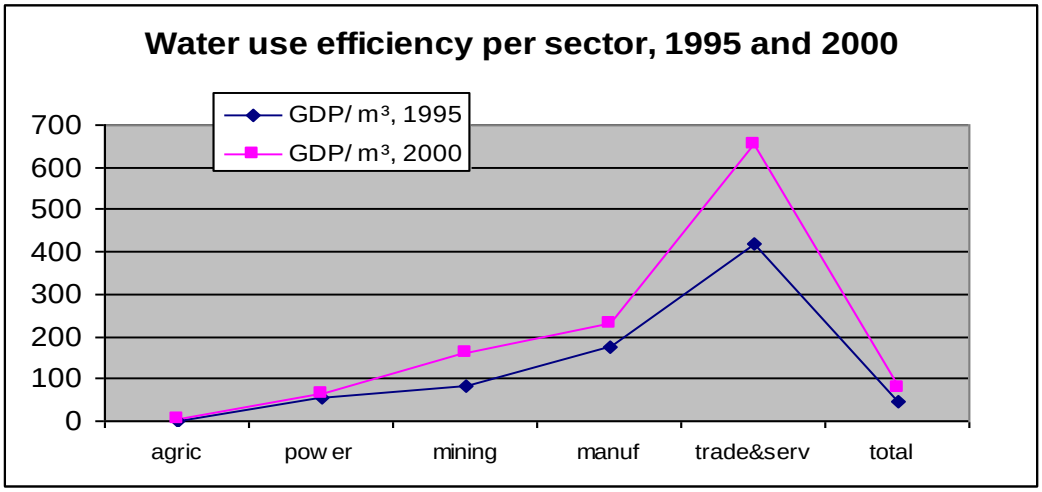
The Westonaria and Rand West Municipal IDPs (2016) both highlight the following challenges:

- Poor financial management;
- Insufficient capacity and resources to implement long term social and economic development and environmental management plans;
- Inadequate infrastructure maintenance and ageing engineering infrastructure
- Insufficient Bulk Services capacity for electricity;
- Limited human resource capacity;
- Inadequate financial resources due to a culture of non-payment of services. Only 90% of all billed revenue has been collected (compared to the benchmark is 95%) resulting in a R 19m cash-flow loss in 2015. The municipality's internally generated revenues have decreased from 88% in 2009 to 84% in 2014 which indicates an increasing dependency on government grants to sustain operations.

Resource use and constraints of the local economy: The high contribution of the mining sector to the Westonaria economy implies relative high energy and water use within the economy. As illustrates in Figure 9 below, the mining sector is relatively water intensive or

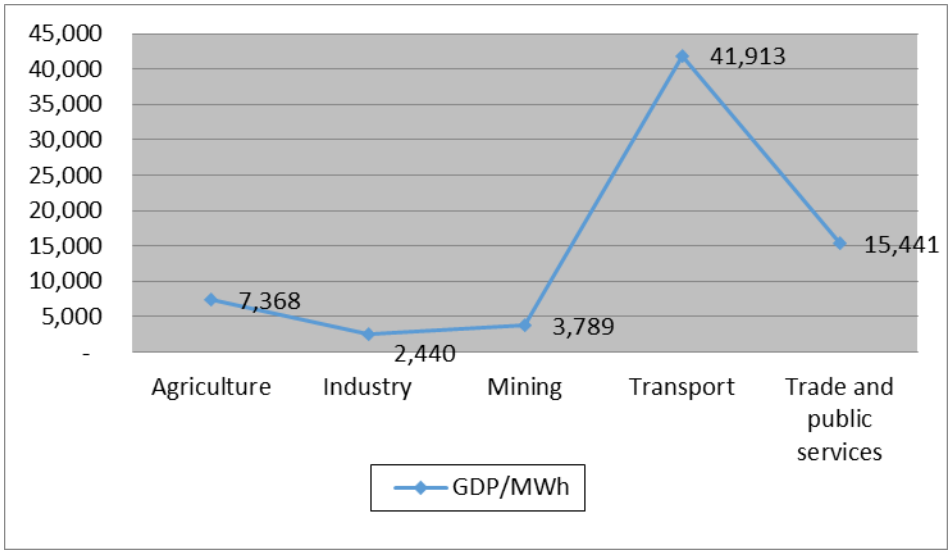
produce a low value of production (GDP) relative to its water use. However, it fares better than the agriculture and energy sectors in terms of water efficiency.



Source: Stats SA: Natural Resource Accounts: Update Water Accounts for South Africa: 2000

Figure 9: Water efficiency per main sector in South Africa

Likewise, the mining sector is relatively energy inefficient, i.e. the production value of the sector is low relative to its energy use – illustrated in Figure 10 below.



Source: Inglesi-Lotz and Blignaut 2011

Figure 10: Energy efficiency per main sector in South Africa, 2006

Community priorities: Integrated Development Plans (IDPs) require public participation and to a large extent reflect the development priorities of the local community in the mine area.

The Rand West City municipality's IDP largely echoes the development priorities for the West Rand District as a whole. The IDP of the West Rand Municipality for the next five years (2016/17 to 2020/21) focuses on development areas aligned to its broader Vision 2016

and Green IQ policies (West Rand District Municipality, 2016). On a district level the objective is to transform the declining mining economy of the West Rand with specific priorities including:

- A holistic approach to environmental concerns involving:
    - recycling, renewable energy and beautification of streets and parks by planting 10 000 indigenous trees;
    - attracting private investors to assist in the growth of green and sustainable industries (e.g. renewable power generation and recycling);
    - promoting a low-carbon built environment that address the problem of dispersed and fragmented city centres and urban sprawl, the lack of public transport, mixed land-use to ensure the high intensity of land use;
    - investigating and promoting new and unique developments on dolomitic land that do not require large structure such as extreme sporting facilities (e.g. 4x4 and off-road sporting facility, etc.);
    - managing and addressing mining-related environmental impacts including the source of funding and the development of measures to address various issues such as water pollution, air quality, mining dumps, waste and tailings.
- Improved informal settlement management;
- The reduction of poverty and unemployment with a focus on:
    - the green economy (above), mining, tourism, transport and agricultural sectors
    - SMME development with a focus on local procurement strategies (public and private sector);
    - Adequate education and training facilities;
- Social development with a focus on efficient health care, facilities promoting safety and security, developing sports, recreation, arts and culture facilities.

In March 2016, the Greater Westonaria Concerned Residents Association (GWCRA) expressed their priorities and concerns more directly through a memo of demands submitted to the mining houses within the jurisdiction of the municipality, Sibanye Gold and Gold Fields. The concerns in the memorandum include:

- High levels of radiation in the West Rand that makes rehabilitated land unsuitable for agriculture;
- Sinkholes causing damage to properties;
- The proliferation of informal settlements, communicable diseases and crime and the failure of the mining industry to mitigate effects of housing backlogs;
- High levels of unemployment among the youth;
- The devaluation of property values;
- The lack of openness and transparency in the mining houses' communication with the local community;

- The need for plans to mitigate against socio-economic impacts and environmental degradation caused by mining houses as well as the need to make reparations to affected communities.

8. POTENTIAL SOCIO-ECONOMIC IMPACTS AND RECOMMENDED MANAGEMENT MEASURES

8.1. BACKGROUND

Following the Section 189 process that was initiated in 2016, stakeholders agreed to the closure of the underground workings at Ezulwini with the last day of operation of the underground workings on 30 September 2016. Production at the mine stopped and current activities mainly focus on water management and the continued pumping of water from the underground shaft. Sibanye is applying for Environmental Authorisation and the required approvals for the closure of the underground workings of the Ezulwini Operations and consequent termination of groundwater pumping by the end of 2017. The Ezulwini mine currently pumps 68 Mℓ/day of extraneous groundwater from its underground mine workings after obtaining a permit in 1986 to dewater the GWGC in order to allow mining activity to take place. Cessation of mining and the termination of pumping of the groundwater will result in the mine workings re-watering and groundwater levels in the dewatered GWGC returning to normal levels over time. The groundwater modelling indicate that re-watering of the mine workings will occur in approximately 1 year and that the dolomite aquifer will recharge in approximately 7 years.

As was mentioned above, the impacts below only refer to impacts due to the decommissioning and re-watering of Cooke shaft 4 and not to the closure of mining activities.

8.2. DIRECT IMPACT ON EMPLOYMENT AND INCOME

Employment impact: In total 155 employees (excluding contractors) are involved in aftercare activities and the reclamation project until the end of 2017 and will be negatively affected by the proposed decommissioning of Ezulwini.

In the high case of all workers currently involved in aftercare and reclamation being unemployed over the long term it will have a very small impact on the estimated 20 000 people already unemployed people in Westonaria; representing less than 4% of current mining jobs in Westonaria and only 0.2% of employment in the formal sector of Rand West City municipality.

Sibanye Gold Limited furthermore committed to offering a portable skills programmes through its SLP in partnership with accredited service providers for 32 of its own employees per year between 2014 and 2016 to prepare workers for alternative skills in case of retrenchments and to become self-reliant or pursue other career opportunities within mining

and other sectors of the South African economy (Sibanye Gold, 2014). Workers had the options to follow a variety of programmes (e.g. electrical domestic installer, welding and cutting skills, mechanical skills, chicken farming, garment making) or alternatively to opt for a R 5000 cash pay-out to sponsor a program of their choice.

The main characteristics of the 155 workers that face potential unemployment over the long term reveal that the incidence on female and unskilled workers will be relatively high, namely 24% and 72% respectively. No information is available related to the age profile of workers potentially facing long term unemployment, however judged by the total labour force age composition of Ezulwini Operations, the portion of youth (34 years and younger) facing long term unemployment could be in the region of 39% or even higher.

Income impact: The potential loss in labour remuneration relates to a high case scenario where to the 155 workers are permanently unemployed after decommissioning of the shaft. The total wage bill for these workers was budgeted at R23.4m for 2017, i.e. close to an average R2m per month.

While salaries and wages will be lost, the decommissioning of the shaft will also substantially reduce the losses made by Ezulwini. Electricity costs related to the pumping of underground water from the shaft is about R13m per month or about R 156m per month. Therefore the complete cessation of pumping of underground water from the shaft would have the highest impact in mitigating losses made by Ezulwini Operations.

Proposed management measure: Consideration should be given to prioritise and prepare the 155 workers that could face unemployment over the long term for work on new Sibanye projects (e.g. the West Rand Tailings Retreatment Project (WRTRP) if it continues) where possible.

8.3. IMPACTS ON SOCIAL SAFETY

The main concern related to the decommissioning of the mine is illegal mining activities. The risk of illegal mining activity is however substantially lower if the mine working area is re-watered (anticipated to be completed within a year after water pumping stops). However, within the first year, increasing water levels could increase the risk of fatalities if illegal mining activities persisted.

Proposed management measures:

- Barricade the entry to the mine shaft through appropriate security measures;
- Continued and intensified access control against and monitoring of illegal mining activities especially for the first year or until the underground mine workings have been re-watered; and
- Communicate the fact that the mine workings at Ezulwini will be re-watered, highlighting the risks related to illegal mining and the inaccessibility of the reserves. Communication

channels that would reach Zama-Zamas should be used, e.g., local radio stations and newspapers.

8.4. ENVIRONMENTAL COSTS

8.4.1. IMPACT RELATED TO WATER AVAILABILITY

The termination of the underground workings and the cessation of pumping water from underground (approximately 68 Mℓ/day) will result in the water level in the mine workings and adjacent dolomitic compartment recovering over time. This in turn will result in mine water to flow from Gemsbokfontein Eye to the north of Ezulwini, on the banks of the Wonderfonteinspruit (WFS) in approximately 7 years. The flow rate of WFS is expected to return to its pre-mining/natural flow rate, gradually increasing from 4 Mℓ/day to 13 Mℓ/day in 13 years. However, since 55 Mℓ/day is currently released into the Kleinwes Rietspruit via the Peter Wright Dam the cessation of pumping will have a very high impact on the quantity of surface water in the Kleinwes Rietspruit.

South Deep mine south of Ezulwini has an agreement with Sibanye Gold to draw 5 Mℓ/ day from Leeuspruit for surface mine workings. However since 2013 the release of water into Leeuspruit with some ad hoc releases to South Deep in 2016 that lasted for a few months only. Only one farmer on Leeuspruit is currently provided with water from Ezulwini through a pipeline.

The two sub-groups of water users which were identified that might be adversely affected economically due to the reduction of water flow in both these rivers include:

- Farmers on the Kleinwes Rietspruit and Leeuspruit that currently make use of the water for irrigation purposes;
- The Waterpan Golf Club just north of Ezulwini that is currently provided with water through a pipeline from Ezulwini.

Waters users along Leeuspruit and Kleinwes Rietspruit that could potentially be affected are identified in Figure 11 and Table 9 below.

Please note that although water users along the Leeuspruit were identified and consulted with, the Leeuspruit has not received water from Ezulwini since 2013 (with the exception of some water that was discharged via pipeline for Bambanani Fruits and, in 2016, some water which was discharged for South Deep, under the understanding that they would take all the water that was pumped by Ezulwini into the Leeuspruit). Therefore, the water users along the Leeuspruit will not be affected further by the cessation of pumping at Ezulwini.

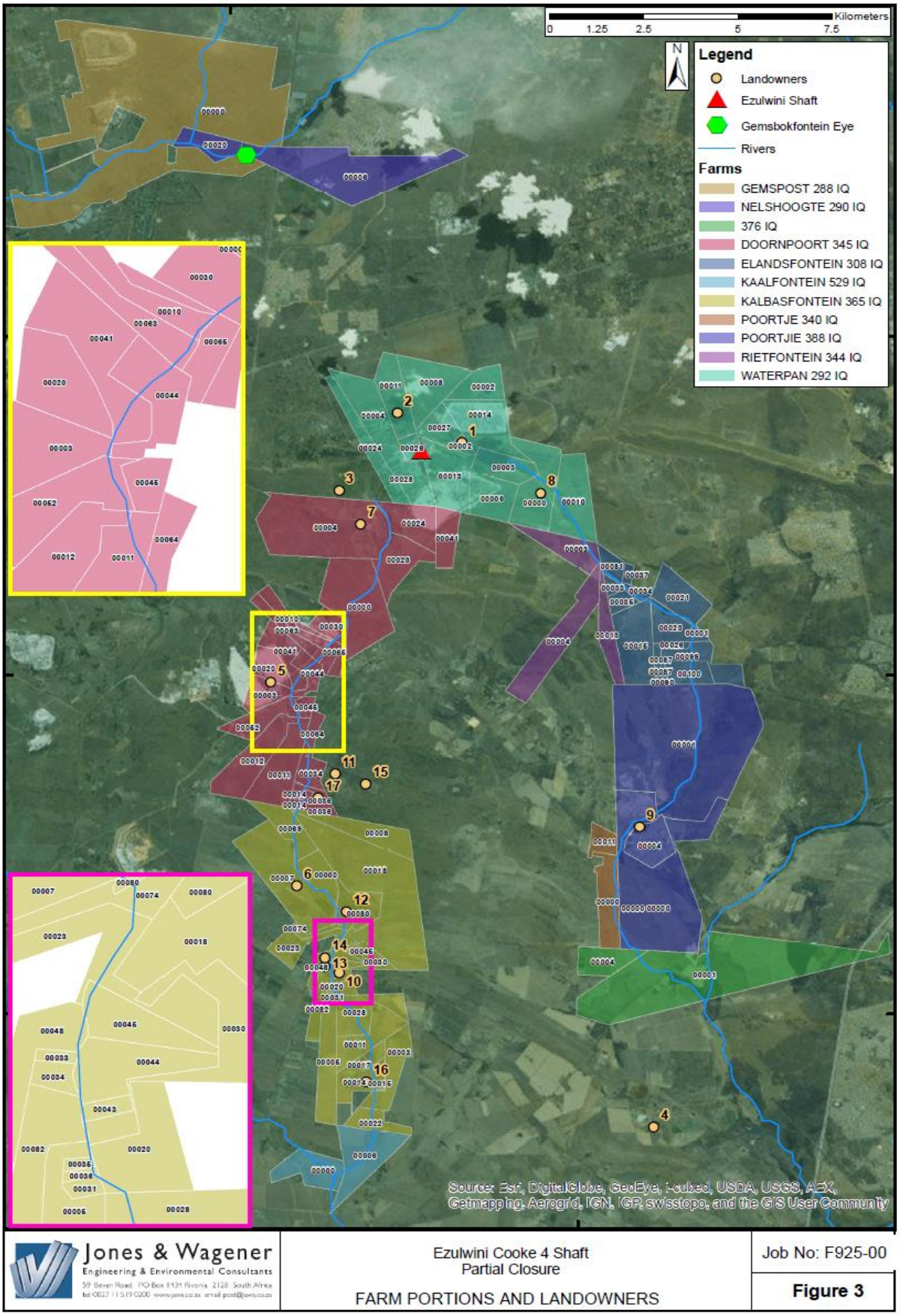


Figure 11: Potentially Affected Water-Users along Leeuspruit and Kleinwes Rietspruit

Table 9: List of identified water users along Leeuspruit and Kleinwes Rietspruit

Nr on map	Farmer	Section	Crop/Livestock	Water use	Potential costs
1	Arrie van Schalkwyk	Waterpan2	Maize	Irrigate from Kleinwes Rietspruit river	High
2	Herman Bouwer	Waterpan 11	Maize	Rain-fed but planning for irrigation from Kleinwes Rietspruit river	High
3	Servigraph	Waterpan 23	Vegetables and grains	Irrigate from Leeuspruit river, commercial and community (GAAP project)	Low
4	Lucky farms	Klopperskraal , pivots south of poortjie	Vegetables	Irrigate from Kleinwes Rietspruit river	High
5	South Deep	Doornpoort, 0,3, 10, 20, 30, 41, 44,45, 52,63	Mining	5Mℓ /day on a regular basis from Leeuspruit before 2013	Low
6	Afrigrow/Servigraph	Kalbasfontien7	Vegetables and grains	Irrigate from Leeuspruit river, commercial and community (GAAP project)	Low
7	Bosele Fruit and Vegetables	Doornpoort 4	Fruit and vegetables	Irrigate from water provided through Ezulwini pipeline (pipe current not in use and needs repairing)	High
8	Rudi Burger	Waterpan 0	Cattle and maize	Irrigated grazing, rain-fed maize	Medium
9	Poortjie community		Subsistence farming	Rain-fed crops with limited irrigation from Kleinwes Rietspruit river	Low/Medium
10	Coetzee Badenhorst	Kalbasfontein 30, 31, 43-45, 74, 20	Unknown	Unknown	Low
11	Izak van Wyk	Doornpoort 33	Maize	Use boreholes	Low
12	Sarel Cilliers (tenant)	Kalbasfontein 33	Unknown	Use boreholes	Low
13	Orion Dagbreek nursery	Kalbasfontein 80	Fruit trees	Use boreholes	Low
14	Goldfields	Kalbasfontein 48, 33	Unknown	Farmers sold out	Low
15	Jenny Jansen van Niewehuizen	Doornpoort 31	Unknown	Unknown	Low
16	B du Plessis	Kalbasfontein 14	Unknown	Unknown	Low
17	Daniel Krieg	Doornpoort 36	Unknown	Unknown	Low

As indicated in Table 9 above, two social projects (numbers 3 and 6) are located on the Leeuspruit. The Gold Alliance Agricultural Project (GAAP) is a programme resulting from an alliance between Sibanye Gold and Gold Fields to implement community based development programmes in Westonaria. The project has 100 beneficiaries who are currently seasonal workers who receive a monthly stipend of R2 200 per month, i.e. receiving in total an annual income of R2 640 000. As is the case with the Aredirisaneng project, the objective of the GAAP project is to develop half of the beneficiaries under an Outgrowers Scheme. However since 2013 Sibanye released no additional water to Leeuspruit and therefore neither one of these projects are expected to be effected.

Based on interviews with potentially affected farmers, 5 farmers could potentially be negatively affected by lower water availability. Assuming the highest possible negative impact of a total income loss for these farmers due to the restricted availability of water for irrigation purposes, total income in the local agricultural sector could decline with R 25m per annum (R8m to low income groups) with 175 permanent jobs and 190 seasonal jobs (mainly unskilled) lost.

The impact on the agricultural sector of Westonaria is expected to be medium, potentially affecting 270 full time equivalent jobs in a local agricultural sector that is estimated to employ only between 2 000 – 3 000 people in Westonaria (old municipal boundaries). Flow-on job opportunities from these agricultural projects links to local suppliers and the induced impact could result in another 40 jobs in the local economy. The income loss due to flow-on impacts could be in the region of an additional R 26m.

The current high levels of uranium in the Kleinwes Rietspruit and Leeuspruit are a key concern in terms of surface water quality. According to the surface water report related to this EIA, at the discharge locations the average uranium concentration exceeds that of the Water User License (WUL) limit by between 70 and 80 µg/ℓ. This situation begs the question whether the use of water from these rivers with augmented water from pumped water from the mine are suitable for farming purposes, especially vegetable and fruit farming.

The surface water report also states that, if water levels drop due to the cessation of pumping at the mine, water quality with respect to E.coli may furthermore deteriorate in both rivers in areas further downstream where water from urban areas is being discharged into the stream due to the significantly reduced dilution from the water.

A positive impact of the re-watering process at Ezulwini is that, in time (approximately 7 years) groundwater will become accessible to farmers again. This could specifically have a positive impact on areas north of the shaft that claims dry boreholes or finding water only a great depths and at huge expenses.

In summary, the closure of Ezulwini will result in the return of surface and groundwater water levels closer to its natural state (7 years are predicted by the specialist reports). It should be mentioned that, while individual water users could have had individual agreements with Ezulwini, users still had to obtain the legal water rights to draw surface water from the 'artificially' augmented rivers during the operational phase of the mine.

It would be uneconomical to maintain an unnatural environmental situation at large expense to subsidise activities of lower commercial value downstream. Ezulwini however has an obligation towards water users that could have experienced a decline in ground water levels during mining operation and who subsequently have been provided with water from Ezulwini

via pipeline, to compensate for groundwater losses. This situation could potentially refer to farming activities north of the shaft.

The Waterpan Golf Club (see Figure 1 above) just north of Ezulwini also makes extensive use of pumped underground mine water from Ezulwini to irrigate the green areas on the golf course. No use is made of boreholes. According to interviews with the golf course management, the cessation of water supply to the golf course would result in the golf club closing down. Allegedly boreholes to the north of the shafts are dry and do not provide an alternative water supply. The Golf Club area is on Sibanye Gold's property and currently has 138 members. No profit is made from the golf club but all membership fees are ploughed back into the maintenance of the course, i.e. some R 166 000 per year being spent locally on chemicals, fertilisers and transport. About 12 people are employed by the Golf Club including 6 unskilled workers – all from outside the local area. The total income loss to workers involved at the Golf Club could be in the region of R 500 000 per year. Due to the relatively low membership fees of the Waterpan Golf Club, club members (many from the Randfontein and Krugersdorp areas) will have to pay much higher fees to become members of other clubs if the Waterpan Golf Club were to close down. The additional costs for membership at more expensive clubs could be in the region of R 250 000 per year (based on interviews with Waterpan Golf Club management).

Proposed management measures:

- It is recommended that Sibanye Gold continues to participate in the existing forums that was established in collaboration with the Rand West City LM and West Rand District Municipality that includes all farmers in close vicinity of the mine, especially those that could experience potential high impacts from the cessation of pumping at Ezulwini shaft
- Set up discussions with the Waterpan Golf Club to minimise potential job losses related to water availability and water quality in a feasible way.
- Sibanye should play an active part in water management forums to resolve water quality issues in the local area
- A clear and transparent communication strategy needs to be followed to keep potentially affected parties well-informed throughout the closure process.

8.4.2. IMPACTS ON CONNECTED MINES

Ezulwini, South Deep and Cooke 3 mines are linked at depth by pillar and open shafts (between Cooke 3 and Ezulwini) and plugged shafts and pillar (between South Deep and Ezulwini) and the re-watering of this aquifer potentially poses a threat to the two remaining operating mines. Potential flooding of both mines (via various flow pathways) could lead to loss of life, increased water pumping costs and potential closure of the mines resulting in very high income and employment losses.

Furthermore, seismic activity due to re-watering could cause ground falls, which could pose a high safety risk for workers in the adjacent mines. It is uncertain whether re-watering in

Ezulwini will increase seismic activity and rock falls in SD. However, it is understood that rock falls due to seismic activity is an ever-present risk in underground mining activities and that all mines have risk management strategies in place to act on the risk including under-roof safety nets to capture falling rocks. Even if risk management strategies are in place, accidental death could still result. The potential for seismic activity related to re-watering in Ezulwini to increase the already high risk profile related to seismic activity in SD is considered a low probability even though the event is uncertain.

The groundwater report that forms part of the EIA of this project considered seepage to adjacent mines as a medium risk before mitigation and a low risk after mitigation measures that include:

- Mapping and identification of potential water conduits (faults, dykes);
- Grouting conduits and rock formation in the vicinity of plugs; and
- Controlled re-watering to monitor and assess possible leakage.

Proposed management measure:

- As per the groundwater and seismic impact assessment specialist reports
- Support South Deep in the evaluation of their risk management strategies related to water inflows, seismic activity and rock falls due to the rewatering of Ezulwini.

8.4.3. IMPACTS RELATED TO DOLOMITIC INSTABILITY

According to the groundwater specialist report, the re-watering of the mine and the subsequent recovery of the dolomite aquifer is likely to cause an increase in seismicity in the area. The re-watering process could also have a possible influence on ground stability and sinkhole formation.

The economic impact of dolomitic instability (involving sinkhole formation or seismic activity) will depend on the type of infrastructure that is affected and the type of damage caused and is impossible to predict at this stage. Apart from the actual damage costs caused by dolomitic instability, it furthermore will erode investor confidence in the region with negative implications for investment in new infrastructure in the local area.

The groundwater report found that the potential for renewed sinkhole activity in the Gemsbokfontein West Sub-compartment could be less severe than previously predicted. The finding is based on the following:

- People were removed from high risk areas prior to dewatering commencing in the mid 1980's;
- Relatively few events having occurred over this large area and long period of time (30 years) due to *dewatering. E*vents due to *re-watering* should be significantly less, though a few events could be expected;

- The rate of water rise will be relatively quick, resulting in a brief period of possible renewed movement (lasting 2 years) before the original baseline conditions are restored. A stable state is predicted within 7 to 15 years;
- As this area consists largely of open space (91%), any possible events should have limited consequences. However, the report mentions that particular attention will have to be paid to major transport routes (N12, R28 roads), railway, gas and power lines; and
- The major residential area of Simunye is situated in an area thought unlikely to be affected by re-watering related sinkholes.

The ground water report rated the unmitigated risk for dolomitic instability as medium in areas where clusters of sinkholes historically occurred. The groundwater report recommends that a Dolomite Risk Management Strategy, as per SANS 1936 (2012) Part 4, be established with an updated hazard zonation and a detailed dolomitic risk management monitoring program.

Proposed management measure:

- As per the groundwater and seismic impact assessment specialist reports;
- A communication strategy needs to be formulated by Sibanye to convey the nature of the risks and the risk management monitoring programme related to dolomitic instability due to the closure of the mine. Information specifically needs to be communicated on a regular basis to the West Rand District Municipality and Rand West City LM, including officials dealing with local economic development, housing projects and investment promotion in the local area.

8.4.4. IMPACTS ON LOCAL ENERGY AND WATER USE

Section 7.2 above, the mining sector is energy and water intensive. The proposed closure of the underground workings at Ezulwini will therefore have a positive impact due to lower water consumption and the reduction of negative externalities (greenhouse gas emissions and water consumption) related to the (coal-based) electricity use of mining activities:

In 2015 the power consumption of Ezulwini shaft alone was 222 mkWh. In South Africa external costs related to coal-based power (costs related to the greenhouse effect and acid mine drainage at source) is estimated to be 0.78c per kWh (2015 prices) (Edkins et.al., 2010) meaning that the annual external costs from power consumption of Ezulwini shaft could be in the region of R 2m per year.

In terms of water use the Ezulwini shaft alone consumed on average 40Ml of water per month obtained from Rand Water over a 10-month period from October 2015 to July 2016 for mostly domestic use. If the shaft is closed it may result in lower water consumption from Ezulwini shaft operations itself. However approximately 224Ml of pumped underground water from the mine shaft is currently used for industrial processes at Ezulwini that will have to be replaced with Rand Water. Therefore, while the closure implies overall lower

consumption level of underground and surface water, it will also result in a shift towards larger consumption of water supplied by Rand Water.

Proposed management measure:

- Ensure water consumption is accurately monitored and ensure that pipe bursts and leaks are repaired timeously.

9. IMPACT ASSESSMENT METHODOLOGY

In order to ensure uniformity, a standard impact assessment methodology was 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 will be used to describe the 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 in Table 17.

Table 10: 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.

Significance Assessment

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, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 11 below.

Table 11: 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	NO IMPACT	There is no impact at all – not even a very low impact on a party or system.

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 19.

Table 12: Description of the 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 impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5km from the proposed corridor / site.
2	Study Area	The impact will affect a corridor not exceeding the boundary of the corridor / site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the corridor / site.

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 scale is rated according to criteria set out in Table 20.

Table13: 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 the 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.
5	Permanent	The environmental impact will be permanent.

Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in Table 21 below.

Table 14: 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

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 22. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 15: 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.

RATING	DESCRIPTION
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.

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.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in Table 23.

Table 16: Example of Rating Scale

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria 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 Table 24.

Table 17: Impact Classes

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

10. Impact Assessment rating

Activity	Impact	Proposed Mitigation Measures	Post-Activity Impact			Cumulative Impact			Post-Mitigatory Impact		
			Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating
Decommission	Direct job and income losses for former employees	Prioritise affected workers for future employment at new Sibanye projects	Significance	1	2.1	Significance			Significance	1	1.6
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	4		Degree of Probability			Degree of Probability	3	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Probable	
Decommission	Lower losses for Sibanye Gold	None – assume complete cessation of pumping underground water from Ezulwini	Significance	3	3.3	Significance			Significance	3	3.3
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	5		Degree of Probability			Degree of Probability	5	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Probable	
			Impact Extent	5		Impact Extent			Impact Extent	5	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	3		Degree of Probability			Degree of Probability	3	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Probable	
Decommission	Impacts on community safety	Barricade access to shaft entry points	Significance	5	2.4	Significance			Significance	5	1.2
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	1		Duration Scale			Duration Scale	1	
			Degree of Probability	4		Degree of Probability			Degree of Probability	2	
			Degree of Certainty	Possible		Degree of Certainty			Degree of Certainty	Possible	

Activity	Impact	Proposed Mitigation Measures	Post-Activity Impact			Cumulative Impact			Post-Mitigatory Impact		
			Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating
Decommission	Direct income losses for adjacent farmers due to water availability	Continue participating in an inclusive forum for potentially affected farmers. Assist farmers where ground water levels decreased during operations and they are not able to obtain water from the pipeline anymore until the groundwater levels have recovered.	Significance	3	2.7	Significance			Significance	3	2.7
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	4		Degree of Probability			Degree of Probability	4	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Possible	
Decommission	Direct loss of income for workers in the agricultural sector	Continue participating in an inclusive forum for potentially affected farmers. Assist farmers where ground water levels decreased during operations and they are not able to obtain water from the pipeline anymore until the groundwater levels have recovered.	Significance	3	2.7	Significance			Significance	3	2.7
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	4		Degree of Probability			Degree of Probability	4	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Possible	
Decommission	Income loss for workers at Waterpan Golf Club	Find a feasibility resolution through interaction with the respective parties that could ensure the continuation of the activities of the Golf Club	Significance	1	1.6	Significance			Significance	1	1.2
			Impact Extent	3		Impact Extent			Impact Extent	1	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	3		Degree of Probability			Degree of Probability	3	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Possible	
Decommission	Higher club membership costs for Waterpan Club	Find a feasibility resolution through interaction with the respective parties that	Significance	1	1.6	Significance			Significance	1	1.2
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	4		Duration Scale			Duration Scale	4	

Activity	Impact	Proposed Mitigation Measures	Post-Activity Impact			Cumulative Impact			Post-Mitigatory Impact		
			Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating	Ranking Criteria	Scores	Impact Rating
	members	could ensure the continuation of the activities of the Golf Club	Degree of Probability	3		Degree of Probability			Degree of Probability	3	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Possible	
Decommission	Potential flooding of adjacent mines	As per groundwater and seismic impact specialist's reports	Significance	5	1.7	Significance			Significance	5	0.9
			Impact Extent	3		Impact Extent			Impact Extent	3	
			Duration Scale	5		Duration Scale			Duration Scale	5	
			Degree of Probability	2		Degree of Probability			Degree of Probability	1	
			Degree of Certainty	Unsure		Degree of Certainty			Degree of Certainty	Unsure	
Decommission	Risks related to dolomitic instability	• Transparent communication strategy to inform local community • As per groundwater and seismic impact specialist's reports	Significance	5	2.2	Significance	5	2.4	Significance	4	2.0
			Impact Extent	3		Impact Extent	4		Impact Extent	3	
			Duration Scale	3		Duration Scale	3		Duration Scale	3	
			Degree of Probability	3		Degree of Probability	3		Degree of Probability	3	
			Degree of Certainty	Unsure		Degree of Certainty	Unsure		Degree of Certainty	Unsure	
Decommission	Lower external costs due to reduced electricity consumption	Ensure water consumption is accurately monitored and ensure that pipe bursts and leaks are repaired timeously	Significance	1	2.0	Significance			Significance	1	2.0
			Impact Extent	5		Impact Extent			Impact Extent	5	
			Duration Scale	4		Duration Scale			Duration Scale	4	
			Degree of Probability	3		Degree of Probability			Degree of Probability	3	
			Degree of Certainty	Probable		Degree of Certainty			Degree of Certainty	Probable	

11. CONCLUSION

The highest potential social costs related to the decommissioning of Cooke shaft 4 at Ezulwini potentially involve the loss of life due to the flooding of adjacent mines, dolomitic instability and increased seismic activity. The probability of these events occurring or the loss of life resulting from these activities due to these impacts is however considered low.

Other negative impacts include potential income losses of farmers due to the decreased in levels of surface water mainly in the Kleinwes Rietspruit, loss of income to workers and suppliers currently involved in care and maintenance activities at the shaft as well as losses related to the potential closure of the Watepan Golf Club. All the cost estimates for the farmers and the golf club are based on the worst case scenario where business activities is projected to close down to the lack of available surface water and therefore represents high end estimates of potential costs.

Potential positive impacts include lower costs and losses for Sibanye, lower energy consumption and a lower ecological footprint as well as the gradual recovery of the environment to its natural (pre-mining) state.

Based on the expectation that the known socio-economic benefits of the project will exceed the known costs, it is recommended that the environmental authorisation for the proposed closure of the underground workings of the Ezulwini Mining Company (Pty) Ltd of Sibanye Gold Limited should be granted.

12. CURRICULUM VITAE OF SPECIALISTS

ANNA SOPHIA KRITZINGER

1. Family name: Kritzinger

2. First names: Anna Sophia

3. Date of birth: 17 March 1964

4. Nationality: South African

5. Education:

Institution [Date]	Degree(s) or Diploma(s) obtained:
University of Stellenbosch, South Africa (1990-1992)	M.Admin (Economics)
University of Pretoria, South Africa (1982-1985)	B.Admin (Hons) (Economics)

Language skills: Indicate competence on a scale of 1 to 5 (1 – excellent; 5 – basic)

Language	Reading	Speaking	Writing
English	1	1	1
Afrikaans	1	1	1
Dutch	2	3	3
German	3	3	4
French	4	4	4

6. Membership of professional bodies: -

7. Other skills: (e.g. Computer literacy, etc.) Computer literacy –MS Office, Accredited training Assessor, Social Accounting Matrix (SAM) literacy

8. Publications:

Kritzinger, A. S. (2011) Towards a Conceptual Framework for LED Strategies. *Skills @ Work, Volume* 4: 67- 79.
Kritzinger, A. S. and Baur P. (2012) Structuring Local Data to Determine LED Strategy Priorities: An Economic Development Perspective. *Skills @ Work, Volume 5: (forthcoming)*

9. Present position: Director of Southern Economic Development Services (SED) and freelance-associate of South African management consultancy Futurelead

10. Years with the firm: 16

11. Areas of specialisation

- Economic impact assessments
- Applied economics (macro-economic and social impact analysis; economic cost benefit analysis, economic incidence analysis, scenario planning)
- Skills development in development profiling and strategies
- Economic databases & economic reviews
- Local social and economic development strategies
- Industry and market analysis
- Analyses of higher education systems in Africa (analyses of demand and supply factors)

Working as a freelance consultant I have developed a strong network with organizations in South Africa – including my involvement as associate of management consulting firm Futurelead as well as an extensive network of development and economic consulting groups such as the Development Bank of Southern Africa, the economic and financial firm Global Insight and Deloitte (Namibia, South Africa and Botswana) the University of Johannesburg (Centre for Local Economic Development) and the Bureau of Economic Research (University of Stellenbosch).

12. Professional experience:

Date from – Date to	**Company (position)**	**Description of activities (country; year of assignment)**
1998 – current	Consulting	Examples of assignments include: **Economic impact analyses:** • Developed economic criteria for the evaluation of projects for the Strategic Infrastructure Programme (SIP) for the Western Cape Province(2005) • Study lead for revenue management study, entailing the identification of mitigation strategies related to project –related revenues (employment and public revenues) for a large-scale gas project for Anadarko petroleum in Mozambique (2012-2014) • Socio-economic impact assessment for Jeanette mine, Free State (2015) • Economic study for a waste disposal site in Tshwane, Gauteng (2014) • Economic impact assessment as part of Social Impact Assessment (SIA) of a Glencore/Xtrata chrome mine in Rustenburg, Mpumalanga (2014) • Economic impact assessment as part of Social Impact Assessment (SIA) for the extension of a mining right application for Boschmanspoort coal mine in Mpumalanga (2014) • Economic impact assessment as part of Social Impact Assessment (SIA) for a casino/retail project in Delmas, Mpumalanga (2014) • Economic study for a private regional landfill in the Ga-Rankuwa area of City of Tshwane (2014) • Economic impact assessment as part of SIA for a CFB coal plant in Delmas area, Mpumalanga, South Africa (2013) • Economic impact assessment as part of SIA of a coal mine in Chrissiesmeer, Mpumalanga, South Africa (2013) • Economic impact assessment as part of SIA for selected wind farms and solar plants in the Northern Cape (2012) • Economic impact assessment as part of SIA for an existing vanadium mine in the Brits area (2012) • Economic impact assessment as part of SIA for a diamond mine in Alexander Bay area, West Coast, South Africa (2012) • Measured the impact of the global financial crisis on the mining industry of 8 SADC countries including South Africa (SADC countries; 2009); • Conducted an analysis of the economic contribution of state owned enterprises to the Namibian economy (Namibia; 1999 and 2009). • Conducted a socio economic impact analysis for the development of an Africa centre and sustainable housing development project in the Western Cape (South Africa; 2007); (Namibia, South Africa, Botswana; 2005-); • Part of an economic evaluation team for strategic infrastructure projects (SIP) in the Western Cape (South Africa; (2005); • Conducted the economic evaluation of an infrastructure project in the Mosselbay area (South Africa;2001); • Economic impact assessment for horse-mackerel industry (Namibia 2003) **Local Economic Development- related work:** • Managed and conducted a research project pertaining to Business Retention and Attraction Strategies to inform strategic inputs to improve

Date from – Date to	Company (position)	Description of activities (country; year of assignment)
		programmes on behalf of Deloitte Nambia for the Local Economic Development Association (LEDA) of Namibia (Namibia, 2013) • Designed and implemented a training project for capacity training in sustainable local economic development (including the "green economy") monitoring for district municipalities throughout South Africa. The project was developed in collaboration with Inwent and the Development Bank of Southern Africa (South Africa; 2008 – 2011). The project has been developed further as one of the courses that forms part of the University of Johannesburg's Centre of Local Economic Development degree programme; • Evaluated local economic development projects in the Western and Eastern Cape. These studies involved the evaluation of existing economic development projects and the identification of LED projects that the NGO-client could potentially get involved in (South Africa, 2002); • Managed a team in conducting a business survey and Local Economic Development action plan for the eastern parts of Cape Town, including township areas such as Mfuleni and parts of Macasser. The project included extensive consultation sessions with community organisations (South Africa; 2007); • Compiled various socio economic development profiles for various South African local authorities including profiles for George municipality; Drakenstein municipality, the Overberg region and Oudtshoorn municipality that were used to inform the Local Development for the towns and district. The profiles and identification of relevant projects involved community facilitation work (South Africa;1998-2008); • Developed a socio economic database for the Cape Metropolitan Area. The study was updated to an extensive economic analysis of the city and some indicators were extended to include all the different regions of the Western Cape (South Africa;1998, 2001); **Industry profiles and market analysis:** • Conducted research and compiled the synthesis report for geothermal potential in the African rift valley (2011) • Conducted various research reports on global sectors e.g. the global oil and gas industry and ship building and repairs (Global, Africa, South Africa; 2003-2007) • Managed the compilation of an "invest in Cape Town report" for Wesgro (2011) • Managed a sector survey and profile for the Cape Town Boat building industry (South Africa, 2008); • Compiled an industry profile for the City of Johannesburg. The study involved a survey of numerous companies and informed the city about the relative importance of the sector for the City of Johannesburg on the hand of various development criteria (South Africa; 2003). **Higher education analyses in Africa:** • Conducted a demand and supply review of the higher education system of Namibia including a gap analyses of current and forecasted labour demand and supply of higher education qualifications (Namibia; 2012 and 2014) • Managed a situational analysis and done a market analysis as well as economic cost benefit analysis for Botswana Export Development Agency with Deloitte SA to investigate the feasibility of a tertiary education hub to diversify the Botswana economy (Botswana; 2009). **Economic cost benefit analysis:** • Conducted a high level economic cost benefit analyses for a regional landfill project in Ga-Rankuwa, City of Tshwane as extension for an

Date from – Date to	Company (position)	Description of activities (country; year of assignment)
		economic impact assessment (South Africa, 2014) • Conducted an economic cost benefit analyses for a coal mine near Chrissiesmeer, Mpumalanga as part of alternative land-use study for a mining application study (South Africa, 2013) • Conducted an economic cost benefit analysis for an agricultural irrigation project in the Pandamatenga area (Botswana, 2010); • Conducted an economic cost benefit analysis for Botswana Export Development Agency with Deloitte SA to investigate the feasibility of a tertiary education hub to diversify the Botswana economy (Botswana; 2009) **Other macro-economic modeling:** • Developed an economic forecast model for the City of Cape Town and the Western Cape economy (City of Cape Town; 2005 updated in 2011, extended to Western Cape in 2014); • Conducted research to establish the economic contribution of agricultural research in South Africa to assist the motivation of increased public grants to the main agricultural research body (South Africa; 2011) • Conducted a comparative economic incidence analysis between fuel levies and motor vehicle licence fees for the Western Cape (South Africa; 2007 updated in 2011) **References:** • Herman Marais (Strategy Partners Agricultural Venture Capital Fund) +27 83 377 6234; hermanm@agrivie.com; • Johan Hayes, (AECOM: Africa Practice Lead: Impact Assessments; +27 +27 (0) 82 859 1932 johan.hayes@aecom.com
1994-1998	Freelance	Freelance work in UK, travelling through Europe
1989 -1994	University of Stellenbosch (lecturer)	Tasks included: • Lecturing first to third year • Marking of papers and assignments • Leading tutorial classes **References:** • Professor Phillip Black (University of Stellenbosch) tel: **+27 (021) 808-2478;** pablack@sun.ac.za
1987-1988	Development Bank of Southern Africa (Researcher)	Tasks included: • Profiling of selected development areas in South Africa • Analyses and database development pertaining to key economic indicators. **References:** • David Viljoen (Development Bank of Southern Africa) tel: +27 (0) 11 313 3043/3303 ; DavidV@dbsa.org

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14. LIST OF INTERVIEWS

Name	Organization	Date
1. Sandra Labuschagne	Sibanye Gold	October 2016
2. Shoki Motlatle	Sibanye Gold	November 2016
3. Grant Stuart	Sibanye Gold	November 2016
4. Phillip Jacobs	Sibanye Gold	November 2016
5. Attie Benson	Sibanye Gold	November 2016
6. Karel Opperman	Sibanye Gold	November 2016
7. Pieter Henning	Sibanye Gold	November 2016
8. Stephen Joseph	South Deep (Gold Field)	November 2016
9. Dirk van der Westhuizen	Waterpan Golf Club	November 2016
10. Ben van Niekerk	Rand West City Municipality	November 2016
11. Cassie Pelser	Rand West City Municipality	November 2016
12. Herman Bouwer	Farmer	November 2016
13. Cobus Nel and Dekker Naude	Servigraph	November 2016
14. Andy Tladi	Bosele Fruit and Veg (formerly Bambanani Farming operations)	November 2016
15. Rudi Burger	Farmer	November 2016
16. Dawie Mclean	Farmer	November 2016
17. Fanie Engelbrecht	Farmer	November 2016
18. Angelo de Andrade	Lucky farms	November 2016
19. Aaron Mokotete	Farmer	November 2016
20. Quinton Naidoo	AfriGrow	November 2016
21. Izak van Wyk	Farmer	November 2016
22. Pieter du Preez	Orion Dagbreek Nursery	November 2016