

PART 3: DESCRIPTION OF THE PROJECT

3.1 GENERAL DESCRIPTION

Several portions of De Beers Kimberley Mines' surface right areas, including all infrastructures associated with these areas, and mining rights was sold to Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture. The sale consisted of two phases, namely; Phase 1 and Phase 2. Phase 1 was completed in 2010 and the Phase 2 of sale has recently been completed.

It is therefore the intention of this EMP¹ (incl. EIA²) (which has been compiled in terms of the MPRDA³ (2002)) to provide the necessary information regarding the Phase 1 and 2 purchase agreements between Crown Resources and De Beers Kimberley Mines, as required in terms of the MPRDR (2004), under the MPRDA (2002).

The purpose of this part of the EMP (incl. EIA) is to provide a background description of the project associated with the purchase agreement and activities associated with De Beers Kimberley Mines. More specifically to illustrate where the information required according to the MPRDA (2002), the MPRDR⁴ (2004) and related DMR⁵ Guideline is addressed in this EMP (incl. EIA).

3.2 REGIONAL SETTING

The town of Kimberley is located in the Northern Cape Province near the Free State Provincial border. The Northern Cape / Free State boundary runs through the eastern section of the De Beers Kimberley Mines mine boundary area with a small portion (0.5%) of the property located on the Free State side of the border.

De Beers Kimberley Mines ceased their underground and opencast mining at Bultfontein, Dutoitspan and Wesselton Mines in 2005 and these mines were sold to Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture as part of the Phase 1 purchase agreement.

Kimberley Underground Mines Joint Venture continued with the underground mining at the above mentioned Mines after the Phase 1 purchase agreement. The Bultfontein, Dutoitspan and Wesselton Mines are located on the eastern side of Kimberley and the largest tailings deposits and resources are located on the areas to the north and south of these mines.

As previously indicated the De Beers Kimberley Mines is also responsible for De Beers Mine and Kimberley Mine which are both dormant mines. The dormant mines are located to the east and centre h of Kimberley respectively. The regional setting of De Beers Kimberley Mines is attached **Figure 1.3-1** in **Appendix A**.

3.2.1 MAGISTERIAL DISTRICT AND RELEVANT REGIONAL SERVICES AUTHORITY

The largest portion 2958ha (99.55%) of the De Beers Kimberley Mines property falls within the Kimberley Magisterial District and is served by the Sol Plaatjie Local Municipality and the Francis Baard District Council. The remaining portion 139ha (0.45%) of De Beers Kimberley

¹ EMP: Environmental Management Programme.

² EIA: Environmental Impact Assessment.

³ MPRDA: Mineral and Petroleum Resources Development Act, Act No. 28 of 2002.

⁴ MPRDR: Mineral and Petroleum Resource Development Regulations (R.527), dated 23 April 2004.

⁵ DMR: Department of Mineral Resources.

Mines (approximately 1/3 of the Fines Residue deposit area lies on a portion of the farm DuToitspan 119), falls within the Free State Province Lejweluputswal District Municipality and is served by the Tokologo Local Municipality. Refer to **Figure 1.3-1** in **Appendix A** for an indication of the Magisterial District and relevant Regional Services authority.

3.2.2 DIRECTION OF AND DISTANCES TO NEIGHBOURING TOWNS

As mentioned previously, the town of Kimberley is situated in the Northern Cape Province, near the Free State Provincial border. The following are neighbouring towns of Kimberley:

- Warrenton - 70 km north.
- Barkley West - 30 km northwest.
- Boshof - 55 km east.
- Ritchie - 40 km south.
- Campbell - 105 km west.
- Douglas - 115 km southwest.
- Petrusburg - 75 km southeast.

The De Beers Kimberley Mines falls within the administrative boundaries as shown in **Table 3.1**.

Table 3.1: Administrative boundaries of the De Beers Kimberley Mines

Province	Northern Cape
District Municipality	Frances Baard District Municipality
Local Municipality	Sol Plaatje Local Municipality
Department of Mineral Resources (DMR) Local Office	Kimberley Offices, Northern Cape
Department of Water Affairs (DWA) Local Office	Kimberley Offices, Northern Cape
Environmental Affairs and Nature Conservation (EANC) Local Office	Kimberley Offices, Northern Cape
Catchment Zone	Lower Vaal water management area (C51L, C52L, C91E quaternary)
Rainfall Zone	C5E, C9B
Water Management Area	Lower Vaal water management

3.2.3 LOCATION OF THE MINE

As mentioned previously, De Beers Kimberley Mines is located in Kimberley, in the Northern Cape Province, near the Free State Provincial border. The following are neighbouring towns of Kimberley:

3.2.4 SITE DESCRIPTION

3.2.4.1 Surface infrastructure

The De Beers Kimberley Mines mine boundary area covers an area of approximately 3981.1240 ha, which was formerly used as grazing land. Surface infrastructure around the various mines is indicated on **Figure 1.3.3-1** and **Figure 1.3.3-2** attached in **Appendix A**. The infrastructure is associated with serving the mines, farms, the power generation industry and numerous towns in the study area.

3.2.4.1.1 Roads

There are tarred roads extending from the town of Kimberley to the above mentioned neighbouring towns, except for a partially un-tarred road which extends between Kimberley town and Petrusburg.

3.2.4.1.2 Railway lines

The major railway line extending from Cape Town to Johannesburg runs via Kimberley town. A secondary line extends to Bloemfontein in the east and to Barkley West in the northwest.

3.2.4.1.3 Power lines

Eskom supplies power to the city and the mines via overhead lines.

3.2.4.1.4 Water

Potable water is piped from the Vaal River to the town of Kimberley. The Sol Plaatje Municipality is the Water Service Provider of potable water to the mines and residential areas in terms of the WSA⁶ (1997). The Sol Plaatje Municipality has the powers and functions of a Water Services Provider in accordance with the WSA (1997).

3.2.5 SERVITUDES

Servitudes for electric power lines, haul roads and water pipe lines extending between the mining areas exist. Many of these are not registered. The location of these structures is indicated on **Figure 1.3.3-1** attached in **Appendix A**.

3.2.6 ADJACENT LAND USES

Most of the land adjacent to the mining area belongs to Kimberley Municipality or De Beers Consolidated Mines. Most of the surface freehold that is not occupied by mining infrastructure or related development is used for agricultural or residential purposes.

The land owners and land use of properties adjacent to the mining area of De Beers Kimberley Mines are indicated in **Table 3.2**, below.

Table 3.2: Land tenure and land use of properties adjacent to the mining area of De Beers Kimberley Mines

Farm name	Portion	Land use		
Alexanderfontein No.123	De Beers Consolidated Mines	Farming		
Alexanderfontein No.123	Portion 50	Kimberley RD	National Government of the Republic of South Africa	Sewage disposal Works
Benaauwheidfontein No. 442	Portion 0	Kimberley RD	De Beers Consolidated Mines	Farming
Benaauwheidfontein No.124	Portion 8	Kimberley RD	Crown Resources (Pty) Ltd.	Mining
Dorsfontein No.77	Portion 13	Kimberley RD	Adriaan Hendricus Louwrens	Piggery
Dutoitspan No.119	Portion 2	Kimberley RD	Crown Resources (Pty) Ltd.	Mining
Jockey No.78	Portion 0	Kimberley RD	Griqualand West Polo Gymkhana and Racing Club	Race Course
Kareeboom No.76	Portion 0	Kimberley RD	EC Lockyear	Farming

⁶ WSA: The Water Services Act, Act 108 of 1997.

Farm name		Portion	Land use		
Kareeboom No.76		Portion 2	Kimberley RD	AJ Thompson	Farming
Kenilworth Estate No.71		Portion 0	Kimberley RD	Sol Plaatje Municipality	Industrial area
Kenilworth Estate No.71		Portion 5	Kimberley RD	Kenilworth Utiliteitsmaatskappy vir gestremde persone	Residential area
Rietpan No.79		Portion 0	Kimberley RD	De Beers Consolidated Mines	Farming
Roodepan No 70		Portion 0	Kimberley RD	Sol Plaatje Municipality	Residential area
Roodepan No.70		Portion 1	Kimberley RD	Sol Plaatje Municipality	Residential area
Roodepan No.70		Portion 4	Kimberley RD	New Diamond Corp. (Pty) Ltd	Mining
Roodepan No.70		Portion 7	Kimberley RD	Sol Plaatje Municipality	Residential area
Roodepan No.70		Portion 8	Kimberley RD	Residential area	Sol Plaatje Municipality
Roodepan No.70		Portion 9	Kimberley RD	Residential area	Sol Plaatje Municipality
Rooifontein No.211		Portion 1	Boshoff RD	Farming	JJ Reichert
Susanna No.197		Portion 0	Boshoff RD	Farming	De Beers Consolidated Mines

3.3 Geology and Mineralization

Kimberley Mine has the following remaining resources in the LOM plan: Stadium, Pulsator, Old Direct Treatment Plant (ODTP), Kenilworth, Reservoir, Area 5 Tailings Mineral Resource, Area 1 Tailings Mineral Resource, Area 2 Tailings Mineral Resource, Area 8 Tailings Mineral Resource, Area 6 Tailings Mineral Resource and the Main Tailing Resources (**Figure 3.3**). The many and varied dumps (tailings mineral resources) in the Kimberley area are the manifestation of over one hundred years of mining in the Kimberley (The Big Hole), De Beers, Dutoitspan, Bultfontein and Wesselton Mines. Their wide geographical distribution and recovery technology that existed at the time resulted in the creation of floors at the turn of the century. When mining of soft, altered, near- surface Kimberlite (yellow ground) diminished the hard "blue-ground" was laid out to weather. Treatment of the floored dump material produced the various dumps, now known as tailings mineral resources due to their diamond bearing nature and associated economic mineability.

The Colville and Kenilworth mixed tailing mineral resource (MTMR's) were built by tailings derived from the treatment of kimberlite from the Kimberley and De Beers Mines respectively. The material mined from the pipes was floored and crushed before being washed, using pans, to produce a heavy mineral concentrate. Pulsator TMR is concentrate tailings from the central plant where pulsating jigs were used to process and subsequently recover diamonds. The ODTP and the Current Tailings Mineral Resource (CTMR) were built from coarse tailings (minus slimes) derived by this new "direct treatment" method and their material were sourced from all the kimberlites mined at that time.

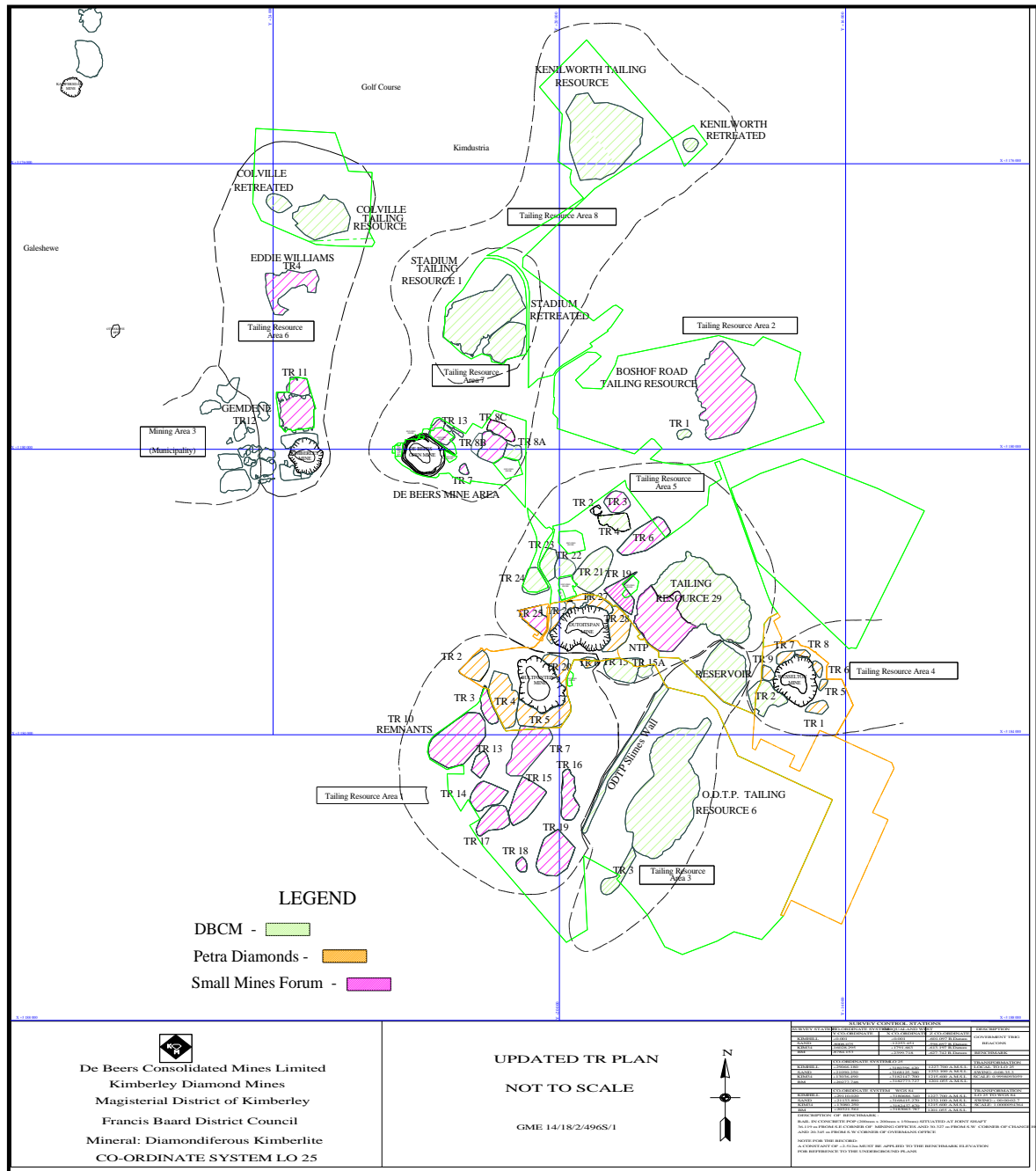


Figure 3.3: Kimberley Mines Footprint Extent Showing All Tailing Mineral Resources Scattered Around the Mining License Areas

3.4 DRILLING AND SAMPLING CAMPAIGNS

There have been a number of sampling campaigns conducted on the Kimberley tailings resources dating as far back as 1949 with the latest as recently as 2006. The historic sampling was conducted using pits and trenches. More recent sampling has been done using the more advanced drilling and processing techniques producing far more reliable results. Earlier sampling activities took place and included mineralogy, size analysis, diamond distributions and grade, however, reliability of this information were questionable. Several Large Diameter Auger-drilling (LDA) programmes were recently (1989 and 1998) conducted to obtain information for the main dumps. The advantage of this method of sampling is that both the vertical and

horizontal planes of the dumps could be sampled. Recent sampling included the main tailings mineral resources (ODTP, Kenilworth, Pulsator, Boshof, Colville, and Reservoir) and the current tailings mineral resource (TMR29).

Business plans are based on a number of sampling programme results that are subsequently consolidated into a resource estimation by Mike Millad (2006 Mineral Resource Sampling) and Sean Duggan during 2006.

3.5 DATA VERIFICATION

Internal reviews, Independent reviews and audits

Sampling data underwent rigorous checks and validation and these were conducted internally and externally. There were a number of instances where sampling and data integrity was compromised. Compromised datasets were excluded for the resource estimation. Contaminated samples and those thought to have been tampered with were excluded and not used in the resource estimation process. All the tailing resources sampled in the above campaign were re-estimated by the MRM- team in Cape Town at the beginning of 2005. Following the process of elimination of the aforementioned sample datasets, the remaining samples' total grade values were factorized, using their rolled-up diamond size-frequency distributions, to comply with a strict +3 sieve bottom cut-off (in line with the CTP's bottom cut-off). These factorized data were used as final inputs for the grade estimation of the five tailing mineral resources.

3.51 DATA STORAGE

The quality assured and verified data is signed off by the relevant competent person(s) and stored on the local network that is backed up by the server in line with the IT policy. Every folder has an owner and the owner gives permission to a set group. The permission can be full control, modify, read and execute, read, write or special permissions. There is data protection on the server where data is stored and Raid configuration which allows other drives to kick in when the one fails. Data is backed up daily (and kept for four weeks on site); weekly (also kept for four weeks on site); monthly (kept on site for a full year); and yearly (and kept for seven years).

3.6 MINERAL RESOURCE

De Beers' resources and reserves are classified according to the South African Code for Reporting of Mineral Resources and Mineral Reserves (the 'SAMREC Code'). Kimberley Mines Resources are classified in the inferred and deposit category. Whilst there is no sampling campaign planned for those resources making up the Life of mine, focussed mining exercises will be conducted to improve the level of confidence. These are however not expected to increase the level of confidence from deposit to inferred but improve understanding the resource definition (laterally and vertically) and treatability in the processing plant.

Table 3.4: Kimberley Mines Resource Statement as at 31 December 2012

Diamond Resources	Inclusive (1 - 6)	BCO (mm)	Classification	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011
				Tonnes (million)	Grade (cpht)	Carats (million)	USD/carat	Revenue (USD million)					
Mine Kimberley													
Colville	1.15	1.15	Measured									0.000	0.000
			Indicated										0.000
Kenilworth	1.15	1.15	Inferred	0.628	0.629	9.22	9.21	0.058	0.058	109.55	108.86	6.342	6.302
			Measured										0.000
ODTP	1.15	1.15	Indicated									0.000	0.000
			Inferred	0.314	0.602	25.57	28.50	0.080	0.172	112.10	100.51	8.989	17.259
Pulsator	1.15	1.15	Measured									0.000	0.000
			Indicated										0.000
Reservoir	1.15	1.15	Inferred	22.045	24.328	12.27	12.31	2.706	2.995	119.31	112.41	322.802	336.700
			Measured										0.000
Stadium	1.15	1.15	Indicated									0.000	0.000
			Inferred	0.574	0.619	21.48	21.50	0.123	0.133	298.43	324.16	36.766	43.118
Area 3	1.15	1.15	Measured									0.000	0.000
			Indicated										0.000
Area 5	1.15	1.15	Inferred	8.349	8.265	10.50	10.46	0.876	0.865	98.45	82.37	86.274	71.213
			Measured										0.000
Mine Kimberley Total			Indicated	3.285	4.014	12.20	13.42	0.401	0.539	95.31	82.68	38.199	44.537
			Inferred	0.190	0.190	13.99	13.99	0.027	0.027	79.97	77.00	2.128	2.049
			Measured									0.000	0.000
			Indicated	2.858	96.161	13.29	4.62	0.380	4.438	105.91	107.88	40.227	478.765
			Inferred	0.000	0.000			0.000	0.000			0.000	0.000
			Indicated	0.000	0.000			0.000	0.000			0.000	0.000
			Inferred	38.242	134.808			4.650	9.226			541.728	999.943
			Total	38.242	134.808			4.650	9.226			541.728	999.943

1. The figures quoted in the statement above reflect the inclusive estimates not reflected in the reserve statement for Mine Kimberley as at December 2012. The percentage attributable to De Beers sa is shown elsewhere in this document.

2. Diamond Resources are inclusive of those modified to produce Diamond Reserves.

3. Tonnage quoted as dry metric tonnes (t).

4. Grade quoted as carats per hundred metric tonnes (cpht).

5. Mining methods: Doze ,Load and Haul

6. Mineral Resources are sated at a Strict Bottom Cut Off

7. Tonnes and carats read from the new orange blocks in the conversion tab

3.7 MINE DEVELOPMENT AND MINE PLAN

The Tailings Mineral Resources that form the basis of this Business Plan Technical Report are Old Direct Treatment Plant, Reservoir, Area 5: Tailings Mineral 15, Pulsator, Recovery Tailings, Kenilworth and Stadium Mineral Resources. With these resources, the life of mine (LOM) for the tailing mineral resources extends to 2018. This mining plan comprises a total of 38.573 million tons of ore from 2013 to 2018. This total tonnage is made up of material from Pulsator, ODTP, Reservoir, Stadium, Kenilworth, and Recovery Tailings. The plan mines the ODTP (53%) as the main source of diamonds followed by Reservoir (21%). Current Tailings Mineral resources do not form the basis of this business plan technical resource as it is not profitable to mine as yet. Techno-economic studies are underway and are aimed at thoroughly understanding this resource and the technology required to mine it profitably. This study is aimed to be concluded by the second quarter of 2013.

Table 3.5: Dates underground mining ceased at De Beers Kimberley Mines

Name of mine	Date mining ceased
Kimberley Mine	1914
De Beers Mine	1990
Bultfontein Mine	2005
Dutoitspan Mine	2005
Wesselton Mine	2005

The tailings recovery operations that are currently taking place at De Beers Kimberley Mines are estimated to continue until 2018, with the potential to extend mining to 2035.

3.8 MINING FLEET AND EQUIPMENT

Mining of the tailing mineral resources is carried out by Setjhaba carriers using mechanised ground handling fleet consisting of 2 water tankers, 4 bulldozers, 6 front-end-loaders, rear tip

trucks and support equipment (grader and a TLB). The fleet consists of twelve (12) 50 ton trucks used mainly on-mine. On-mine resources consist of Pulsator, Recovery Tailings, Reservoir, Old Direct Treatment Plant Tailings Mineral Resources. Off-mine hauling is conducted using 2 x 30ton and 2 x 38ton trucks). The off mine trucks are used mainly for off mine resources: Stadium and Kenilworth TMRs. Of the 6 front end loaders, 3 are used mainly in the loading zones while 2 are used mainly for building stockpiles and for feeding the plant from the stockpiles. The water tankers are used to wet the haul roads and loading areas for dust suppression.

3.9.1 PROPOSED TIME TABLE, DURATION AND SEQUENCE

The sequence and timing of reclaiming of the tailings resources is constrained by grade requirements, as well as the design of the Treatment Plant (i.e. CTP). The proposed dates for various project components are listed in **Table 3.6** below.

Table 3.6: Proposed timetable, duration and sequence for current reclamation activities at De Beers Kimberley Mines

Activity	Start	Duration	End
Rehabilitation programme	Continuous	Life of Mine	2016
Development of Closure EMP	2008	3 years	2011
Submission of Closure EMP to Authorities	2011	N/A	N/A
Cessation of production date	2018	N/A	N/A
Decommissioning programme	2017	5 years	2020
Submission of Closure Application	2020	N/A	N/A

Notes:

N/A - Not applicable

3.9.1.1 Proposed decommissioning programme

De Beers Kimberley Mines will remain responsible for the development and implementation of the decommissioning programme for the disturbed land use areas associated with previous and current mining activities at De Beers Kimberley Mines until Closure has been obtained. It must however be noted that Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture have taken over full liability for the decommissioning and rehabilitation of the disturbed land use areas which forms part of the Phase 1 and 2 purchase agreement.

The decommissioning programme that will be implemented at De Beers Kimberley Mines is anticipated to commence in \pm 2017, and will last \pm 5 years.

3.9.1.2 Proposed date for Closure application

An application for Closure of De Beers Kimberley Mines will be made within \pm 3 to 5 years after tailings reclamation has ceased and the decommissioning programme has been completed. It is anticipated that a final Closure Plan for De Beers Kimberley Mines will be submitted during \pm 2014, and a Closure Application will be submitted during \pm 2017. The mentioned Closure Application will be developed in accordance with the requirements of the MPRDR (2004).

3.9.1.3 Proposed after-care programme

The proposed after-care programme for De Beers Kimberley Mines is included within this EMP (incl. EIA), and will be described in more detail in the Closure EMP that will be developed for De Beers Kimberley Mines. The Preliminary Closure Plan gap analysis dated 2010 for De Beers Kimberley Mines has been attached in **Appendix B**.

3.10 THE SURFACE INFRASTRUCTURE INCLUDING MINE SURFACE LAYOUT

As mentioned previously, opencast and underground mining activities have ceased at De Beers Kimberley Mines and tailings resource recovery is taking place. Although the recovered tailings material is processed at the CTP, infrastructure associated with previous mining and related activities also exist within the mine boundary of De Beers Kimberley Mines.

3.10.1 MINE INFRASTRUCTURE

The main mining and related infrastructure at De Beers Kimberley Mines includes the following:

- CTP.
- Infrastructure associated with the KMF⁹ mining initiatives namely Pikwane 1 and 2, Superstone and Superkolong.
- Workshops, administration and other buildings.
- Solid waste management facilities.
- Water pollution management facilities.
- Water (clean and process) reticulation and supply systems.
- Haul and access roads.
- Conveyor systems.
- Borrow pits.
- Electrical distribution systems

Refer to **Figure 1.3.3-1** in **Appendix A** for a plan indicating the location of the infrastructure at De Beers Kimberley Mines, the relevant mine infrastructure is described below.

3.10.1.1 Treatment Plant

3.10.1.1.1 Combined Treatment Plant (CTP)

The CTP is situated on the northern side of De Beers Kimberley Mines' property, adjacent to the current tailings resource. Refer to **Figure 1.3.3-2** attached hereto in **Appendix A** for an indication of the locality of CTP in relation to De Beers Kimberley Mines.

CTP was designed to treat tailings resource material as well as underground ore reserves simultaneously. When the underground operations ceased, the CTP was no longer required to treat underground ore reserves, but treatment of tailings resource material continued.

The CTP operates at 1 050 tonnes per hour, 24 hours per day, seven days per week and 345 days per year. The CTP treats up to 6.5 million tonnes of tailings per annum from the mainly Kenilworth, Pulsator, Stadium and ODTP⁷ tailings resources. Tailings resource material is transported to the Treatment Plant with trucks via a series of public roads and haul roads.

The CTP incorporates the best practice technology available. The water consumption for all process head feeds are reduced to the minimum as a result of limited water resources.

⁷ ODTP: Old Direct Treatment Plant; ⁹Kimberley Miners Forum

Thickeners are used to optimise process water return and reduce the loss of water during the deposition of tailings and slimes at the CTP Paste Deposition facility. High capacity slurry pumps, capable of pumping a thickened slurry known as paste, are used to convey the waste over a distance of 5 kilometres to the disposal facility.

3.10.1.2 Infrastructure associated with the small-scale mining initiatives

De Beers Kimberley Mines sold TMR's to KMF that are involved in reclaiming some of the older tailings resources. Three of these treatment plants are located on the perimeter of the De Beers Open Pit Mine, as well as Superkolong located adjacent to the TMR29. As part of the Phase 2 sale, this Superkolong plant will now fall into the area sold to Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture.

Infrastructure for the processing of the recovered tailings resources (e.g. infrastructure associated with the Plants), is present at the above-mentioned localities of these small-mining initiatives. The plant areas however fall outside of the Kimberley Mines Mining Licence area.

Post the Petra Phase 1 and Phase 2 process, the remaining De Beers Kimberley Mines mining area is approximately 3657.389 ha in size and is fenced off. A road system links the different areas of responsibility. The Petra extent will total area of 707.5832 ha.

3.10.1.3 Housing, recreation and other employee facilities

Employees are mainly housed at residential areas in the town of Kimberley. Dutoitspan is used for recreational purposes such as angling and Rooifontein is managed as a game farm with various animal species, including species such as springbok, blesbok, and zebra, etc. Game management within the farm enclosure is popular during the hunting season.

3.10.2 ACCESS TO THE WORKINGS

3.10.2.1 Employees' transport

Most of the mine's employees are transported from and to their residential areas via busses that have been contracted by the mine for his purpose. Some of the employees of the mine provide their own transport to and from the mine.

3.10.2.2 Access to the mining area

As mentioned previously, tarred and un-tarred roads exist on the mining property, which provide access to the entire mining area. This includes the haul roads which are used to transport the tailings material from the tailings resources to the CTP for processing.

Municipal roads are used to transport tailings material from tailings resources present in the Kimberley town area to the mine where it is processed. Only specified routes are used for transport of tailings material to minimise damage to the roads, as well as inconvenience to the public.

3.10.2.3 Transport of the product

After tailings material has been transported via trucks to the Ore receiving tip, it is conveyed to CTP where it is scrubbed and screened. The processed tailings concentrates are conveyed to the Recovery Plant where the diamonds are recovered from the concentrate material.

The recovered diamonds are transported using specialised security vehicles and where feasible by aircraft, due to the small volume nature of the product and its value.

3.10.3 EXISTING ROADS, RAILWAYS AND POWER LINES

The existing infrastructure serving the De Beers Kimberley Mines can be seen on **Figure 1.3.3-1** in **Appendix A**.

3.10.4 SUBSIDENCE

3.10.4.1 Expected location, extent and depth of surface subsidence

Although no subsidence outside the Kimberley Mine pit area is expected due to the nature of previous mining methods undertaken, a surface-monitoring programme is in place to monitor the pit sidewall stability at both Dormant Mines. In addition, De Beers Pit is currently being filled with tailings materials from the re-treated tailings resources by the KMF. Once the De Beers pit has been filled and capped, pit rim stability would be attained as the walls of the pit will no longer be able to collapse.

Localised subsidence within the rehabilitated areas may occur in the future due to settling of the backfilled layers. If areas of subsidence form within the backfilled and rehabilitated areas, these will be reshaped to ensure free-draining of the area. Additional mitigation, monitoring and management measures associated with this aspect are addressed in this EMP (Incl. EIA) in Part 7 and Part 8.

No subsidence is anticipated to occur due to the tailings resource recovering methods currently undertaken at De Beers Kimberley Mines.

3.10.4.2 All drainage paths affected by surface subsidence

There are no natural watercourses within the mining boundary of De Beers Kimberley Mines. It is therefore not anticipated that surface subsidence will affect any natural water courses.

3.10.4.3 All structures affected by surface subsidence

Although no surface subsidence is anticipated to occur due to the underground mining activities that have taken place at De Beers and Kimberley Mines, some infrastructure such as structures associated with the Kimberley Mine, is situated within the break-back zone of the associated pits. Mitigation and management of possible long-term impacts arising due to the location of certain infrastructure within the break-back zone of the relevant pits will be addressed in detail in the Closure EMP developed for De Beers Kimberley Mines. The Closure Plan Gap analysis dated 2010 for De Beers Kimberley Mines has been attached in **Appendix B**.

3.10.5 ALL STRUCTURES THAT MAY BE AFFECTED BY BLASTING VIBRATIONS

No structures on the mine have been damaged by vibration due to previous underground blasting. Since underground mining operations at the mines have ceased, no blasting is currently taking place at De Beers Kimberley Mines and no structures will therefore be affected. As mentioned above, no structures were affected by blasting and vibration during the previous underground mining activities, and therefore it can be stated that no structure will be affected by blasting and related vibrations undertaken by Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture.

3.10.6 SOURCES OF WATER

The Water Uses in terms of Section 21 of the NWA⁸ (1998), were described in detail within the Integrated Water Use Licence Application of De Beers Kimberley Mines, titled “*De Beers: Kimberley Mines, Integrated Water Use Licence Application*”, dated October 2006, compiled by Clean Stream Environmental Services with reference number DB/KM/05/2006 (hereafter referred to as the Kimberley Mines IWULA⁹, dated October 2006). The relevant aspects have been discussed in this part of this EMP.

3.10.6.1 Process water

In summary, De Beers Kimberley Mines mainly receives water for their process requirements from four sources namely:

- Affected mine water from subsurface sources (i.e. Wesselton underground mine).
- Treated effluent from the Greenpoint WWTW¹⁰.
- Treated effluent from the Homevale WWTW.
- Water from Dutoitspan.
- Water from Kamfers Dam

Correspondence with the then DWAF¹¹ indicated that it was unnecessary for De Beers Kimberley Mines to apply for a Water Use Licence to utilise water obtained from the sewage purification plant at the Kamfersdam, providing that an Impact Study be undertaken for the Kamfers Dam. The permission letter from the then DWAF with reference number 24/1/9/1, dated May 2004 is attached in **Appendix C1**. The impact assessment report, titled “*Sol Plaatje Municipality, Kamfers Dam: Water Quality and Quantity Impact Study, Northern Cape*”, dated January 2006, compiled by Kwezi V3 Engineers is available from the mine on request.

Water from Homevale WWTW and Kamfersdam and Wesselton UG is firstly received from these sources and other sources when necessary. Potable water is also used during the final recovery of diamonds. According to the EMS¹² Manual, titled “*Kimberley Mines: Environmental Management System Manual*”, dated February 2010, developed by De Beers Kimberley Mines, the current water use at the CTP is approximately 220 000 m³ per month. Water pumped from the De Beers Mine and Kimberley Mine is utilised by the small mining companies located at De Beers Mine Pit area.

3.10.6.1.1 Mine affected water

Affected mine water is pumped from the dewatering shafts around the open pits of De Beers Kimberley Mines, i.e. at De Beers Mine and Kimberley Mine. The contaminated water is pumped into surface water storage facilities situated at the KMF operations. As part of the purchase agreement, up to 80,000kl of water per month is also pumped from Wesselton Mine by Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture, directly to the CTP and to the storage facility located south of the CRD known as the 4 Million Gallon dam. The CTP utilises this as process water.

3.10.6.1.2 Treated effluent from Greenpoint WWTW

⁸ NWA: National Water Act, Act 36 of 1998.

⁹ IWULA: Integrated Water Use Licence Application.

¹⁰ WWTW: Wastewater Treatment Works.

¹¹ DWAF: Department of Water Affairs and Forestry.

¹² EMS: Environmental Management System.

De Beers Kimberley Mines has an agreement with the Frances Baard District Municipality to receive treated effluent from the Greenpoint WWTW since the treated effluent is considered to be a reliable source of process water for De Beers Kimberley Mines. An open canal and pipeline has been installed from the WWTW to the Dutoitspan. **Appendix C3**

3.10.6.1.3 Treated effluent from Homevale WWTW

Treated effluent water from the Homevale WWTW, managed by Sol Plaatje Municipality, is pumped to the maturation ponds. Approximately 130,000kl of this matured water combined with 70,000kl per month from Kamfers Dam is pumped to the lined Hill reservoir which is situated to the North of the CTP. The treated effluent is then fed by means of gravitation to the storage facility south of the CRD, which in turn supplies the CTP with process water. De Beers Kimberley Mines has authorisation to abstract 300 000 m³ per month of treated effluent from the Homevale WWTW as stated in the Municipal agreement AA 54/12/20 dated 13 October 1980 **Appendix C2**.

3.10.6.1.4 Dutoitspan

The Dutoitspan receives water from the following sources:

- Treated effluent from the Greenpoint WWTW via an open trench or pipeline.
- Storm water runoff from a portion of Kimberley town and mining areas via storm water trenches.
- Overflow from the process water storage facility located south of the 4 Million gallon dam.
- At times, runoff from Petra operations.

The Dutoitspan occasionally supplies the CTP with process water. The Dutoitspan has an effective depth of around 2.2 m with a surface area of 793 ha. This pan has a volume of approximately 17,447,000 m³. The Dutoitspan, historically was a seasonal pan, although currently it is a perennial pan. Refer to Photograph 1 of the Photographic Report, attached as **Appendix D** for a visual representation of Dutoitspan. The utilisation of Dutoitspan as a storage dam for contaminated mine water was described in detail in the document titled "*Clean Stream Environmental Services, 2006: Kimberley Mines. Integrated Water Use Licence Application. Reference number DB/KM/05/2006*" that was submitted to the then DWAF in October 2006.

During exceptionally high rainfall seasons, Dutoitspan is able to overflow into the Benfontein Pan via the Paardebergvlei. Borrow pits below the FRD are also utilised as an emergency storage facility for affected storm water runoff from the CTP and Petra slimes dams. Refer to Photograph 2 of **Appendix D**, for a visual representation of the borrow pit. In addition to the mentioned borrow pit, Paardebergvlei is currently near dry and the vlei walls have been repaired with the expectation therefore that no additional flow of contaminated water to the Benfontein is anticipated to occur. Refer to Photograph 4 in **Appendix D**, for a visual representation of Paardebergvlei.

Dutoitspan is fed by storm water runoff over the entire Kimberley area, including the mines and the industrial areas, as well as any excess water pumped from underground mines and Petra operations.

3.10.6.2 Potable water

Potable water for use at De Beers Kimberley Mines is supplied by the Sol Plaatje Municipality, abstracted from the Vaal River and supplied to De Beers Kimberley Mines in terms of the WSA, 1997.

The Sol Plaatje Municipality has the powers and functions of a Water Services Provider delegated to them by the DWA in terms of the WSA, 1997. **Table 3.6** indicates the volume of Vaal water supplied by the municipality to De Beers Kimberley Mines from 2008 to 2012.

Table 3.6: Potable water usage statistics from 2008 to 2012

Year	Vaal water used by De Beers Kimberley Mines (kl)
	supplied by the Municipality (kl)
2008	267,665
2009	253,492
2010	168,054
2011	133,928
2012	129,696

In addition, groundwater is also abstracted from five boreholes within the mine boundary of De Beers Kimberley Mines. The abstracted water is utilised for the watering of animals, irrigation of gardens and for domestic purposes. The volumes of water abstracted from the boreholes as specified within the De Beers Kimberley Mines IWWMP¹³, dated October 2006, are indicated in **Table 3.7**, below.

Table 3.7: Abstraction volumes relevant to the borehole abstraction scheme as at 2011/2012

Borehole	Volume	Abstraction rate
	Average l/month	l/hour
Lister engine borehole	20000	2000
Deutch engine borehole	250000	3500
Boma borehole	20000	-
Windmill 1 (near Olifantsfontein Hotel)	30000	-
Windmill 2 (next to Geology road)	30000	-
Estimated monthly total	350000	-

3.11 SOLID WASTE MANAGEMENT

Due to the reclamation and tailings recovery and related activities that are taking place at De Beers Kimberley Mines, the generation of solid waste (including hazardous and general waste), is unavoidable. Therefore it is important to implement appropriate management measures regarding the management of all waste forms to minimise / prevent the impact thereof on the

¹³ IWWMP: Integrated Water and Waste management Plan.

surrounding environment. These management measures regarding waste management at De Beers Kimberley Mines have been described within the Water Use and Waste Assessment Report, titled “De Beers Kimberley Mines: Water Use and Waste Assessment to facilitate the development of an Integrated Water and Waste Management Plan”, dated September 2004 with Report No. P292.1, and compiled by Pulles Howard and De Lange Incorporated, as well as within the De Beers Kimberley Mines IWWMP, dated October 2006, extracts of which are attached in **Appendix E**. The relevant aspects contained within the above-mentioned documents are summarised within this part of this EMP document.

Waste management at De Beers Kimberley Mines takes the following aspects into consideration:

- Separation, recycling, re-using, reducing and responsible disposal of all types of waste.
- The development of operational procedures and Closure plans for waste disposal facilities.
- Monitoring to ensure set objectives are met.

A Standard Procedure has been developed by De Beers Kimberley Mines which addresses the above-mentioned considerations and stipulates the procedures to be implemented towards waste management. This Standard Procedure, titled “*Waste Management Procedure*”, dated February 2010, and procedure number KM.EM.PR-18, is attached in **Appendix F1**. Waste management was also described in the Standard Procedure titled “*Environmental Monitoring and Measurement*”, dated February 2010, attached hereto in **Appendix F2**.

3.11.1 INDUSTRIAL WASTE DISPOSAL (EXCLUDING MINE WASTE)

Industrial waste generated at De Beers Kimberley Mines is separated into different colour coded bins (also referred to as telecons) prior to disposal. These bins include:

- Silver grey colour-coded telecon for old / used steel (e.g. old tools, pumps, chain, steel plates, bolts and / or any steel structure).
- Black colour-coded telecon for rubber (e.g. old tyres, conveyor belts and other rubber products).
- Light brown colour-coded telecon for timber (e.g. old poles, planks, wood pallets and cable drums).
- General waste is yellow
- Red – Hazardous waste such as oil contaminated material, batteries
- Blue - Fluorescent tubes / CFLs

The above-mentioned colour-coded bins are sent to the Salvage Yard where all salvageable materials are removed, sold and / or sent to the workshop for reconditioning and re-use. It is the responsibility of the Salvage Yard Supervisor to separate the salvageable / recyclable waste from those that are not.

The Salvage Yard was exempted from the requirements of Section 20 of the ECA¹⁴ by the then DWAF in August 2002. A copy of this Exemption is available from the mine on request.

Industrial waste generated at the CTP is collected in suitable containers that are clearly marked. The hazardous industrial waste (including oil and oil rags) are separated from non-hazardous waste. A suitable waste removal contractor removes the industrial waste from the

¹⁴ ECA: Environmental Conservation Act, Act No.73 of 1989.

mine boundary area to an appropriate licensed hazardous waste disposal. No hazardous waste is disposed at the CTP or any disposal site within the mine boundary of De Beers Kimberley Mines.

3.11.2 DOMESTIC WASTE DISPOSAL

Waste that does not pose a significant threat to public health or the environment if properly managed due to its composition and characteristics, is referred to as general waste. At De Beers Kimberley Mines, the following is regarded as general waste:

- Building rubble.
- Garden waste.
- Office waste (e.g. domestic solid waste).
- Certain dry industrial waste.

All the general waste generated at De Beers Kimberley Mines will be separated in colour-coded bins (also referred to as telecons) according to the waste classification categories prior to final disposal at any registered landfill site, with preference given to the Sol Plaatjie Municipal registered landfill site.. Refer to the Standard Procedure on waste management, dated February 2010, attached hereto in **Appendix F1** for an indication of the mentioned waste classification categories.

According to the Standard Procedure on Waste Management, dated February 2010, attached hereto in **Appendix F1**, the transport and disposal of general waste at De Beers Kimberley Mines is the responsibility of the Assistant Engineering Manager and section leaders.

The CTP the only processing Plant and general waste management procedures have therefore only been summarised above pertaining to those relevant to the CTP, including the Recovery / Sort house. Refer to the Standard Procedure on Waste Management, dated February 2010, attached hereto in **Appendix F1**.

3.11.3 HAZARDOUS WASTE DISPOSAL

Hazardous waste is defined by De Beers Kimberley Mines as *“waste which can, even in low concentrations, have a significant adverse effect on public health and / or the environment. This is on account of its’ inherent chemical and physical characteristics such as toxicity, ignitibility, corrosiveness, carcinogenic, and other properties”*. The following material discarded on site can be regarded as potentially hazardous:

- Oily waste, primarily from the processing, storage and use of mineral oils and the servicing of machinery.
- Organic waste, e.g. paint and resin waste (lead-based paint).
- Inorganic waste such as acids and alkalis, and solutions, as well as waste containing marginal proportions of fibrous asbestos.
- Other wastes including fluorescent tubes, redundant chemicals, etc.
- Medical waste.
- Radioactive waste (i.e. redundant radioactive sources at the CTP).

It is anticipated that hazardous waste will only be generated at the CTP, which is currently the only operational Treatment Plant at De Beers Kimberley Mines, (Environmental Monitoring and Measurement, 2006). Since opencast and underground mining activities have ceased and only tailings resource recovery methods are currently undertaken at De Beers Kimberley Mines, no explosive waste is generated at De Beers Kimberley Mines.

As all other waste generated at De Beers Kimberley Mines, hazardous waste will be separated and collected within colour-coded bins which is located within a demarcated area at each site. Each colour-coded bin will be clearly marked for that particular waste type. According to the Standard Procedure on Waste Management, dated February 2010, attached hereto in **Appendix F1**, hazardous waste will be separated according to the following:

- Blue colour-coded special container for fluorescent tubes.
- Red colour-coded special container (recycling tanker) for used oil (clearly marked as used oil only).
- Red colour-coded telecon for all the material contaminated by heavy metals, oil and other pollutants.
- Electronic waste is sent to the IT department.

Hazardous waste disposal is conducted by an approved waste removal contractor. The Company removing the hazardous waste provides a certificate of safe disposal on removal of the waste and a final certificate upon disposal of the waste.

In general, all batteries (i.e. wet / dry cell) are to be sent to the supplier of the batteries. De Beers Kimberley Mines will be credited for the batteries and the company will provide the CFS with a safe disposal certificate. Refer also to the Standard Procedure on waste management, dated February 2010, attached hereto in **Appendix F1**, for more detailed information regarding the disposal of batteries at De Beers Kimberley Mines.

3.11.4 MINE RESIDUE DISPOSAL

De Beers Kimberley Mines currently produces two types of mine residue, namely coarse residue deposits (CRD)(tailings) and fine residue deposits (FRD)(slimes).

3.11.4.1 Tailing Mineral Resources (TMRs)

The tailings resources are operated according to the Code of Practice for De Beers Kimberley Mines' residue deposits dated October 2001 compiled by Wates, Meiring and Barnard.

Waste products generated during underground mining previously undertaken at De Beers Kimberley Mines consisted of coarse tailings which were deposited on the tailings resources, as well as wet slimes deposited on the slimes dams. However, as mentioned previously, the underground mining activities at De Beers Kimberley Mines have ceased. Due to improved technology, it has been found viable for De Beers Kimberley Mines to reclaim most of the tailings resources located within the mine boundary of De Beers Kimberley Mines. A tailings reclamation sequence and plan was compiled as part of the De Beers Kimberley Mines Business Plan, and is updated monthly.

Since the CTP is currently the only operational Plant, tailings material from the old tailings resources that has been identified to be reclaimed is transported by truck to the CTP where it is stockpiled and processed.

The tailings deposits at De Beers Kimberley Mines can be subdivided as follows:

- Old tailings resources earmarked for re-treatment.
- Reminders of Old tailings resources to be rehabilitated *in situ* (minimal).
- Current Coarse Residue Deposits.

- Current Fines Residue Deposits.

3.11.4.1.1 Old tailings resources earmarked for reclamation

Most of the old tailings dumps (now referred to as tailings resources) within the De Beers Kimberley Mines mining area have been earmarked for reclamation. Various tailings resources yield various grades of material to be processed at the CTP, and therefore mining of several tailings resources takes place simultaneously.

3.11.4.1.2 Old tailings resources to be rehabilitated in situ

At present, Dump 8 has been earmarked for *in situ* rehabilitation, since the potential for reprocessing is low due to the grade of the Kimberlite within the dump. It is also possible that other old tailings dumps (resources) may be rehabilitated *in situ*, reshaped and worked back. However the intentions of the mine regarding the *in situ* rehabilitation or reprocessing of the dump will be clarified as part of the finalisation of the Closure EMP for De Beers Kimberley Mines. The draft Closure Plan dated 2009 for De Beers Kimberley Mines has been attached in **Appendix B**.

3.11.4.1.3 Current tailings resource

The current Coarse tailings resource to the south of the CTP. Waste products generated from the current processes taking place at the CTP consists of coarse tailings and de-watered (paste) slimes. Tailings are deposited on the current tailings resource (No. 29), a large portion of which will also be re-treated in the future. Superkolong disposes coarse residue ahead of the advancing CRD TMR29.

Coarse residue (tailings) is conveyed to the current tailings resource in a dry state with average moisture content of approximately 15 %. The residue is deposited over the edge of the tailings resource and allowed to fall at its natural angle of repose.

Table 3.8 indicates the parameters for the current tailings resource as was recorded in 2012.

Table 3.8: Parameters of the current tailings resource as recorded in 2012

Description	Total
Footprint area	136.81 ha
Total height from the lowest point	85 m
Volume of tailings currently contained	93 437 804 m ³
Rate of disposal (2012)	302,000 tonnes / month

3.11.4.2 Slimes dams

The main difference between the tailings and that of the slimes is the particle size of the slimes which is smaller than 1 mm in diameter. Fine waste is thickened at the CTP before being deposited hydraulically on the CTP Slimes dam.

Three of the four KMF operations simultaneously dispose of coarse tailings and dewatered slimes into the De Beers Pit after recovery. **Table 3.8** indicates the slimes dams at De Beers Kimberley Mines as well as the relevant volume and surface area of these slimes dams.

Table 3.8: Slimes dams at De Beers Kimberley Mines as well as the relevant volume and surface area of these slimes dams

Description	Surface area (m ²)	Volume (m ³)	Height (m)
Kenilworth Plant slimes area (decommissioned)	360 000	468 000	X
De Beers Pit slimes deposition facility	298 000	101,000,000 (Co-disposal)	400m
Area 1 FRD	146 000	43 725	1.6m
Boshoff slimes (decommissioned)	60 000	240 000	2m
ODTP slimes area (decommissioned)	1 350 000	20 250 000	X
CTP slimes dams	4 070 000	20 125 000	8m

In addition to the above-mentioned slimes dams at De Beers Kimberley Mines, an emergency slimes holding facility situated to the east of CTP. This facility is described in detail within the De Beers Kimberley Mines IWWMP, dated October 2006, extracts of which are attached in **Appendix E**, and briefly summarised below.

As mentioned previously, the tailings including the slimes from the small mining initiatives are disposed of into the De Beers Pit. A Slimes Thickening Plant which improves the viscosity of the slimes was constructed at De Beers Mine area.

According to the De Beers Kimberley Mines IWWMP, dated October 2006, the emergency slimes holding facility has a surface area of 31 000 m², a height of 2 m and a capacity of 62 000 m³. In addition to the natural clay layer that serves as an impervious membrane, this facility has toe trenches to contain seepage, return water as well as storm water falling on the side slopes of the dam. It still serves as an emergency facility to contain slimes if necessary in the future, thus minimising potential surface water pollution.

3.11.4.3 In-pit backfilling

As mentioned previously, opencast and underground mining activities by De Beers Kimberley Mines have ceased and only tailings resource recovery methods are currently undertaken. With approval from the then DME on 14 March 2000, tailings material from the recovered tailings resources, especially resulting from operations at the small mining initiatives, are disposed of into the De Beers Pit. The filling of the pit with tailings material also forms part of the rehabilitation of the De Beers Pit. The De Beers pit will be filled, domed and then capped with an armour layer. This doming is done in order to account for any subsidence that may occur. Refer to Photograph 7 of Appendix D for a visual representation of the backfilling of De Beers Pit with tailings material.

3.12. WATER MANAGEMENT

3.12.1 DOMESTIC WASTEWATER MANAGEMENT

Sewage generated at the De Beers Kimberley Mines is collected by a network of sewers and directed to the Greenpoint Municipal Sewage System Plant.

3.12.2 STORM WATER MANAGEMENT

Storm water management is based on the principle of separating clean and dirty water and therefore incorporates the fundamental principle of pollution prevention. The impact of the mining operations on the hydrological cycle (water flow and quality), and visa versa must be addressed as part of a Storm Water Management Plan (SWMP) that must still be developed for De Beers Kimberley Mines in the near future.

Due to the absence of any natural defined drainage channels, surface runoff from the study area is mainly overland sheet flow. The entire water management system at De Beers Kimberley Mines was developed in such a way that effluents, spills and affected runoff, especially from tailings resources, reach the Dutoitspan. This is done by a network of storm water trenches which vary from approximately 1.5 m x 1 m to about 3 m x 2 m. These storm water trenches occur on the outside and inside of the mining areas of De Beers Kimberley Mines. Refer to Photograph 8 of **Appendix D**, for an example of such a storm water channel within the mine boundary of De Beers Kimberley Mines.

No storm water management measures such as berms exist around either the tailings resources situated within the mine boundary of De Beers Kimberley Mines or stockpiles at the Treatment Plants. Therefore, the current separation of clean and dirty water within the mine boundary of De Beers Kimberley Mines is insufficient. The entire mine is thus regarded as a dirty water management system. A Surface Water / Storm Water Management Audit Report must be conducted by a suitably qualified person to assess whether any additional clean water diversions are possible or necessary to maximise the clean water area of the mine. This should also include a risk assessment to quantify the risk associated with the current approach to the environment. The compliance with requirements of GN 704 will also be ensured during such an assessment.

3.12.3 WASTEWATER DISPOSAL / STORAGE FACILITIES

It is the intention of this part of this EMP (incl. EIA) document to describe the current wastewater management measures that are implemented at De Beers Kimberley Mines, as well as the wastewater disposal facilities utilised as part of the water management system, undertaken at De Beers Kimberley Mines to facilitate in minimising potential impacts associated with the current mining and related activities taking place at the mine.

3.12.3.1 4 Million gallon dam

Treated effluent water from the Hill reservoir is gravitationally fed to the 4 Million gallon dam, which is situated south of the CRD. It was not included in the Phase 2 purchase agreement with Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture, and therefore remains the property and responsibility of De Beers Kimberley Mines. The 4 Million gallon dam has a capacity of 18.2 Ml and water from this dam is pumped to the CTP to be re-used as process water. Contaminated water from this dam is also utilised by Superkolong, for use in their process.

3.12.3.2 20 kl Jojo tank

The 2 x 20 kl Jojo tank is utilised for fire fighting as well as for gland service water.

3.12.3.2 CTP

The CTP receives water from water storage facilities (4 Million Gallon Dam) as well as water from the underground workings at Wesselton Mine. This water is used within the diamond recovery process currently taking place at the CTP.

3.12.3.2.1 Plant Spillage reservoir

The plant spillage reservoir is centrally located to collect contaminated runoff water from the Treatment Plant for re-use in the processes at the CTP. Contaminated water from the CTP is collected in concrete lined channels and directed through a concrete lined settling pond into the concrete lined slimes spillage reservoir. The settling pond will allow for particles to settle, and all water flowing into the mentioned reservoir will therefore have minimum suspended particles. The plant spillage reservoir has a wall height of 2.7 m, a surface area of 0.2 ha and the capacity to store 3 000 m³ of water.

3.12.3.2.2 Process water tanks

Process water from the 4 Million Gallon Dam is stored within two process water tanks situated at the CTP. The water contained within the process water tanks are utilised during the recover process at the CTP. These tanks have a capacity of 1 500 m³ each. Refer to Photograph 9 of Appendix D.

3.12.3.2.4 Clear water dam

The CTP clear water dam is situated at the CTP and receives water from the Wesselton Mine underground workings. Water contained within the CTP clear water dam is used in cleaner processes undertaken at the CTP.

3.12.3.2.5 Dutoitspan

Although Dutoitspan was a natural seasonal pan prior to the commencement of mining and related activities at De Beers Kimberley Mines, this pan is currently a perennial water body that is regarded as a affected water storage facility.

3.12.3.2.6 Paardebergvlei

The Paardebergvlei is situated downstream of the Dutoitspan. Both the Paardebergvlei and the Benfontein Pan are usually dry, except for one or two months of the year during the rainy season.

Although Dutoitspan previously overflowed into the Benfontein Pan via the Paardebergvlei during heavy rainfall events, it is not anticipated to overflow to the mentioned pan in future since a borrow pit has been constructed downslope of Dutoitspan. This borrow pit is also utilised as an emergency storage facility for affected storm water runoff from the CTP slimes dams. In addition to the mentioned borrow pit, Paardebergvlei is currently dry and therefore no additional flow of contaminated water to the Benfontein is anticipated to occur. Refer to Photograph 4 of Appendix D.

3.12.3.2.7 Hill reservoir

The Hill reservoir is situated to the north of the CTP. The Homevale WWTW supplies treated effluent to six maturation ponds from where the treated effluent is pumped to the lined Hill

reservoir. The treated effluent contained within the mentioned reservoir is fed by means of gravitation to the 4 Million Gallon Dam, which in turn supplies the CTP with process water. A small amount of treated effluent from the Hill reservoir is supplied to the Gun Club as well as to Superstone. This lined dam has the capacity to store 14 000 m³ of water and covers a surface area of 1.1 ha.

3.12.3.2.9 Borrow pit situated adjacent to the CTP slimes dams

A borrow pit was excavated adjacent to the CTP slimes dams and the Paardebergvlei. This borrow pit was utilised as an emergency storage facility for affected storm water runoff from the CTP slimes dams. Refer Photograph 3 of **Appendix D** for a visual representation of the mentioned borrow pit.

3.12.6 WATER AND SALT BALANCES

3.12.6.2 Water balance

A water balance for water consumption at De Beers Kimberley Mines was initially calculated in March 2003. However, mining operations at De Beers Kimberley Mines have changed significantly since March 2003 and therefore the water balance was updated in 2011, expanded and converted accordingly. Seasonality and operating requirements of water management measures, amongst other, is incorporated.

De Beers Kimberley Mines is committed to updating and expanding the current water balance to reflect the current situation at the mine. This will in return ensure the effective utilisation of the water balance as a management tool, for example in simulating the effect of additional water management measures or the effect of any rehabilitation projects on the water management system. Updating and expanding of the water balance will reveal the areas of concern for water management at De Beers Kimberley Mines, as well as non-compliance with the requirements of Regulation GN. 704 dated 1999.

3.12.6.2 Salt balance

According to DWAF's Best Practice Guideline G2: "*Water and Salt Balances*", dated August 2006, accurate water and salt balances are considered to be one of the most important and fundamental water management tools available. The purpose of water and salt balances include amongst other:

- To provide the necessary information to assist in defining the mine's water management strategy.
- To assist in assessment of the proposed water reticulation system, with the main focus on water usage and identification of possible pollution sources.
- To assist with the design of proposed storage facilities and minimisation of the risk of spillage.
- To assist with the water management decision-making process by simulating and evaluating various water management strategies before implementation.

No salt balance exists for De Beers Kimberley Mines due to limited water quality data, especially on a micro scale. A salt balance complying with the requirements of the DWA will therefore be developed by De Beers Kimberley Mines, taking Closure into account. The salt balance should be utilised in the planning of the current mining and related activities, as well as to verify the applicability of the salt balance once actual monitoring information becomes available.

3.13 WATERCOURSE ALTERATIONS

3.13.1 WATERCOURSES

No natural drainage channels are present within the mining boundary of De Beers Kimberley Mines. Drainage systems were however, constructed during the development of the mining infrastructure to control storm water runoff within the mining area. The areas that constitute the Phase 1 and 2 purchase agreements to Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture contains these existing constructed drainage systems and is utilised by both De Beers Kimberley Mines and Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture to control storm water runoff. In 2012 a storm water management plan was commissioned and will be implemented.

3.13.2 WETLANDS

Dutoitspan and Paardebergvlei (outside Mining licence area) occur within the De Beers Kimberley Mines property. These wetland areas are not under statutory protection. . Suitable habitat for such water bird species is, however, provided in the Dutoitspan throughout the year due to water being pumped from the mines to the pan. The ecological importance of the Dutoitspan and Paardebergvlei will be determined as part of a biodiversity study that will be conducted for the mine.

Dutoitspan is however currently regarded by the mine as part of the affected water management system since it receives contaminated runoff water from various mining areas. Dutoitspan overflows into the borrow pits south of the CTP FRD and only during exceptional rains (1/100 year flood) will water flow to Paardebergvlei which in turn has the potential to overflow into the Benfontein Pan.

3.14 LAND USE OPTIONS AFTER REHABILITATION

Mining at De Beers Kimberley Mines commenced over a century ago, and the town of Kimberley grew around the De Beers Kimberley Mines. As a result of this historical development, the town of Kimberley and the De Beers Kimberley Mines mining area are intertwined, leading to a relatively complex situation regarding post-mining land use options. The situation of the town of Kimberley also places certain limitations on post-mining land use options when considering long-term sustainability of such land uses. Due to the complexity of the situation at De Beers Kimberley Mines, it is not possible to identify a single end land use for the De Beers Kimberley Mines. It is anticipated that a combination of site specific end land use options will need to be considered for specific areas within the De Beers Kimberley Mines mining area, including the following, amongst others:

- *In situ* rehabilitation of tailings resources (dumps) and slimes dams.
- Removal of surface infrastructure and rehabilitation of the disturbed surface land use area (e.g. to grazing potential in areas outside of Kimberley town, and to a state where the land can be utilised for industrial or residential buildings, etc.),
- Conservation / preservation of buildings and sites of historical importance (e.g. Kimberley Mine – the Big Hole).
- Sale of potentially viable mineral resources to other mining companies (this has already been implemented for the underground mines and tailings material at De Beers Kimberley Mines which constituted the Phase 1 and 2 purchase agreements).

The detailed site specific end land use objectives will be determined as part of the Closure EMP which will be developed in consultation with the relevant Authorities and Interested and Affected

Parties in the near future. The draft Closure Plan dated 2009 for De Beers Kimberley Mines has been attached in **Appendix B**.

3.15 BENEFITS OF THE PROJECT

As underground mining was curtailed at De Beers Kimberley Mines in 2005, the underground mines, and related infrastructure, were sold to Crown Resources (Pty) Ltd.: Kimberley Underground Mine Joint Venture. The purchase agreement, as previously mentioned, consisted of two phases namely; Phase 1 (completed in 2010) and Phase 2 (recently completed). The liability, responsibility as well as rehabilitation of the areas that constitutes the phases of the purchase agreement now fall with Crown Resources (Pty) Ltd.: Kimberley Underground Mines Joint Venture. De Beers Kimberley Mines therefore, benefits from the Phase 1 and 2 purchase by the selling of unused mines, areas and infrastructure.

3.15.1 WHERE IS IT INTENDED THAT THE PRODUCT(S) WILL BE SOLD

De Beers Kimberley Mines, as previously mentioned, curtailed its underground mining and is only involved in the tailings reclamation and resource recovery processes. De Beers Consolidated Mines distributes the diamonds, recovered from De Beers Kimberley Mines, to the rest of the world via the Central Selling Organisation in London.

3.15.2 AN ESTIMATE OF THE TOTAL ANNUAL EXPENDITURE AT FULL PRODUCTION

The total annual expenditure at De Beers Kimberley Mines to maintain the current operation is approximately R 454 million which exclude diamond stock movement and indirect De Beers Consolidated Mines charges.

3.15.3 AN ESTIMATE OF THE CURRENT LABOUR FORCE

In addition to numerous contractors used in operations, 283 staff members are currently employed at De Beers Kimberley Mines effective 31 January 2012, of which 200 permanent staff is working at the CTP.

3.15.4 AN ESTIMATE OF THE MULTIPLIER EFFECT ON THE LOCAL, REGIONAL AND NATIONAL ECONOMY

Suppliers and contractors in Kimberley, as well as the rest of South Africa, benefit from mining and related activities at De Beers Kimberley Mines. Approximately 400 contractors and suppliers within the Northern Cape Province, as well as 800 contractors and suppliers outside of the province benefit from the De Beers Kimberley Mines operations. An average of approximately R 60 million is spent locally, while R 100 million is spent in the rest of South Africa.

3.16 LISTS OF ACTIVITIES TO BE UNDERTAKEN AS PART OF THE PROJECT IN TERMS OF THE MPRDA (2002)

As mentioned previously, De Beers Kimberley Mines is currently a fully operational mine and no new expansion projects are being planned for the near future. No activities during the construction phase are therefore applicable for De Beers Kimberley Mines. The impacts associated with the Construction Phase are therefore not described within this EMP (incl. EIA) document. All relevant aspects, if any, will be addressed under the Operational Phase.

3.16.1 CONSTRUCTION PHASE

As mentioned previously De Beers Kimberley Mines is currently a fully operational mine and no new expansion projects are being planned for the near future. This part of the EMP document is therefore not applicable for De Beers Kimberley Mines. The impacts associated with the Construction Phase are not described within this EMP (incl. EIA) document. All relevant aspects, if any, will be addressed under the Operational Phase.

3.16.2 OPERATIONAL PHASE

As mentioned previously, De Beers Kimberley Mines has been operational since 1870. Since this time, the Kimberley Mine ("Big Hole") closed in 1914 and De Beers Mine in 1990. In addition, opencast and underground mining activities have ceased at De Beers Kimberley Mines, although tailings recovery methods are currently in operation.

The following activities take place during the Operational Phase at De Beers Kimberley Mines:

- Mining and related activities:
 - Extraction of Kimberlite ore by means of tailings resource recovery techniques by the small initiatives (Dumpco, Superstone, Superkolong and Sedibeng),
 - The pumping out of water accumulating in the pits.
 - Transport of the Kimberlite ore to the CTP¹⁵.
 - Disposal of coarse mining waste and slimes.
 - Operation of the CTP and the KSMP¹⁶.
- Utilisation of infrastructure:
 - Utilisation of pollution control measures, e.g. the pollution control dams, return water dams, as well as storm water management measures, e.g. trenches.
 - Utilisation of ablution facilities, offices and workshops.
- Rehabilitation and restoration of disturbed areas:
 - In-pit backfilling at the De Beers Kimberley Mines.

3.16.3 DECOMMISSIONING PHASE

The Decommissioning Phase will commence when the reclaiming of tailings (and thus the production of diamonds) ceases at the De Beers Kimberley Mines. This phase will continue until Closure begins.

The following activities, which are expected to impact on the surrounding environmental aspects, are anticipated to take place during the Decommissioning Phase:

- Removal of infrastructure:
 - Ripping and removal of haul road material, as well as removal of redundant infrastructure such as the Treatment Plants, workshops, conveyors, other buildings (e.g. offices), depending on the post-closure land use.
 - The demolition of redundant concrete structures.
- Rehabilitation and restoration of disturbed areas:
 - Final backfilling of the De Beers Pit.
 - Rehabilitation of waste dump sites (*in situ* rehabilitation of, as well as the rehabilitation of the remaining footprints of, waste dumps that will be removed).
 - Clearing of stockpile areas.

¹⁵ CTP: Combined Treatment Plant.

¹⁶ KSMP: Kimberley Mines Sampling Plant.

- Rehabilitation of footprint areas of the reclaimed tailings resources.
- Shaping of rehabilitated areas, including the dams and remaining permanent tailings resources that are not reclaimed.
- Operation and maintenance of remaining pollution management measures, depending on the long-term water management strategy.
- Placement of topsoil (if required).
- Planting of vegetation.
- Monitoring and reporting.
- Stabilising and remediation of the affected areas.
- Maintenance of rehabilitated land until Closure is obtained.

It is important to note that activities that will be undertaken during the Decommissioning Phase will focus on rehabilitation. Routine monitoring and maintenance of the rehabilitated areas will be conducted until Closure is obtained under the MPRDA, 2002, and the Post-closure commences.

3.16.4 POST CLOSURE PHASE

The Post-closure Phase will commence once the mine has obtained a Closure Certificate from the DMR.