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Ecologists & Environmental Services

Storm Water Management Plan for proposed diamond prospecting operations on a portion of the Remainder of the farm Remhoogte 152 near Prieska, Northern Cape Province.

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DECLARATION OF INDEPENDENCE

DPR Ecologists and Environmental Services is an independent company and has no financial, personal or other interest in the proposed project, apart from fair remuneration for work performed in the delivery of ecological services. There are no circumstances that compromise the objectivity of the study.

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1. INTRODUCTION

The purpose of the assessment is to develop a **SWMP** (Storm Water Management Plan) to inform the **WULA** (Water Use License Application) that is required for the proposed prospecting operations for alluvial diamonds for which a mining authorization is being obtained in terms of the **MPRDA** (Mineral and Petroleum Resources Development Act).

1.1 Mining processes

The prospecting operations entail several different activities. The processing of material will be managed by the existing plant and infrastructure on the adjacent mining right area. However, these will also be discussed in brief for completeness sake. The main aspect with regards to storm water management is however concerned with the excavation of gravel and diamondiferous material. The main prospecting processes involved with the excavation of material will include the following:

- The clearance of an area of more than 20 hectares of indigenous vegetation.
- The development of haul roads with a width of 15 meters.
- The continuous lengthening (and rehabilitation) of these haul roads.
- The development of access roads with a width of 6 meters.
- The continuous establishment and reclamation of temporary stockpiles associated with prospecting operations.

The following structures, infrastructure and facilities will be erected to aid in the processing of material. As mentioned, the majority of these are already present in the adjacent mining right area and will also be used for prospecting operations:

- Processing plant.
- Ablution facilities; chemical toilets will be utilised and serviced regularly by a service provider.
- Control berms and trenches will be utilised to separate clean and dirty areas on the prospecting site.
- Fuel storage area; a 23 000 l diesel tank will be utilised and placed within bund walls with a capacity of 1.5 times the volume of the diesel tank. A concrete floor will also be established at the re-fuelling point.

- Existing roads will be utilised as far as possible although it is highly likely that additional roads will need to be created.
- Salvage yard (Storage and laydown area).
- Product stockpile area.
- Waste disposal site; the operation will establish a dedicated, fenced waste disposal site with a concrete floor and bund wall. Waste types to be disposed of in this area include low level hazardous material in closed receptacles, domestic waste and industrial waste.
- Temporary workshop facilities and wash bay.
- Water distribution pipeline.
- Water tank; establishment of a 10 000 litre water tank with purifiers for potable water.

The prospecting methods and processes which will be relevant to the management of storm water will include the following:

The prospecting operations will take place as a phased approach with prospecting initiated by a non-invasive desktop study which will include a literature survey, aerial photography and satellite image interpretation and ground validation of targets in the first year. The subsequent phases will be invasive in nature and will include pitting and trenching to determine grade and quality. The most invasive process will entail bulk sampling to determine the economic viability of the potential deposit. The total duration of the prospecting and evaluation activities is planned for five years.

- The desktop phase will not entail activities relevant to storm water management.
- RC-drilling will entail a reconnaissance line or grid of 200m x 200m or 100m x 50m with holes drilled approximately 5 meters deep depending on the depth to bedrock (it is envisaged that at least 300 holes will be drilled).
- Pits and trenches will be excavated. Approximately 150 pits of dimensions 2m x 3m x 5m and 20 trenches of dimensions 100m x 50m x 5m will be excavated.

1.2 Scope of Work

The proposed prospecting areas consist of two separate areas to the north and south of the current mining area which has been subjected to extensive alluvial diamond mining operations. The region is considered to have a low rainfall and forms part of an arid area. Consequently, wetlands are not abundant on the site. However, the prospecting area contains a high amount of watercourses. The Diepsloot, a large and prominent, though clearly ephemeral, stream system drains the northern portion while a few smaller drainage lines and the Brak River occur in or adjacent to the southern prospecting area. The combined extent of both prospecting areas are approximately 2 500 hectares although the core prospecting areas will exclude a large portion of the northern prospecting area (Map 1). The proposed prospecting areas has not yet been affected by mining operations and impacts on it are relatively low and they are therefore considered to be in a natural and pristine condition. The purpose is to develop a SWMP for the prospecting operations in support of the water use application in terms of the National Water Act, 1996. The main objectives of the SWMP are to ensure:

- Protection of life and property from flood hazards
- Prevention of erosion and consequent sedimentation of watercourses
- Protection of water resources from pollution
- Ensure continuous operation through different hydrological cycles
- Maintaining downstream water quality and quantity requirements
- Protection of the natural environment with the emphasis on the watercourses and their ecosystems

1.3 Methodology

- Desktop assessment of all available hydrological and rainfall data, topographic information, contours, aerial images and Scoping Report.
- On site assessment of surface water features, and potential sources of contamination.
- Interpretation of surface water flow patterns calculated from available survey data.

1.4 Principles that were considered during the development of the SWMP

- Prevent the contamination of clean runoff.
- Erosion is a consequence of surface water runoff and causes significant degradation of watercourses in terms of sedimentation.
- Dirty water must be contained and disposed or treated in an environmentally responsible manner.
- The SWMP must be sustainable for the life circle of the mine and relevant for all different hydrological cycles.
- The statutory requirements of the various regulatory authorities and stakeholders must be considered and incorporated.

2. OVERVIEW OF THE HYDROLOGICAL CYCLE AND PROCESSES THAT AFFECTS THE GENERATION AND MANAGEMENT OF STORM WATER

2.1 Background

As mentioned, the prospecting area consists of two separate areas and these fall within different quaternary catchments. The southern prospecting area associated with the Brak River falls within quaternary catchment D62J and the northern prospecting area associated with the Diepsloot falls within quaternary catchment D71D. Both form part of the Lower Orange Catchment in the Northern Cape Province. The affected watercourses also drain into the Orange River adjacent and to the north of the site (Map 1).

The study area is situated in the Nama Karoo Biome which is characterised by shallow, rocky soils and vegetation dominated by low shrubs/small trees but most prominently dwarf karroid shrubs. A grass layer is also present but not dominant. This is the dominant situation in the northern prospecting area. The southern prospecting area also has some affinity with the Savannah Biome which is situated across the Orange River to the north. This area includes deeper sandy soils and although a tree component, diagnostic of the Savannah Biome, is largely absent the area contains a much higher dominance by grasses.

Brak River and associated drainage line (Southern prospecting area)

The Brak River is a large watercourse which forms the southern border of the southern prospecting area (Map 1). It therefore does not form part of the site but there is still a high likelihood that it could be affected by prospecting operations. The catchment is also relatively unaffected by any large impacts which will also increase the condition of the river. The river flows into the Orange River approximately 6 km to the west of the site. Therefore, any impact on the river at the site is also likely to affect the Orange River. The banks are also affected by a severe infestation of the exotic Mesquite Tree (*Prosopis glandulosa*). This has a significant impact on the riparian community of the river. The riparian vegetation associated with the river is clearly indicative of high salt concentrations associated with the river. A small drainage line also drains into the river and originates in the central portion of this prospecting area along the foot of a low calcrete ridge. It drains from north to south along the foot of the ridge where it has a clear main channel in the deeper sands. This main channel does however become indistinct in close proximity to the Brak River in the bottomlands adjacent to it.

Diepsloot, associated drainage pattern and adjacent drainage lines (Northern prospecting area)

The Diepsloot is a large stream system associated with an intricate pattern of tributary drainage lines (Map 1). It dominates the northern prospecting area and together with its tributaries covers almost the entire prospecting area. The catchment is not affected by any significant impacts and the condition of the stream may therefore be considered to be pristine. The lower section of the stream is located adjacent to irrigated pecan nut plantations which will have some significant impacts on the stream mostly in terms of increased runoff as well as fertiliser and pesticide pollution. The stream flows into the Orange River almost directly adjacent to the site. Therefore, any impact on the stream at the site is also likely to affect the Orange River. The stream is also largely free of any exotic weeds or invaders with these being confined to a few exotic weeds. The vegetation associated with the stream is characteristic of riparian vegetation in this region but do not support the presence of wetland conditions. The stream is also associated with a substantial bottomland which is associated with silt and sediments transported from the catchment and deposited along the stream. The main channel of the stream also shows a high tendency for erosion. The site survey indicated that this system and catchment will be highly susceptible to erosion which should be taken into account in terms of the proposed prospecting.

A note should be made here that two drainage lines also occur to the north and south of the Diepsloot but are included in this description due to their proximity and similarity to this stream (Map 1). Small circular depressions were also identified along the eastern border of the Diepsloot which should be assumed to be depression wetlands and should be avoided by prospecting activities (Map 1).

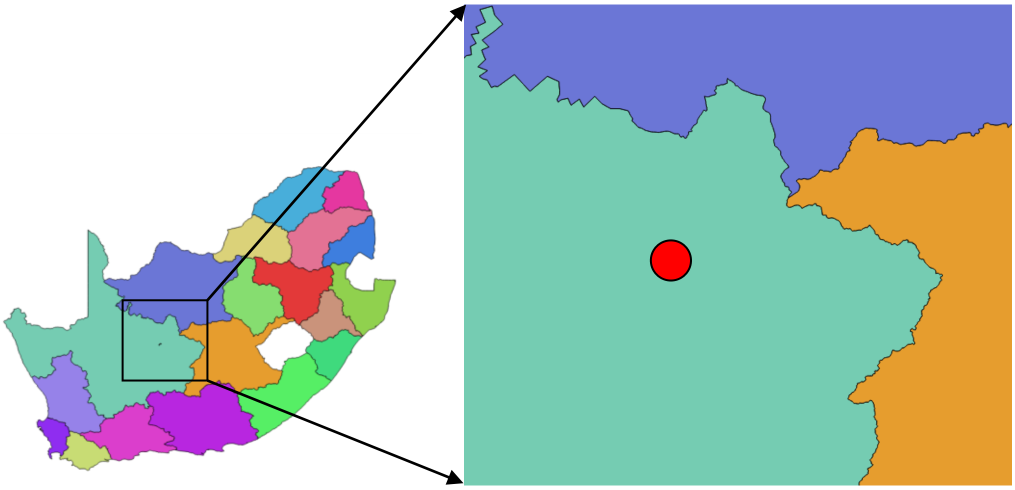


Figure 1: Location of the site within the Lower Orange WMA.

2.2 Precipitation

The prospecting area is situated in a dry region with a harsh climate, consisting of cold, dry winters and hot, semi-dry summers. Due to elevation characteristics as well as hydrological zone characteristics rainfall and evaporation data from the weather station D70E001 (Boegemos) are presented here. Prieska receives between 200 and 300 mm of rain annually, with the Boegemos station receiving a mean annual precipitation of 235.3 mm. Precipitation occurs mainly during autumn, with most rainfall received during February (41 mm) and March (40 mm). This is considered a relatively low rainfall and causes the area to form part of the more arid parts of South Africa. The mean annual evaporation at Boegemos is 2668.6 mm. Evaporation occurs mainly during summer, with most evaporation experienced during December (335 mm) and January (325 mm). The lowest (106 mm) evaporation is experienced in June. This decreases the likelihood of wetland conditions forming as soils are unable to retain saturated conditions due to high evaporation. The area does however contain a high amount of watercourses. Form the above it should be clear that the climate in the area is severe and is situated in an arid region. The surface water runoff in the area does not occur frequently and is quite erratic and results in an estimated mean annual runoff for the area between 0 – 2.5 mm according to a study by the Water Research Commission (WRC REPORT NO. TT 685/16, 2016).

From the above the average storm water runoff volumes is therefore considered to remain relatively low and should therefore be easily managed. This should however not be confused with flood discharge within the affected watercourses which can be substantial but should not be influenced by prospecting as long as the watercourses are excluded from the discussed operations.

2.3 Infiltration

Under normal conditions or undisturbed land the rate of infiltration averages 80%. The type of development or land modification has an impact on the rate of infiltration and therefore the amount of storm water generated.

The infiltration of storm water will be altered to a significant degree by mining activities. Where vegetation is removed for mining activities this will decrease the infiltration rate and increase storm water runoff to a significant degree (Mmachaka 2013, Mavimbela & Van Rensburg 2016). However, where areas with an even or low slope gradient is affected the estimated runoff will remain low and this should not result in a marked increase in runoff. In contrast, areas with steep slope gradients such as dominates the northern prospecting area has been shown to considerably decease infiltration rates and in combination with the clearance of vegetation the potential storm water runoff generation may become significant and would therefore also considerably increase erosion. As long as the steep slopes of the uneven terrain in the northern prospecting area is avoided by prospecting operations the impact on infiltration should not be significant. Exploration pits and trenches are also anticipated to be inward draining and will therefore not contribute to runoff.

2.4 Topography

Runoff is generated whenever the rain reaches the ground faster than it can infiltrate and the energy of the runoff water is a direct function of its potential to cause erosion.

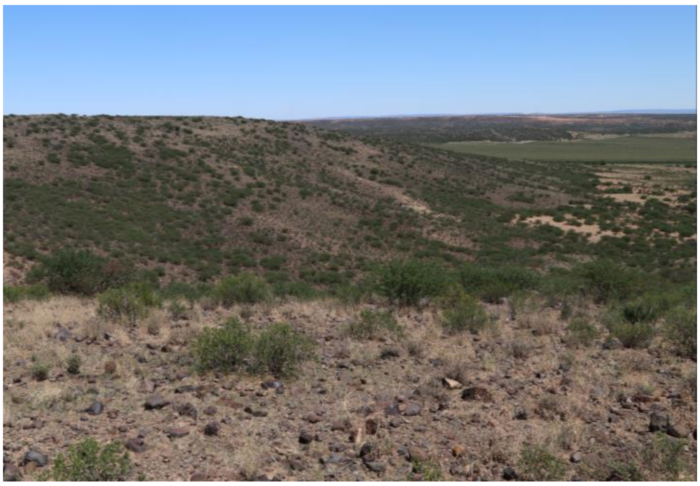
The topography of the study area is highly variable with northern area being the most uneven, rocky terrain.

The topography of the southern prospecting area is undulating with flowing landscape mostly devoid of prominent hills or ridges (Map 1). It contains a gradual but definite slope from the north to the south and is associated with the catchment of the Brak River which forms the southern border of the area. The elevation of the site decreases steadily toward the south and forms a bottomland associated with the Brak River. The elevation of this portion varies from 1022 m in the north and decreases to 942 m in the south and also clearly indicates a gradual slope over a large distance. Two prominent topographical units within this area are a calcrete outcrop along the eastern border also associated with a small drainage line and a low stony ridge along the eastern border. The Brak River is also a very important topographical feature and although situated outside the site boundary will still be included within the wetland assessment. The topography of the southern prospecting area will therefore be subjected to a relatively low erosion potential and infiltration will be high with lower runoff.

The topography of the northern prospecting area is very uneven and dominated by hills and ridges with calcrete cilffs and -capped mesas all linked to a complex stream system associated with a bottomland with high silt content (Map 1). The stream system is the Diepsloot and drains the entire prospecting area. It flows into the Orange River adjacent to the western border of the site. Although the terrain is highly uneven the general direction of slope is from east to west and follows the drainage pattern of the Diepsloot. A flat plateau surrounds this uneven terrain or valley system associated with the Diepsloot. The elevation is highly variable but is at its maximum along the plateau or mesas at around 1040 m and decreases to 946 m where the Diepsloot exits the site along the western border. Due to steep slopes and the presence of an intricate drainage pattern the uneven portion of the northern prospecting area will be subjected to a high erosion potential and infiltration will be low with a higher runoff. Although rainfall is relatively low, single, high rainfall events may generate flash floods in this portion which is evidenced by flood debris along the drainage network.

Excavations associated with the prospecting operations, including pitting and trenching, will be primarily inward draining and therefore not of significant concern to storm water runoff. Runoff which drains inwards into excavations will therefore not discharge into the watercourses on the site but will infiltrate to some degree as groundwater recharge. Those areas which will be of importance to storm water are areas where the natural vegetation has been cleared, including areas around excavations, stockpiles, haul roads and the processing plant. The southern prospecting area contains a relatively uniform topography with gradual slope which drains into the Brak River. However, due to the topography the storm water in this portion will be manageable using standard storm water management measures. The northern prospecting area contains a large portion of uneven terrain with steep slopes and an intricate drainage pattern. Here the topography will prevent adequate storm water management and erosion is anticipated to be highly problematic and separation of clean and dirty storm water will be difficult. This uneven, rocky terrain in the northern prospecting area should therefore be excluded as far as possible.

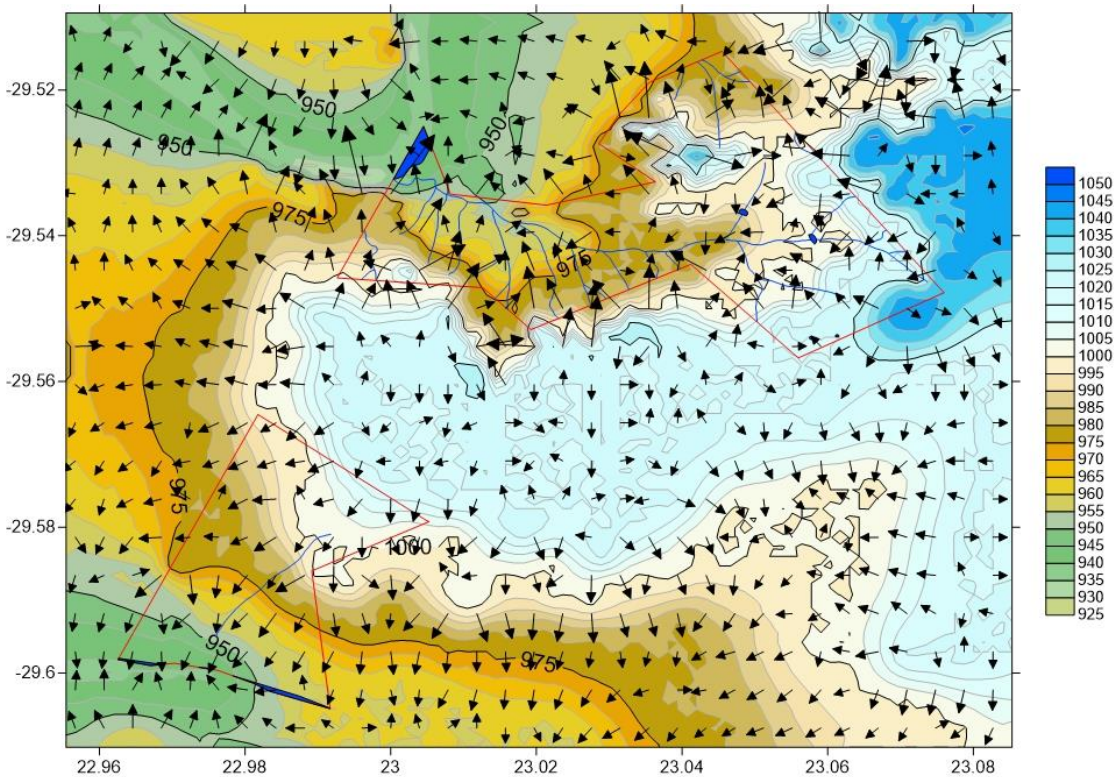
	The southern prospecting area has a gradual and gentle slope which will promote infiltration, decrease runoff and enable adequate storm water management.
	Though the slope in the southern prospecting area is gradual there is still a definite slope from north to south and toward the Brak River forming the southern border of this area.

	The bottomlands located adjacent to the Brak River (blue) is largely flat and will enable adequate management of the storm water runoff.
	The northern prospecting area contains steep slopes including cliffs which will significantly decrease infiltration and increase storm water runoff which will be problematic for storm water management.
	The majority of the northern prospecting area consists of uneven, rocky terrain.

	The northern prospecting area also contains an intricate drainage pattern with a multitude of drainage lines and streams all feeding into the Diepsloot.
	Flood debris (blue) in the main channel of the Diepsloot indicates that due to the steep slopes and isolated but highly infrequent heavy rainfall events it is discharged by flash floods.
	A large and deep main channel of the Diepsloot indicates that it is discharged by large but infrequent flash floods which will have significant implications for storm water management.

	The northern prospecting area contains small portions of plateau along the eastern and south western borders where the slope gradient is flat to gentle and it should be clear that storm water could be adequately managed here.

The surface water flow patterns are a function of the local topography and indicated in Figure 2 & 3 below. This clearly illustrates the main direction of runoff. The southern prospecting area will contain runoff mainly in a north to south direction with a clear but gradual slope. The northern prospecting area will contain an intricate, multi-directional runoff pattern but with the main direction of drainage being from the surrounding high lying plateau into the valley system associated with the Diepsloot and from this stream the main direction of drainage is from east to west. Note the highest elevation is located around the northern prospecting area.



<u>Figure 2: Surface flow patterns of the Remhoogte prospecting area. Note the rather uniform drainage pattern of the southern prospecting area compared to the multi-directional and intricate drainage pattern of the northern prospecting area.</u>

Figure 2: Surface flow patterns of the Remhoogte prospecting areas overlain on aerial imagery (Google Earth 2019). The uniform topography of the southern prospecting area and varied uneven terrain of the northern prospecting area is also clearly visible.

2.5 Evapotranspiration

Evapotranspiration is the process whereby water is extracted from the soil by plants and respires as vapour through their leaves. The semi-arid and arid parts of South Africa has the highest Potential Evapotranpiration (PET) with values averaging 2547 mm per annum. However, due to the low rainfall and soil moisture, evapotranspiration in the study area will only average 22.5 mm per annum. As a result the clearing of vegetation during prospecting activities is anticipated to have a very low impact on evapotranspiration. Keep in mind though that clearing of vegetation will however have a significant influence on runoff rate and decrease in infiltration (*2.3 Infiltration*).

2.6 Recharge

Recharge is the vertical movement of surface water through the unsaturated zone to reach the ground water horizon. The rate of recharge is estimated to be 3 % of the **MAR** (Mean Annual Rainfall).

The rate of recharge and the MAR of the area is considered relatively low which will therefore not entail a high risk of ground water pollution. Furthermore, the risk of surface- and ground water contamination is reduced as a result of the nature of the mining operation, i.e. the absence of chemical processes such as leads to high impacts in gold mining for example, etc.

However, prospecting activities will disturb the soil surface, mobilise sediments and may lead to high sediment loads in watercourses. Storm water runoff generated from prospecting areas including the excavation sites, stockpiles and processing plant should therefore be isolated to these areas and prevented from entering the numerous watercourses and natural drainage pattern on the site.

2.7 Streamflow

The southern prospecting area is largely devoid of watercourses. It is bordered to the south by the Brak River, a very important and sensitive watercourse. Furthermore, it drains into the Orange River approximately 6 km to the west of the site and any impacts on it will therefore also affected the Orange River. The interior of the southern prospecting area is largely devoid of watercourses and due to the sandy, deeper soils the area has a high infiltration rate. The interior is therefore drained by diffuse surface flow as well as groundwater flow. A small drainage line occurs along the low calcrete ridge in this area and is the only defined drainage channel. The most likely impact that prospecting in this area will have on storm water is increased erosion and consequent sedimentation. However, due to the relatively gradual slope and sandy soils it should be possible to manage this by standard storm water management measures.

The northern prospecting area contains an intricate drainage network of drainage lines and streams mostly feeding into the Diepsloot. This stream also drains into the Orange River immediately adjacent and to the west of the site. Therefore, any impacts on this drainage system will also affected the Orange River. Due to the topography dominating this area it contains a high amount of watercourses and due to the steep slopes the rate of infiltration is low and runoff high. This prospecting area is therefore mainly drained by concentrated surface flow. This will therefore be problematic in containing dirty storm water and preventing erosion. It is recommended that the majority of this prospecting area be excluded from operations and that this be confined to the surrounding plateau portions where storm water will be manageable.

2.8 Ground water flow

The combination of a relatively low rainfall and deep ground water table is not conducive to the formation of seeps, fountains and recharge of surface water features from ground water. However, the uneven terrain and variable geology may cause the formation of a hillslope seep or fountain in some instances. Such a system is however absent from the study area.

3. ASSESSMENT OF CLEAN AND DIRTY AREAS

Areas producing dirty storm water consists of two clearly defined areas, namely the processing plant and prospecting excavations. Both of these areas should be managed holistically to prevent dirty storm water from exiting these areas.

3.1 Plant areas

The plant area is likely to contain the majority of dirty water sources. The most direct sources of dirty storm water will be associated with storage facilities for fuel, lubricants and waste. However, excavations may form the most prominent source of erosion and sedimentation.

The following structures and infrastructure associated with the plant may contaminate storm water:

Ablution facilities – Improper management or servicing may result in sewage spillage and contamination of storm water runoff. This is an easily managed source of contamination and should not be problematic.

Fuel storage facility – petrochemicals are known as common pollutants of storm water runoff. As long as bund walls and concrete lining as stated in the Scoping Report is implemented this should not be a significant source of storm water contamination.

Waste disposal site – Wastes, especially hazardous wastes, may contaminate storm water runoff if not stored correctly. As long as adequate bund walls and concrete lining is implemented this should be easily managed.

Workshop and wash bay – This is a common source of contaminants as it is not contained within a bunded area. The workshop and washbay area should at least be lined with concrete and an oil separator installed at the washbay.

Road network – Though the road network does not form a significant source of dirty storm water, inadequate design and construction of roadways can cause significant erosion and consequent increased sediment load within storm water. This should be prevented by adequate design and construction including storm water management measures such as v-drains, culverts and erosion control measures such as gabions where erosion is problematic.

The above described sources of dirty storm water or contaminants should not become problematic as long as dirty storm water is contained within the plant area. Therefore, in addition to the above measures such as bund walls, lining, etc. it is recommended that the clean storm water be diverted around the plant area by means of berms and that dirty storm water be contained within the plant area by constructing cut-off trenches and berms around the plant area.

One of the most significant sources of dirty storm water is the stockpiles including topsoil, overburden and product stockpiles. These stockpiles contain steep slopes which generate a high velocity runoff and in turn increases the erosion potential considerably. Furthermore, these stockpiles consist of a high percentage fines which are easily mobilised. It is also known that diamond mining is coupled with a significant increase in suspended solids in surface water. It will therefore be of high importance to prevent erosion of stockpiles and contain high sediment load storm water within the stockpile area. Strom water management measures should include keeping the slope angle of stockpiles low and implementing berms and cut-off trenches around stockpiles.

In addition to the above, areas where the vegetation has been cleared will also experience increase erosion and should be included in the footprint of the stockpiles as described above.

Furthermore, the rehabilitated environment will itself also form a source of erosion and sediment as it will be devoid of vegetation and will contain mobile sediments. Care should therefore be taken to establish an indigenous vegetation layer as quickly as possible and to implement continuous erosion monitoring and remediation.

Berms, cut-off trenches and other storm water management measures should be maintained on a continuous basis and monitoring should include the occurrence of erosion and areas where dirty storm water bypasses this system.

The pollution prevention measures included within the Scoping Report as well as the SWMP should be strictly implemented and should be sufficient to contain sources of dirty storm water.

These measures will however be unlikely to contain dirty water in the uneven, rocky terrain in the northern prospecting area and it is recommended that the majority of this prospecting area be excluded from operations and that this be confined to the surrounding plateau portions where storm water will be manageable (Map 1).

3.2 Excavations

Mining excavations will not occur near the processing plant and will then likely form a separate source of dirty storm water. The excavation of material will form a pit or trench which will be largely inward draining and will therefore not contribute to dirty storm water runoff. Excavation will however act as a water trap for clean storm water runoff and as a result it is recommended that berms be erected around excavations to divert clean storm water around them and into the natural drainage pattern. The material excavated will be transported to the plant for processing and resultant storm water will be managed as described for the plant. However, topsoil and overburden will most likely be stored adjacent to the excavation or trench and will have the same impacts on storm water runoff and erosion as described for the stockpile area at the plant. As a result a berm should also be constructed around these smaller stockpiles around excavations and the slope angle of stockpiles should also be kept to a minimum. Any associated areas having been cleared of vegetation should be included in this footprint as it will also be a source of erosion and sediment.

4. STORM WATER MANAGEMENT PLAN - SWMP

Implementation of adequate storm water management measures as discussed should ensure separation of clean and dirty storm water and the containment of dirty storm water in operational areas. This will however be pointless without continuous maintenance and monitoring of these measures. This should also include monitoring of erosion and remedying this where it occurs, monitoring and repair of damaged berms and where cut-off trenches become filled with sediment cleaning of these should be undertaken.

One of the main aims of the SWMP is to retain dirty storm water and therefore sediments and suspended solids within the operational area, i.e. the plant, stockpile area, excavations, etc. These sediments and suspended solids, as well as contaminants such as hydrocarbons, will therefore accumulate within these operational areas. This should also be taken into consideration during rehabilitation of operational areas. In other words, this contaminated material should be disposed of responsibly during rehabilitation. This should include disposal of material contaminated by hazardous wastes at a registered disposal facility.

Plant and stockpile areas

As discussed, the plant and stockpile area will be one of the most prominent sources of dirty storm water. It is therefore recommended that dirty storm water be contained within the plant and stockpile area by means of berms and cut-off trenches around the perimeter. This should also allow clean storm water to be diverted around this area and into the natural drainage pattern.

The stockpile storage area associated with the plant will be especially susceptible to generate dirty storm water in terms of increased runoff rate, erosion, sediment load and suspended solids. It will therefore be important to contain storm water generated on these stockpiles to the immediate area by means of berms and cut-off trenches and keeping the stockpile slope angles to a minimum.

In addition to the above storm water management measures the following measures should be implemented as listed in the EMP:

Ablution facilities – Chemical toilets which should be serviced regularly by the service provider.

Fuel storage facility – Erect bund walls around diesel storage tanks with a capacity 1.5 times the volume of the tanks. The soil surface should also be lined with concrete both under the tanks as well as where vehicles will be re-fuelled.

Waste disposal site – Wastes, especially hazardous wastes, should be stored in a designated, fenced area with a concrete floor and bund walls.

Temporary workshop and wash bay – The workshop and washbay area should at least be lined with concrete and an oil separator installed at the washbay.

Road network – Implement adequate design and construction including storm water management measures such as v-drains, culverts and erosion control measures such as gabions where erosion is problematic.

Excavations

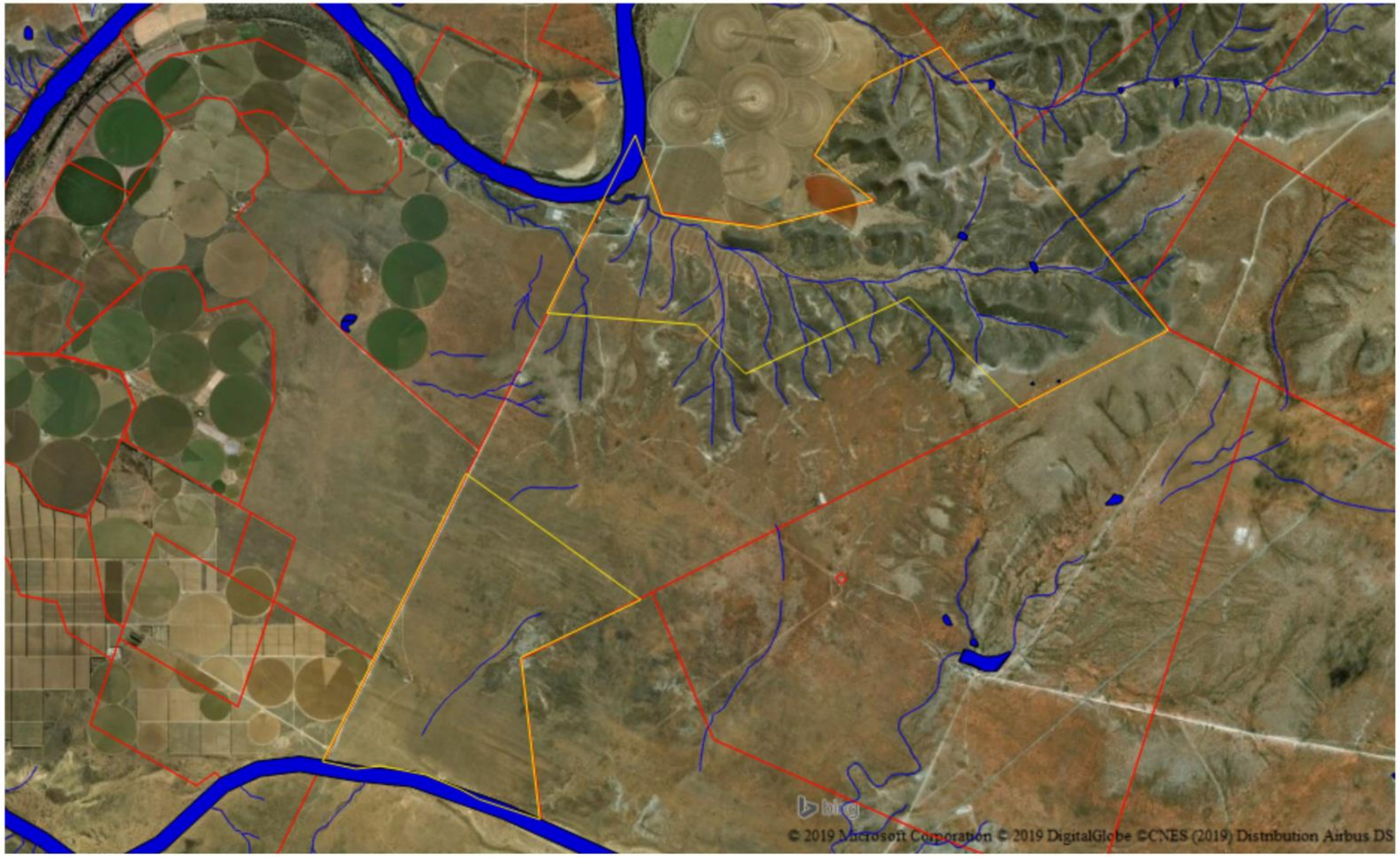
Clean storm water runoff should be diverted around mining excavations and into the natural drainage pattern. Where topsoil and overburden is stockpiled adjacent to excavations the same storm water measures should be implemented as for stockpiles at the plant, i.e. berms should also be constructed around these smaller stockpiles at the excavations and the slope angle of stockpiles should also be kept to a minimum. Any associated areas having been cleared of vegetation should be included in this footprint as it will also be a source of erosion and sediment.

Operation in close proximity to watercourses especially the Brak River and Diepsloot

Both of the prominent watercourses occurring in the study area function, amongst others, as storm water channels and aid in flood discharge. As a result they should be protected and preserved to perform this function with regard to storm water. In addition, they also form the main conduits by which storm water exits the study area. This is also of further importance as they drain into the Orange River adjacent to the site and any impacts on them will also affect this river. It should therefore be clear that dirty storm water should be prevented from entering these watercourses. This may be attainable for the southern prospecting area where the topography will allow for adequate storm water management but will not be possible for the uneven terrain covering the majority of the northern prospecting area. It is recommended that the majority of this prospecting area be excluded from operations and that this be confined to the surrounding plateau portions where storm water will be manageable (Map 1). Adequate storm water management for the remaining areas should include keeping the plant and stockpiling area further than 100 meters from the discussed watercourses, strict implementation of storm water management measures as discussed and where mining activities takes place within 100 meters of these systems the necessary application for authorisation should be submitted in terms of the National Water Act (NWA, 1998).

Annexure A: Locality Map

Locality map of the alluvial diamond prospecting operations on a portion of the Remainder of the Farm Remhoogte 152 near Prieska, Northern Cape Province.



Map 1: Locality map of the proposed prospecting application area on the Farm Remhoogte 152 near Prieska. The area is clearly divided into a Northern- and Southern Prospecting areas. Watercourses are indicated including the Brak River in the southern prospecting area and Diepsloot in the northern prospecting area. Note the clear difference in topography with the northern area clearly very uneven and southern area more flat. Note also extensive irrigation to the west and natural areas to the east.

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Legend:

- Property boundaries
- Application area
- Watercourses
- Wetlands and impoundments

Map Information

S 29.546253º
E 23.074005º

Spheroid: WGS 84
Scale: 1:85 000
Quantum GIS

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