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CIVIL DESIGN REPORT FOR THE SURFACE WATER MANAGEMENT STRUCTURES

FOR THE

KEBRAFIELD ROODEPOORT COLLIERY MINE DEVELOPMENT

ON

PTN 17 OF THE FARM ROODEPOORT 151 IS EMALAHLENI LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

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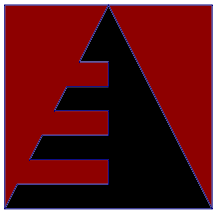

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1. INTRODUCTION

This Civil Engineering Design Report on the Surface Water Management Structures has been compiled in order to assist with the proposed Kebrafield Roodeport Colliery Mine Development to comply with the required Regulations with regard to new mining operations as set out in the National Water Act, 1998 (Act 36 of 1998) as well as the regulations for use of water for mining and related activities as set out in Government Notice No GN704 dated 4 June 1999.

2. GENERAL INFORMATION

The new mining project entails the construction of the following mining infrastructure on the properties:

- Opencast mining operations on Ptn 17 of the Farm Roodepoort 151 IS;
- Gravel haul and maintenance roads on all proposed mining areas;
- Office complex and workshop areas on all proposed mining areas;
- Top soil stockpiles on all proposed mining areas;
- ROM stockpiles on proposed mining area;
- Overburden dumping areas on the proposed mining area;
- Containment structures for dirty water management on all proposed mining areas.

The mine envisages to engage in several water uses that require authorization in terms of Section 21 of the National Water Act, 1998 (Act 36 of 1998). The water uses that need to be applied for are:

- Section 21(j) for the dewatering of the open pit / underground mining shafts;
- Section 21(f) for the discharge of water containing waste (if needed);
- Section 21 (g) for the ROM and Stockpile areas;
- Section 21(g) for the use of process water for dust suppression;
- Section 21(g) for using ROM as backfill material in opencast areas;
- Section 21 (g) for the tailings dam (and associated return water dam); and
- Section 21(g) for the disposal of sewage waste into a septic tank (to be determined).

Impact on water resources is to be expected and therefore appropriate mitigation measures need to be implemented in order that the existing natural water course of an unnamed tributary the Woes-Alleen Spruit and other water users in the vicinity of the mining area not are negatively impacted on.

The proposed mining area falls in a sub-catchment of the quaternary catchment B12B (Klein-Olifants River).

It also pointed out that the proposed opencast mining area on Ptn 17 of the Farm Roodepoort 151 IS is located adjacent to an unnamed tributary of the Woes-Alleen Spruit and any mining activity within the 1:100 flood or 100m buffer line will not be permitted.

The total area for the proposed mining area on Ptn 17 of the farm Roodepoort 151 IS is approximately 29,0149ha. This area excludes any area within the 100mm buffer line and the 1:100 year flood line. It also excludes the area demarcated for the road diversion.

Runoff from ore stockpiles, overburden and discard stockpiles need to be contained, as stormwater from these areas become polluted. Water pumped from mining activities in the opencast mining pit is also regarded as polluted water and according to regulations is to be contained with all other polluted water runoff.

Potential water flows stemming from uncontrolled seepage and decants is not expected and therefore no provision for intercept of any seepage and decant is required.

The mine will follow a zero discharge policy and water management infrastructure will be designed in accordance with the requirements as contained in GN 704 Regulations. In this instance clean water separation will be introduced, allowing direct runoff towards natural watercourses. Surfaces within the mining dirty areas will be kept to a minimum to reduce the volume of dirty runoff generated by mining activities. The affected polluted water will be collected in HDPE lined pollution control dams from where the dirty water will be recycled for further use and exposed to evaporation.

3. LOCALITY

The proposed Kebrafield Colliery is situated in the jurisdiction of the Emalahleni Local Municipality. The applicable farm portion is Portion 17 of the Farm Roodepoort 151 IS and is situated over a local dirt road which is to be relocated around the higher side of the proposed mining operations.

The reader is referred to Appendix A for the location of mine.

An unnamed tributary of the Woes-Alleen Spruit is located on the eastern side of the proposed mining operations. No other defined drainage channels have been identified crossing the proposed mining area on Ptn 17 of the Farm Roodepoort 151 IS. The village of Pullens Hope is in turn located to the east and directly adjacent to the unnamed tributary.

No natural drainage channel will have to be diverted due to the proposed mining operations.

4. GEOLOGY/GEOHYDROLOGY

The area is characterised by a gentle undulating topography and in the area of the proposed opencast coal mine the slope is more or less in the order of 1:50.The direction of the slope on site is towards the east towards the tributary of the Woes-Alleen Spruit.

The upper soil horizons have high erosive potential and therefore special care must be taken with surface water management as the whole study area has high erosive potential.

The soil conditions in which the water management structures are to be sited indicate soils of moderate permeability and therefore water containment structures are to be lined in order to limit polluted water seepage in to the groundwater.

Groundwater seepage into mining activities will be pumped out from the mining operations via a network of pipes to the PCD's, alternatively into the diversion channels. It has been determined that the groundwater inflow into mining activities will amount to 120m^3 per day.

5. SURFACE WATER MANAGEMENT STRUCTURES

Regulation GN704 requires that the capacity of any stormwater management structure must be designed to cater for a 1:50 year 24 hour storm in addition to any other storage required. To this effect a design storm equal to 126mm will be applied in order to determine stormwater run-off and for which the capacities of the PCD's must be designed for.

The surface water management structures which are to be implemented will entail the following:

- Water conveying structures (lined channels and berms)
- Pollution Control Dams lined with a HDPE lining.

5.1 WATER CONVEYING STRUCTURES

Water conveying channels will be provided along the higher side of the mining areas in order to divert clean surface water draining from higher lying areas to natural drainage courses traversing the project area as indicated on drawings no 2379/001/A and 2379/002/A attached as Appendix B.

Strategically aligned berms and channels will be located within the mining area in order to contain the polluted surface water runoff from the mining area and from contaminated sources originating from the mining operations as indicated on drawing no 2379/003/A attached as Appendix B.

Diversion channels will be constructed in order to divert polluted (dirty) surface water to pollution control dams (PCD) where the polluted water will evaporate leaving the pollution elements behind in the PCD. Detail of typical diversion channels required for this proposed mining project is indicated on drawing 2379/003/A.

The capacity of the diversion channels are determined by the area which is to be drained. The critical areas would be the areas utilized for the access roads, overburden dump areas, ROM stock pile and the mine workshop and admin areas. The capacity of the channels must cater for the run-off of a 1:50 x 24h storm (GN704).

Appendix D provides the flow calculations for the various diversion channels as proposed. The maximum flow velocities vary from 1,72m/s to 2,11m/s for each of the diversion channels. Erosion of the channel is to be expected at these flow velocities and it is recommended that all diversion channels be lined with a 100mm thick 20MPa concrete lining reinforced with Ref 100 mesh reinforcing to eliminate any erosion of the channel sides. By lining the diversion channels, infiltration of polluted water in to underground water aquifers will also be eliminated.

5.2 WATER CONTAINING STRUCTURE

Provision of water containing structures is critical and is required to store all surface water originating from the dirty mining areas. The water originating from mining activities would include groundwater pumped from the pit operations, surface water originating from rainfall and seepage/decanting water from the mining operations.

The water containing structures will be lined with 1,5mm thick HDPE liner, in order to limit any seepage/leakage from the dam. The lining will protected by a 200mm earth backfill over the lining. This will also prevent the uplift of the lining should groundwater be trapped below the lining.

The positioning of any structure, including pollution control dams, is critical and may not be placed within the 1:100 year floodline or the 100m buffer line of any natural water course. The proposed positions of these water containment structures are indicated on drawing no 2379/001/A. Typical construction detail of the dams are indicated on drawing 2379/003/A attached as Appendix B.

6. WATER BALANCE DETERMINATION

The size of the proposed water containment structures is determined by the following inflows factors:

- Rainwater inflow
- Groundwater inflow
- Decanting and seepage from polluted sources
- Evaporation
- Re-use of contaminated water from the water containment structure

6.1 RAINFALL / EVAPORATION DATA

Summary of the rainfall/climate data utilized for calculations is set out as follows in Table 1 below.

Table 1 : Rainfall / Evaporation Data

Item No	Description	Unit
1	MAR for B12B	98 mm
2	Mean Annual Evaporation	1 810.39 mm
3	Mean Annual Precipitation	707.23 mm
4	1:50 x 24 hour Rainfall	126 mm

6.2 RAINWATER INFLOW

The mine is located in the summer rainfall of South Africa and rainfall usually occurs in the form of convectional thunderstorms with the high rainfall months being between October and March. Climate data (Mean Annual Rainfall and Mean Annual Evaporation) from the weather station 516480 at Schoonoord in the Mpumalanga Province, approximately 18km from the Kebrafield Roodepoort Colliery, indicates that the average annual rainfall / precipitation (over a period of 50years) for the project area is 707mm per annum and the mean annual evaporation to be approximately 1 810 mm per annum.

Table 2: Climatic Data for the Pullens Hope Area

Month	Average Rainfall (mm)	Mean Monthly Evaporation
January	123.36	191.56
February	90.15	172.72
March	74.13	158.83
April	31.92	126.85
May	11.06	104.97
June	7.99	86.19
July	10.47	98.42
August	15.89	130.48
September	27.68	171.99
October	75.12	189.10
November	111.22	185.20
December	128.23	194.08
Year	707.23	1810.39

Stormwater originates from rainfall onto clean natural areas as well as from rainfall onto the dirty areas and by way of surface flows, drains to the lowest point where this then needs to be disposed of. In the case of clean water, diversion channels are to be provided to collect surface water and divert the same to natural water courses before it becomes polluted.

In the case of polluted water, separate diversion channels will be provided and which will discharge into pollution control dams in which the polluted water must be contained. Evaporation will allow sedimentation to form and which can then be collected and disposed of in a responsible way.

Stormwater originating from rainfall onto the dirty areas needs to be managed and contained. For this requirement, the water containment structures have to provide sufficient capacity for it not to allow spillage for a storm intensity of 1:50 years x 24 hours runoff. The runoff determined from this storm will determine the storage capacity of the pollution control dams (PCD) for the proposed mining activities located on Ptn 17 of the farm Roodepoort 151 IS and will be the determining factor in sizing the PCD.

Provision for the containment of runoff of polluted water will be confined to active opencast mining areas, mine haul roads, mine access roads, overburden dump areas, run-of-mine stockpile areas and mine workshop areas.

6.3 GROUNDWATER INFLOW

It is confirmed by the geohydrologist that groundwater inflow into the opencast mining operations is to be expected. It is estimated that the inflow in the opencast mining operations will be 120m^3/day.

6.4 DECANTING AND SEEPAGE

Decanting and seepage is not expected from the minining operations once the mine operation areas have been rehabilitated. Therefore no provision is made to intercept this discharge of groundwater.

6.5 EVAPORATION

Climate data for the area indicates that the average evaporation figure for the project area is 1810 mm per annum. The annual evaporation figure for the area is considerably more than the combined groundwater inflows and annual rainfall figures which results in a constant water deficit.

6.6 RE-USE OF WATER

As an integral part of the water management system it is required that dirty water be re-used in the mine operations, mainly for dust suppression and washing of the mined product.

7. WATER POLLUTION GENERATION AREAS

Surface water management of any mining activity is critical in order to contain surface water originating from areas that may contaminate and/or pollute surface water run-off. It is also a requirement that clean water originating from outside or within the mining operations is to be separated and limited from entering areas which may contaminate or pollute the water. Providing strategically placed and aligned cut-off berms and drainage channels is essential in achieving the separation of clean and polluted water.

The following areas have been determined as potential pollution areas on the mine which can contaminate water:

- Mine haul roads;
- Mine access roads;
- Ore dump areas;
- Overburden dump areas;
- Run-of-Mine stockpile areas;
- Mine workshop areas;
- Coal seam mining areas.

It is during severe rain storms that the most water in the form of runoff is contaminated in a short period of time when it passes over/through the areas as defined above. It is therefore imperative that this runoff be managed by way of berms and drainage channels to force runoff to the pollution control structures as indicated on Drawing No 2379/001/A as attached as Appendix B.

Rain falling into the opencast mining pits, as well as groundwater inflow will be contained and collected in the pits and then pumped to the pollution control dams located outside the opencast pits. Provision for the containment of runoff from a 1:50 year storm in the pollution control structures needs to be provided.

The contours and topography of the land dictates that two (2) pollution control dams will be required as indicated on Drawings No 2379/001/A and 2379/002/A.

The areas as set out above all contribute in generating dirty water runoff and the areas therefore generating dirty polluted water are determined to be as follows:

- The dirty Catchment Area South is calculated to be : 151 160m^2
- The volume of the pollution control dam SOUTH required to manage a 1:50 year 24 hour storm : 19 046m^3
-
- The dirty Catchment Area North is calculated to be : 138 175m^2
- The volume of the pollution control dam NORTH required to manage a 1:50 year 24 hour storm : 17 410m^3

The construction detail of the dams is provided on Drawing 2379/003/A as attached as Appendix B.

8. POLLUTION CONTROL DAMS

The siting of pollution control dams is critical in order that it maximizes the containment of all polluted water. The pollution control dam design specifications are as set out below. The reader is referred to Appendix B for the siting and layout of the surface water management structures.

It is a requirement that pollution control dams do not leach any of the polluted contents into the groundwater and is therefore required to be lined in order to limit seepage. It is proposed that a 1,5mm thick HDPE lining be used to line the dam basin. The lining will be covered by a 200mm thick soil backfill.

8.1 POLLUTION CONTROL DAM SOUTH

- Type of dam structure : Earth embankment
- Seepage control : 1,5mm thick HDPE lining
- Earth embankment height : 3m
- Earth embankment crest width : 3m
- Earth embankment crest length : 320m
- Earth embankment slopes : 1:3 (for both up- and downstream slopes)
- Free board : 800mm

A typical cross section of the pollution control dam is provided on Drawing No 2379/003A attached as Appendix E.

8.2 POLLUTION CONTROL DAM NORTH

- Type of dam structure : Earth embankment
- Seepage control : 1,5mm thick HDPE lining
- Earth embankment height : 3m
- Earth embankment crest width : 3m
- Earth embankment crest length : 330m
- Earth embankment slopes : 1:3 (for both up- and downstream slopes)
- Freeboard : 800mm

A typical cross section of the pollution control dam is provided on Drawing No 2379/003A attached as Appendix E.

9. POST-MINING SURFACE WATER MANAGEMENT

No decanting of groundwater accumulating in the mined out areas is expected in the period following the completion of all mining activities, decommissioning and the rehabilitation of the mined areas.

It is also recommended that, when backfilling the mined areas, the topography which to be created, should be engineered in such a manner that overland runoff is directed away from the previous mined areas. The clean water channels which were provided during the mining operations phase should then in this instance be retained as this will assist in diverting any surface water away from the newly rehabilitated areas.

10. RIVER DIVERSION

The mining activities as planned will not impose on any tributaries and /or rivers and therefore no river diversions will be required. Only very small and localised natural drainage channels will be affected and will drain into the clean water cut-off channel to be constructed.

11. RECOMMENDATIONS

11.1 Stormwater diversion channels as proposed on drawing 2379/001/A be implemented.

11.2 Pollution control dams as proposed on drawing 2379/001/A be implemented.

11.3 Pollution control dams are to be lined with an impervious membrane (1,5mm HDPE lining) to limit any seepage of polluted water into the groundwater regime. The liner is to be protected by 200mm backfill laced over the HDPE liner.

11.4 Rehabilitation of mined areas is to be engineered to divert surface water flow away from rehabilitated areas.

11.5 A buffer of 10m wide be provided above the 100m buffer or the 1:100 flood line to allow for future surface water structures and access above the demarcated development boundaries.

12. SUMMARY

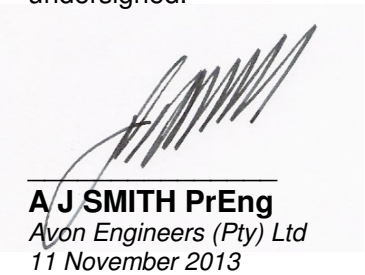
The water balance clearly indicates that, due to high values of evaporation as well as the use of onsite water, a water deficit will result. The pollution control dams, as a result, have been sized purely for the management of the runoff generated by a 1:50 year X 24 hour storm (GN704), as well as groundwater inflow into the mining cuts exposed at the time of mining.

Water conveying structures (such as drainage channels and berms) need to be provided, in order to manage and separate clean and polluted water, as well as channeling polluted water to the pollution control structures.

It should be noted herewith that surface water management is not a once-off mitigation action, but has to be monitored on a regular basis in order to determine whether the structures provided, are always relevant and appropriate. Maintenance of this infrastructure is essential in order successfully address potential pollution of the natural water courses.

The surface water management infrastructure as proposed has been formulated and designed according to the information supplied at this point in time. Should the surface water management infrastructure found to be inadequate to provide meaningful mitigation measures as intended by this report due to late changes in mine planning, the infrastructure as proposed will have to be redesigned, modified and/or upgraded to suit the later mining planning model requirement.

Should more details be required regarding this Design Report, please do not hesitate to contact the undersigned.



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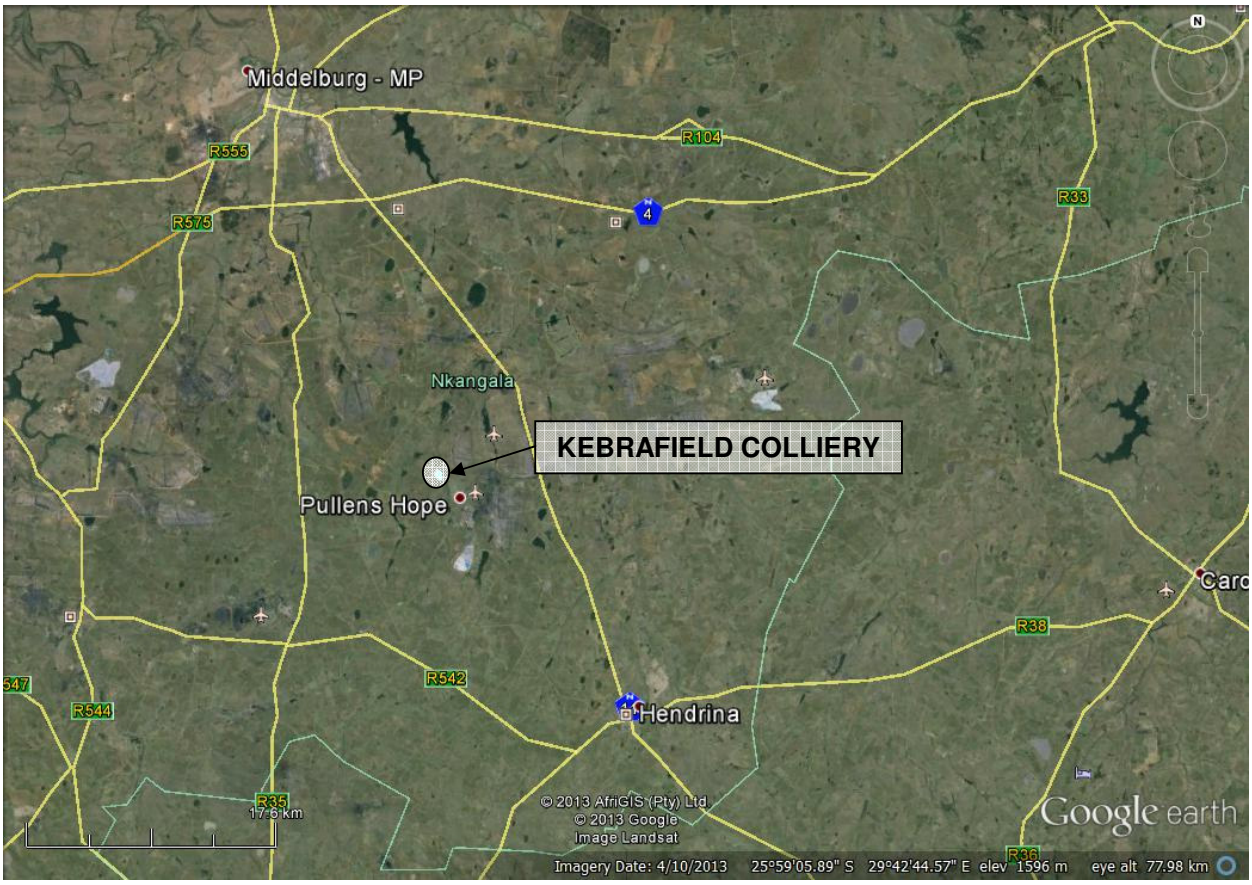
11 November 2013

APPENDIX A:
LOCALITY PLAN



LOCALITY PLAN

APPENDIX B:

SURFACE WATER MANAGEMENT STRUCTURES

2379/001/A
2379/002/A
2379/003/A

APPENDIX C:

WATER BALANCE CALCULATIONS

APPENDIX D :

DIVERSION CHANNEL FLOW CALCULATIONS