INTEGRATED WATER AND WASTE MANAGEMENT PLAN (IWWMP):

PROPOSED DOLERITE MINING ON A PORTION OF PORTION 0 (REMAINING EXTENT) OF THE FARM THANDISIZWE NO 16691, UMSHWATHI MUNICIPAL AREA, KWAZULU-NATAL PROVINCE

EWULAAS REFERENCE: WU 18568

April 2021

PREPARED FOR:

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EXECUTIVE SUMMARY

The Applicant, Inzalo Crushing and Aggregates (Pty) Ltd, applied for environmental authorisation to mine dolerite from a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691 in the uMgungundlovu Magisterial District of the KwaZulu-Natal Province.

The proposed mining footprint will be 4.9 ha and will be developed over a portion of the farm used for grazing. The proposed mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

Greenmined Environmental (Pty) Ltd was appointed by Inzalo Crushing and Aggregates (Pty) Ltd, as an independent environmental consultant to undertake the required Water Use License Application (WULA) process in terms of the National Water Act, 1998 (Act No. 36 of 1998) [NWA] for the proposed activities at Naaz Quarry on the Farm Thandisizwe No 16691, Portion 0 (Remaining extent), uMgungundlovu Municipal District of the Kwazulu Natal Province

The proposed mining area is located within the Mgeni Sub-Water Management Area which is managed as part of the Mvoti to Umzimkulu Water Management Area by the Department of Water and Sanitation (DWS). The earmarked area was chosen against the eastern rise of a hill. Following the downward slope of the hill a drainage line was identified that crosses through/near to the proposed mining area that drains into the Umgeni River. It was concluded that the proposed mine will have no impact on wetlands

The key water uses applied for: Destruction of a portion of a Drainage line, mining within 100m of a Drainage line, stockpiling and dust suppression. The client will no longer make use of the temporary wash bay as referred to in the Final Basic Assessment Report.

- 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource; and Dust suppression – water will be obtained from municipality 20m^3 per day.
- S21 (g): Stockpile area – 55 000m^3
  This is a designated area for stockpiling and the 55 000m^3 is at full capacity but might differ depending on material sales.
- 21 (c): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (c): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line

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ABBREVIATIONS

BMPs	Best Management Practise
BPG	Best Practice Guideline
CA	Competent Authority
CE	Critically Endangered
COC	Contaminants of Concern
CMA	Catchment Management Area
DSR	Draft Scoping Report
DEA	Department of Environmental Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EI&S	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMPR	Environmental Management Programme Report
EPA	Environmental Performance Assessment
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
GIS	Global Information System
GHS	Globally Harmonised System
GN	Government Notice
GPS	Global Positioning System
Ha	Hectares
HCS	Hazardous Chemical Substances
IHA	Integrated Habitat Assessments
I&APs	Interested and Affected Parties
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
ISP	Integrated Strategic Perspective
Km	Kilometre
LoM	Life of Mine
M	Meters
m3	Meters cubed
MPRDA	Mineral and Petroleum Resources Development Act
MAP	Mean Annual Precipitation
MAT	Mean Annual Temperature

MPTA	Mineral and Petroleum's Title Registration office
NWA	National Water Act (Act No. 36 of 1998)
NWRS	National Water Resource Strategy
NEMA	National Environmental Management Act (Act No. 107 of 1998) [as amended]
NEMBA	National Environmental Management Biodiversity Act
NEM: WA	National Environmental Management: Waste Act (Act No. 107 of 1998) [as amended]
NFEPA	National Freshwater Ecosystems Priority Areas
PES	Present Ecological State
Ptn	Portion
SWD	Stormwater Dam
SWMP	Stormwater Management Plan
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
WMA	Water Management Area
WULA	Water Use License Application
WCDM	Water Conservation and Demand Management (WCDM)

1. INTRODUCTION

1.1 ACTIVITY BACKGROUND

Greenmined Environmental (Pty) Ltd was appointed by Inzalo Crushing and Aggregates (Pty) Ltd, as an independent environmental consultant to undertake the required Water Use License Application (WULA) process in terms of the National Water Act, 1998 (Act No. 36 of 1998) [NWA] for the proposed activities at Naaz Quarry on the Farm Thandisizwe No 16691, Portion 0 (Remaining extent), uMgungundlovu Municipal District of the Kwazulu Natal Province.

The proposed mining footprint will be 4.9 ha and will be developed over a portion of the farm used for grazing. The proposed mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

The proposed MP project will therefor entail the:

- site establishment and infrastructure development;
- stripping and stockpiling of topsoil from the proposed mining footprint area;
- blasting and excavation of the mining area;
- crushing and screening of the loosened material at the processing plant; and
- stockpiling the product until sold and transported of site.

The proposed quarry will appoint ±11 employees (including management), and due to the small scale of the operation no permanent infrastructure will be built at the mining area. The Applicant plans to establish the following mobile/temporary infrastructure within the mining footprint:

- Chemical ablution facilities to be serviced by a registered contractor;
- Crushing and screening plant;
- Containers that will be used as site offices, workshops and storage rooms;

Naaz Quarry is located on portion 0 (remaining extent) of the Farm Thandisizwe No 16691, within the uMgungundlovu Municipal District of the Kwazulu Natal Province. The affected property is approximately 6 km north-east of Copesville on the outskirts of Pietermaritzburg. Access to the site can be gained via R33 towards New Hanover, in the northern direction approximately 4.11 km from Copesville by taking a right turn onto the farm road onto the farm yard, from where the road continues to the mining area along the eastern rise of the hill.

The study site falls within the Quarter Degree Square (QDS) 2931CB the Pongola-Mtamvuna Water Management Area (WMA) 4 and the Quaternary Catchment U20G (DWS, 2016) (Figure 1).

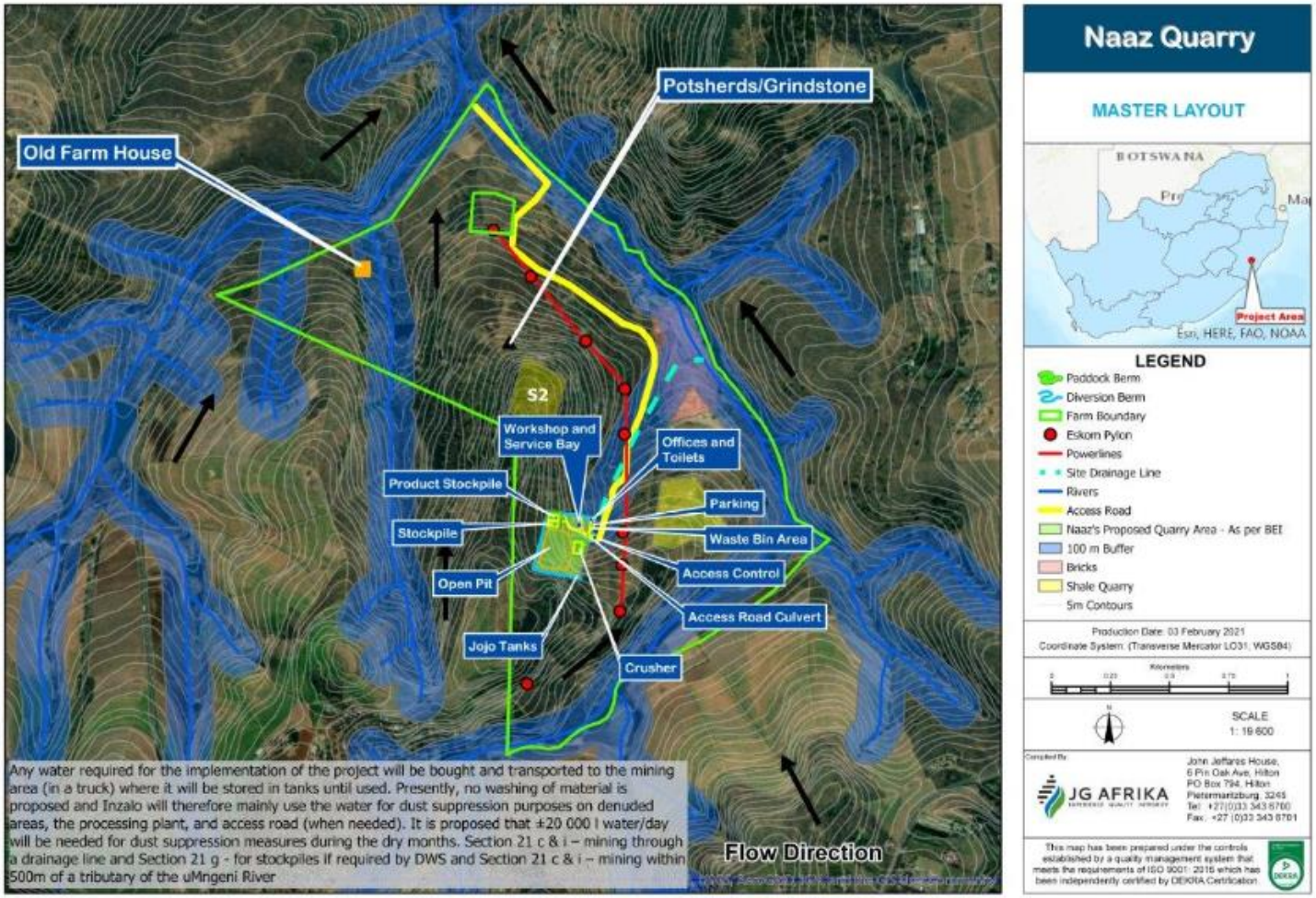

Figure 1: Master Layout plan zoomed out (JG Africa)

1.2 CONTACT DETAILS

Table 1: Mine Manager Contact Details

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Postal Address:	P.O. Box 26730 Kempton Park 5256

Table 2: Company Contact Details

Company Name:	Inzalo Crushing and Aggregates (Pty) Ltd
Contact Person:	Robert Shedlock
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Table 3: Environmental Assessment Practitioner Contact Details

Company Name:	Greenmined Environmental (Pty) Ltd
Contact Person:	Murchellin Saal
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1.3 REGIONAL SETTING AND LOCATION OF ACTIVITY

Naaz quarry is located on a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691 in the Msundzi Local uMgungundlovu Magisterial District of the KwaZulu-Natal Province. The affected property is approximately 6 km north-east of Copesville on the outskirts of Pietermaritzburg. Access to the site can be gained via R33 towards New Hanover, in the northern direction approximately 4.11 km from Copesville by taking a right turn onto the farm road onto the farm yard, from where the road continues to the mining area along the eastern rise of the hill.

The mining footprint will be 4.9 ha and will be developed over a portion of the farm used for grazing. The proposed mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

Table 4: GPS coordinates of the proposed mining footprint

NUMBER	DEGREES, MINUTES, SECONDS		DECIMAL DEGREES	
	LAT (S)	LONG (E)	LAT (S)	LONG (E)
A	29º31'32.606"	30º26'02.080"	-29.525724º	30.433911º
B	29º31'33.586"	30º26'09.553"	-29.525996º	30.435987º
C	29º31'41.639"	30º26'06.770"	-29.528233º	30.435214º
D	29º31'40.357"	30º25'59.801"	-29.527877º	30.433278º

Figure 2 Satellite view showing the location of the MP application area (white polygon) in relation to the surrounding area (image obtained from Google Earth (Greenmined – FBAR)

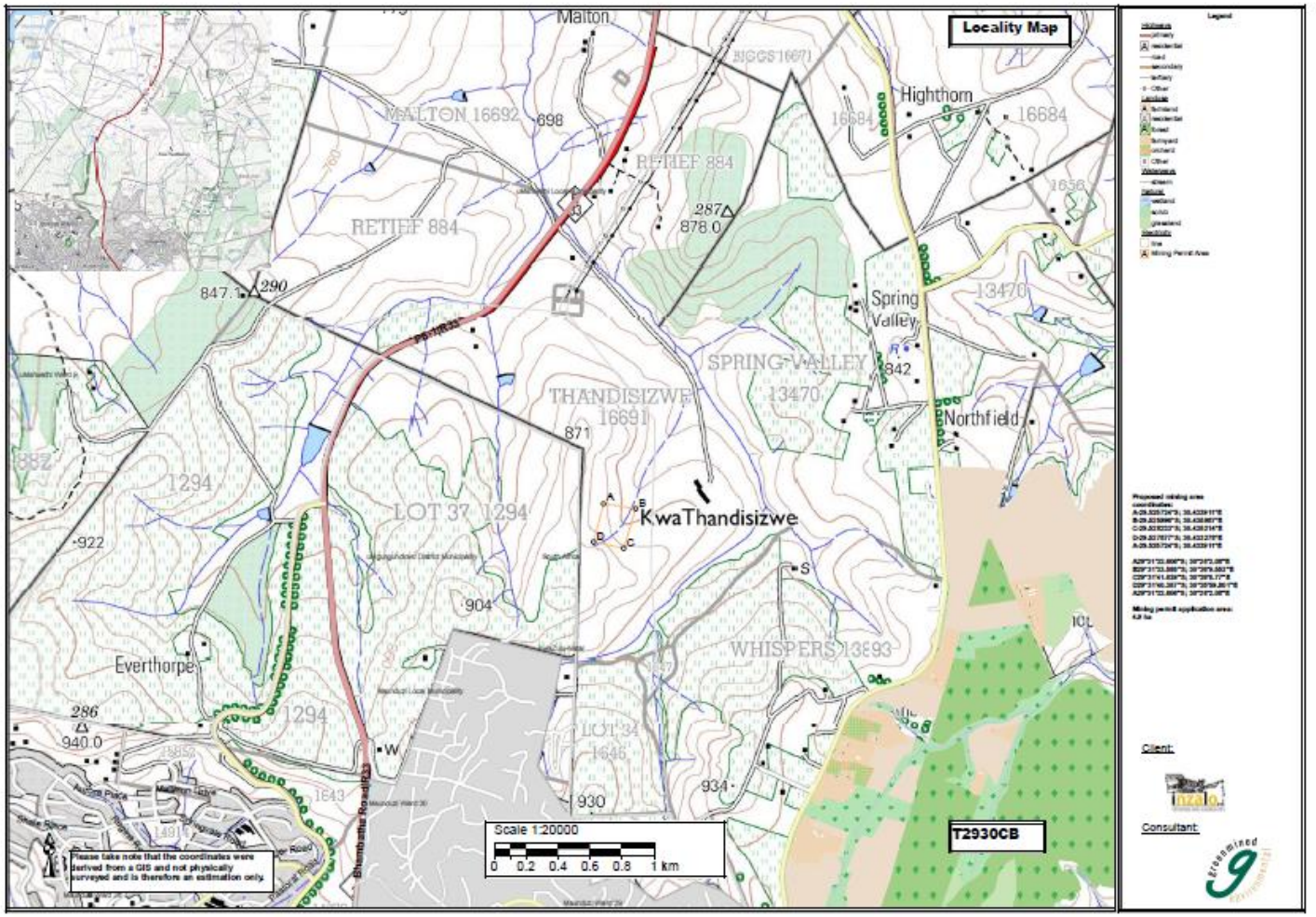

Figure 3: Locality Map of Naaz Quarry (Greenmined – FBAR)

1.4 PROPERTY DESCRIPTION

Table 5: Property owner Contact Details

Property	Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691
Farm Portions	Portion 0
21 Digit Survey General Code	N0FT00000001669100000
Owner	Mr. Naaz Moosa
Deed of Transfer	T36338/2005
Extent as per title deed	4.9ha
Applicable Water Uses	Section 21(g), 21g , 21 (c & i) and 21(c & i)

1.5 PURPOSE OF IWWMP

The integrated water use license application aims to provide information to the DWS on all water uses associated with the proposed Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691 in the uMgungundlovu Magisterial District of the KwaZulu-Natal Province. The Environmental Assessment Practitioner (EAP) identified the following objectives that should be considered in the technical assessment:

- The project type, project locations, proposed method statement, and the technology should be described by the EAP to ensure that a clear and thorough review process can be conducted;
- EAP should aim to address all water uses, as defined in Section 21 of the National Water Act (NWA), which will be triggered by the Quarry;
- Alternatives that are feasible should be identified, as well as the identification of the environmental impacts together with their effect on the environment, as well as their mitigation measures that should be adopted for this project;
- All legislative measures should be addressed, which should include the Section 27 motivation for the NWA, Public Participation to notify all stakeholders and Interested and Affected Parties (I&AP) of the project;
- Integrate a site specific and implementable water management program addressing all the identified water uses and waste management related components (process water balances, stormwater management, groundwater management, water re-use and reclamation, water conservation and demand management, waste minimisation, and recycling etc.) at Naaz Quarry;
- Guide the water user in terms of the water and waste related measures that must be structured and progressively implemented over short, medium, and long term periods (during the life of mine);
- Present a plan of how the management of water and waste is integrated, and the monitoring plans that is in place to achieve such management;
- Clarification of the content of the IWWMP for DWS officials and the water users, as the various regional office of DWS might have different interpretation regarding the content of the IWWMP;
- Standardisation of the format of the supporting documentation which DWS required during submission of a Water Use License Applications (WULA); and

- To document all the relevant information in a manner that enables the DWS to make informed decisions regarding the authorisation of the water use(s).

The IWWMP also strives to show the DWS that the selected management measures included in the IWWMP's action plan adhere to the SMART concept which refers to:

- S - Sustainable;
- M - Measurable;
- A - Achievable;
- R - Resource Allocated; and
- T - Timeframe Specific.

2. CONCEPTUALISATION OF ACTIVITY

2.1 DESCRIPTION OF ACTIVITY

As described in 1.1 above, The Applicant, Inzalo Crushing and Aggregates (Pty) Ltd, applied for environmental authorisation to mine dolerite from a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691 in the uMgungundlovu Magisterial District of the KwaZulu-Natal Province.

The proposed mining footprint will be 4.9 ha and will be developed over a portion of the farm used for grazing. The proposed mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

The proposed MP project will therefor entail the:

- site establishment and infrastructure development;
- stripping and stockpiling of topsoil from the proposed mining footprint area;
- blasting and excavation of the mining area;
- crushing and screening of the loosened material at the processing plant; and
- stockpiling the product until sold and transported of site.

The proposed quarry will appoint ±11 employees (including management), and due to the small scale of the operation no permanent infrastructure will be built at the mining area. The Applicant plans to establish the following mobile/temporary infrastructure within the mining footprint:

- Chemical ablution facilities to be serviced by a registered contractor;
- Crushing and screening plant;
- Containers that will be used as site offices, workshops and storage rooms; and

2.2 EXTENT OF ACTIVITY

The proposed mining footprint will be 4.9 ha and will be developed over a portion of the farm used for grazing on Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691. Presently, it is believed that the mineable area (4.9 ha) may have an inferred dolerite reserve of >1 750 000 m³. Based on the proposed production rate, the dolerite resource shows a potential life of mine of >55 years. In light of this, and the fact that the proposed 4.9 ha mining area only occupies ±8% of the identified dolerite intrusion, it is believed that the permit holder will responsibly consume the resource on the property.

2.3 KEY ACTIVITY RELATED PROCESSES AND PRODUCTS

The proposed mining method will make use of blasting in order to loosen the hard rock; the material will then be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries.

Should the MP be issued and the mining of dolerite be allowed, the proposed project will comprise of activities that can be divided into three key phases (discussed in more detail below) namely the:

(1) Site establishment/construction phase which will involve the demarcation of the permitted mining area. Site establishment will also necessitate the clearing of vegetation, the stripping and stockpiling of topsoil, and the introduction of mining machinery and equipment.

(2) Operational phase that will entail the mining of dolerite from the approved footprint area via conventional open cast mining methods. The mining method will make use of blasting in order to loosen the hard rock; upon which the loosened material will be transported to the crushing and screening processing plant where it will be screened to various sized stockpiles, before it is sold and transported from site to clients.

(3) Decommissioning phase which entails the rehabilitation of the affected environment prior to the submission of a closure application to the Department of Mineral Resources and Energy (DMRE). The permit holder will further be responsible for the seeding of all rehabilitated areas. Once the full mining area is rehabilitated, the mining permit holder will be required to submit a closure application to the DMRE in accordance with section 43(4) of the MPRDA, 2002. The Closure Application will be submitted in terms of Regulation 62 of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998 (as amended).

SITE ESTABLISHMENT PHASE:

Site establishment entails the demarcation of the mining boundaries, clearance of vegetation, and stripping and stockpiling of topsoil to access the mineral as detailed below:

Demarcation of Mining Boundaries:

Pursuant to receipt of the Environmental Authorisation (EA) and Mining Permit (MP), and prior to site establishment, the boundaries of the mining area will be demarcated with visible beacons.

Access Road:

The proposed mining area (S1) will be reached via an existing farm road that passes the site. Inzalo proposes to upgrade the road to allow comfortable movement of mining related equipment and vehicles. Haul roads into the excavation will be extended as mining progresses. The improvement of the access road, and establishment of haul roads will be below the threshold of the NEMA, 1998 EIA Regulations, 2017.

Figure 4: Satellite view showing the path of the existing access road (orange line) to the proposed mining area (white polygon). (Greenmined- Final Basic Assessment Report)

Clearing of Vegetation:

The vegetation type of the earmarked footprint is classified as Moist Coast Hinterland Grassland (Gs 20). The vegetation cover of the mining footprint (S1) is in a generally poor condition that can be attributed to over frequent veld burning and heavy grazing by livestock. The Vegetation, Aquatic and Risk Assessments (VARA) for the proposed dolerite quarry compiled by Alletson Ecological & Amanzi Aquatics (2020) (Appendix G) noted that although all of one type, the indigenous vegetation of the study area consists of two communities which are described as semi-open savannah and semi-closed savannah. The study identified 58 indigenous species and 19 alien species, and therefore the proposed activity will require the removal of indigenous vegetation during the site establishment- and operational phases to access the mineral. Of the ingenious species, only one (*Brachystelma franksiae*) was found to be listed as a species of concern. It is rated as "Vulnerable" due to habitat loss but is known to occur at seven or eight other localities.

In the circumstance, upon receipt of the EA and prior to site establishment/bush clearance, a qualified botanist will conduct a plant identification walkthrough with site management to identify any *Brachystelma franksiae* and/or other plants in need of a plant removal permit. The botanist will also advise the permit holder on the need for a license in terms of the National Forest Act, 1998 to allow the clearance of trees in areas that may be deemed "Natural Forest". Bush clearance will only commence upon receipt of the applicable plant permits. The environmental control officer (ECO) will assess the compliance of the permit holder with the conditions of said permits.

Topsoil Stripping:

It is proposed that topsoil removal will be restricted to the exact footprint of areas required during the operational phase of the activity. The topsoil will be stockpiled at a designated signposted area within the mining boundary to be replaced during the rehabilitation of the area. It will be part of the obligations of site management to prevent the mixing of topsoil heaps with overburden/other soil heaps. The complete A-horizon (the top 100 – 200 mm of soil which is generally darker coloured due to high organic matter content) will be removed. If it is unclear where the topsoil layer ends the top 300 mm of soil will be stripped. The topsoil berm will measure a maximum of 1.5 m in height in order to preserve micro-organisms within the topsoil, which can be lost due to compaction and lack of oxygen.

Introduction of Mining Machinery and Site Equipment:

As mentioned earlier, Inzalo plans to establish mobile/temporary infrastructure within the mining footprint. It is proposed that the office/processing area (including offices, workshop, store rooms, wash bay, ablution, parking area and crushing infrastructure) will occupy ±1 ha of the proposed 4.9 ha area. As no permanent infrastructure will be established, the production rate will dictate the layout of the proposed footprint area.

Presently, the mining infrastructure/equipment is expected to consist of at least:

- ADT trucks;
- Chemical ablution facilities;
- Containers used as site offices, workshops and storage rooms;
- Crushing and screening plant;
- Drilling equipment;
- Earthmoving- and excavating equipment;
- Generators; and a
- Water truck.

OPERATIONAL PHASE:

Inzalo intends to loosen the hard rock of the quarry by blasting, upon which it will be mechanically recovered with drilling-, excavating- and earthmoving equipment. The rock will then be delivered to the crushing and screening plant where it will be reduced to various sized aggregate. The screened material will be delivered to various size category stockpiles. Transportation of the final product will be from the stockpile area to the end point by means of trucks. The proposed quarry will appoint ±11 employees (including management) that will be sourced from the surrounding area and daily be transported to site.

Water Use:

Any water required for the implementation of the project will be bought and transported to the mining area (in a truck) where it will be stored in tanks until used. Presently, no washing of material is proposed and Inzalo will therefore mainly use water for dust suppression purposes on denuded areas, the processing plant, and access road (when needed).

Dust generation will, as far as possible, be managed through alternative dust suppression methods to restrict water use to the absolute minimum. These measures will include a combination of the following:

The speed of all mining equipment/vehicles will be restricted to 40 km/h on the internal farm road to minimize dust generation;

- Site management will attempt to lessen denuded areas (dust source) to the absolute minimum;
- Strips of used conveyor belts can be attached to the drop end of the crusher plant where crushed material falls onto the stockpiles. This lessens the blowing of fines from the minerals;
- Compacted dust will weekly be cleaned of the crusher plant to eliminate it as a dust source.

Under very windy/dusty conditions the permit holder might have to substitute the above mentioned dust suppression methods with the spraying of water, in which case a water truck will moisten the problem areas, and sprayers at the processing plant will moisten the material to alleviate dust generation at the conveyor belts. The water truck driver will receive proper training to ensure effective use of the water on problem areas preventing water wastage. It is proposed that approximately 20 000 litres of water will be needed per day during the dry months (amount to decrease during the rainy season). At present no water is proposed to be drawn from dams or other surface water sources/courses.

Electricity Use:

The proposed project will make use of diesel generators to power the mining infrastructure until a connection to the Eskom grid (if approved) can be secured. All generators will have secondary containment in the form of a bund wall/drip tray that can contain 110% of the generator's maximum fuel capacity.

Servicing and Maintenance:

A temporary workshop and wash bay will be established on site where minor servicing and emergency repairs of mining related equipment/machinery will take place. The wash bay will have an impermeable floor and drain into an oil sump that will be serviced by a qualified contractor. No wash water will be allowed to drain into the surrounding environment. No bulk storing of fuel (>30 000 l) will take place on site, and any chemicals needed at the workshop will be stored in accordance with the product specific safety data sheet specifications in temporary containers/secured cages.

Waste Handling:

Solid (general) waste, generated during the operational phase, will be contained in sealable refuse bins that will be placed at the office area until the waste is transported to a recognised general waste landfill site. A recognized contractor will service the chemical toilets that will serve as ablution facilities to the employees.

Due to the nature of the project very little generation of hazardous waste is expected, and will mainly be the result of accidental spillages or breakdowns. Such contaminated areas will be cleaned up immediately (within two hours of the occurrence) and the contaminated soil will be contained in designated hazardous waste containers that will be kept in a bunded area with impermeable surface until it is removed from site by a registered hazardous waste handling contractor to an approved facility.

DECOMMISSIONING PHASE:

The decommissioning phase will entail the reinstatement of the processing area by removing the stockpiled material, and site infrastructure/equipment and landscaping the disturbed footprints. Due to the impracticality of importing large volumes of fill to restore the quarry area to its original topography, the rehabilitation option is to develop the quarry into a minor landscape feature. This will entail creating a series of irregular benches along the quarry faces, the top edges of each face being blasted away to form scree slopes on the benches below, thereby reducing the overall face angle. The benches will be top-dressed with topsoil and vegetated with an appropriate grass mix if vegetation does not naturally establish in the area within six months of the replacement of the topsoil (see Appendix J for the Closure Plan).

The decommissioning activities will therefore consist of the following:

- Sloping and landscaping the quarry pit;
- Removing all stockpiled material;
- Removing all mining machinery and equipment from site;
- Landscaping all disturbed areas and replacing the topsoil;
- Vegetating the reinstated area; and
- Controlling/monitoring the invasive plant species

The future land use of the proposed area will be agriculture. Upon replacement of the topsoil, the area around the excavation will once again be available for grazing purposes, and the planting of the cover crop (to protect the topsoil) will tie in with the proposed land use. Inzalo will comply with the minimum closure objectives as prescribed by the DMRE and detailed below:

Rehabilitation of the excavated area:

The excavated area must serve as a final depositing area for the placement of overburden. Rocks and coarse material removed from the excavation must be dumped into the excavation. No waste may be permitted to be deposited in the excavations. Once overburden, rocks and coarse natural materials has been added to the excavation and it was profiled with acceptable contours and erosion control measures, the topsoil previously stored must be returned to its original depth over the area. The area must be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local or adapted indigenous seed mix in order to propagate the locally or regionally occurring flora, should natural vegetation not re-establish within 6 months from closure of the site. If a reasonable assessment indicates that the re-establishment of vegetation is

unacceptably slow, the Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a vegetation seed mix to his or her specification.

Rehabilitation of plant, office and service areas:

Coarse natural material used for the construction of ramps must be removed and dumped into the excavations. Stockpiles must be removed during the decommissioning phase, the area ripped and the topsoil returned to its original depth to provide a growth medium. On completion of operations, all structures or objects shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002):

- Where sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
- Areas containing French drains shall be compacted and covered with a final layer of topsoil to a height of 10 cm above the surrounding ground surface.
- The site shall be seeded with a vegetation seed mix adapted to reflect the local indigenous flora.

Photographs of the camp and office sites, before and during the mining operation and after rehabilitation, shall be taken at selected fixed points and kept on record for the information of the DMRE Regional Manager. On completion of mining operations, the surface of these areas, if compacted due to hauling and dumping operations, shall be scarified to a depth of at least 200mm and graded to an even surface condition. Where applicable/possible topsoil needs to be returned to its original depth over the area. The area shall then be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded with a local, adapted indigenous seed mix.

If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the DMRE Regional Manager may require that the soil be analysed and any deleterious effects on the soil arising from the mining operation be corrected and the area be seeded with a seed mix to his or her specification.

Final rehabilitation:

Rehabilitation of the surface area shall entail landscaping, levelling, top dressing, land preparation, seeding (if required) and maintenance, and invasive plant species clearing. All mining equipment, and other items used during the mining period must be removed from the site (section 44 of the MPRDA). Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site. The management of invasive plant species must be done in a sporadic manner during the life of the mining activities. Species regarded as Category 1a and 1b invasive species in terms of NEM:BA (National Environmental Management: Biodiversity Act 10 of 2004 and regulations applicable thereto) will be eradicated from the site. Final rehabilitation shall be completed within a period specified by the Regional Manager.

Once the mining area was rehabilitated the permit holder is required to submit a closure application to the Department of Mineral Resources and Energy in accordance with section 43(4) of the MPRDA, 2002 that states: *"An application for a closure certificate must be made to the Regional Manager in whose region the land in question is situated within 180 days of the occurrence of the lapsing, abandonment, cancellation, cessation, relinquishment or completion contemplated in subsection (3) and must be accompanied by the prescribed environmental risk report".* The Closure Application will be submitted in terms of Regulation 62 of the MPRDA, 2002, and Government Notice 940 of NEMA, 1998 (as amended).

2.4 ACTIVITY LIFE DESCRIPTION

If approved Inzalo will mine the dolerite resource identified on Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691. Presently, it is believed that the mineable area (4.9 ha) may have an inferred dolerite reserve of >1 750 000 m³. Based on the proposed production rate, the dolerite resource shows a potential life of mine of >55 years. In light of this, and the fact that the proposed 4.9 ha mining area only occupies ±8% of the identified dolerite intrusion, it is believed that the permit holder will responsibly consume the resource on the property.

2.5 ACTIVITY INFRASTRUCTURE DESCRIPTION

As mentioned earlier, Inzalo plans to establish mobile/temporary infrastructure within the mining footprint. It is proposed that the office/processing area (including offices, workshop, store rooms, ablution, parking area and crushing infrastructure) will occupy ±1 ha of the proposed 4.9 ha area. As no permanent infrastructure will be established, the production rate will dictate the layout of the proposed footprint area.

Presently, the mining infrastructure/equipment is expected to consist of at least:

- ADT trucks;
- Chemical ablution facilities;
- Containers used as site offices, workshops and storage rooms;
- Crushing and screening plant;
- Drilling equipment;
- Earthmoving- and excavating equipment;
- Generators; and a
- Water truck.

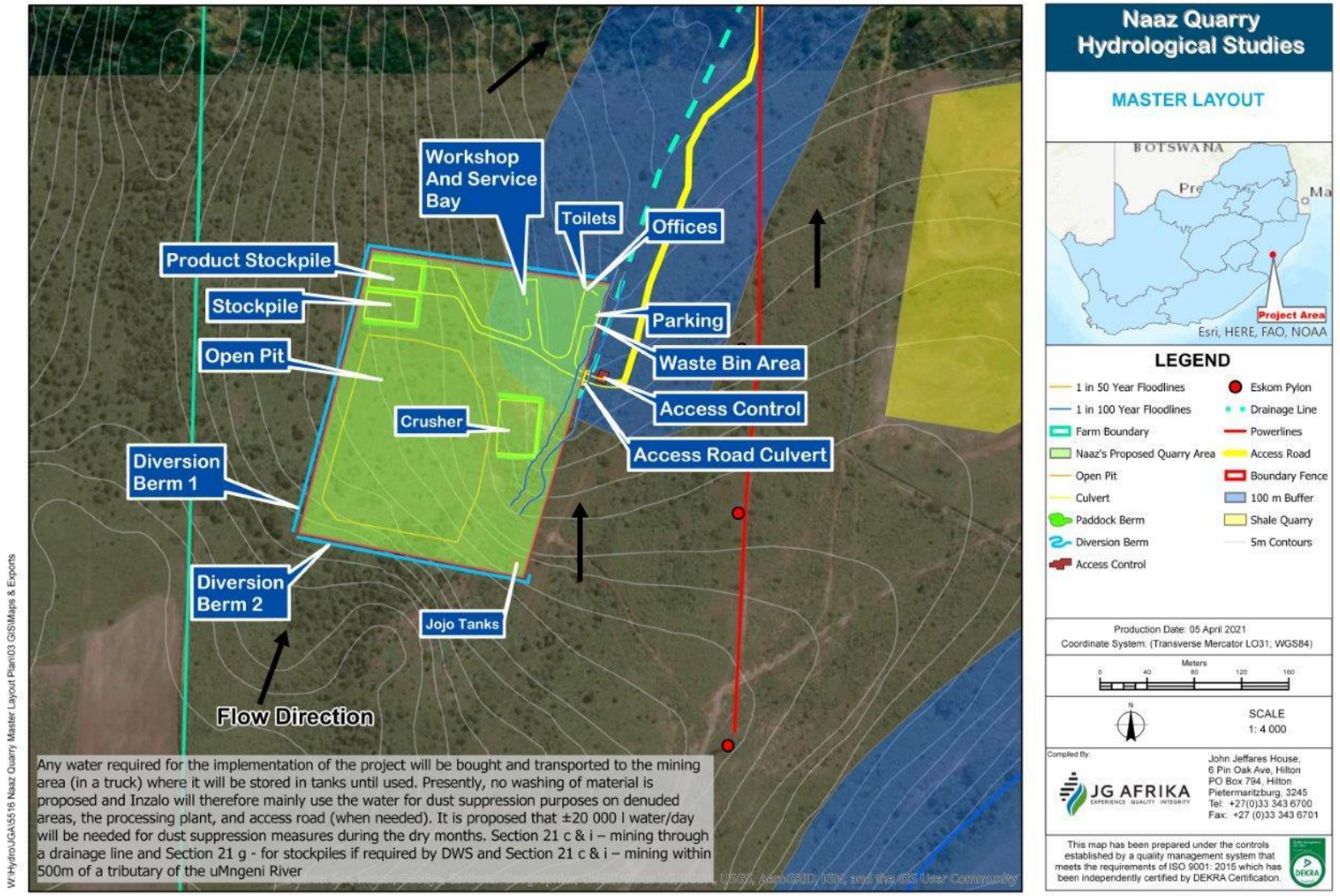

Figure 5: Master Layout plan (JG Africa)

2.6 KEY WATER USES AND WASTE STREAMS

The proposed mining area is located within the Mgeni Sub-Water Management Area which is managed as part of the Mvoti to Umzimkulu Water Management Area by the Department of Water and Sanitation (DWS). The earmarked area was chosen against the eastern rise of a hill. Following the downward slope of the hill a drainage line was identified that crosses through/near to the proposed mining area that drains into the Umgeni River. It was concluded that the proposed mine will have no impact on wetlands

2.6.1 The key water uses applied for

- 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource; and – Dust suppression – water will be obtained from municipality 20m³ per day.
- S21 (g): Stockpile area – 55 000m³
  This is a designated area for stockpiling and the 55 000m³ is at full capacity but might differ depending on material sales.
- 21 (c): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (c): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line

Table 6: Water uses Table					
WATER USE(S)	**PURPOSE**	**VOLUME (M^3)] / DIMENSIONS**	**PROPERTY DESCRIPTION AS PER TITLE DEEDS**	**CO-ORDINATES**	**PROPERTY OWNER**
Section 21 (g)	Storing water – Dust suppression – water bought from Municipality.	Volume – Maximum storage required: 4800m^3	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Centre point of site: 29°31'37.12"S 30°26'4.64"E	Mr. Naaz Moosa
Section 21 (g)	Stockpiling area	Volume – Maximum storage required: 55 000m^3 This is a designated area for stockpiling and tche 55 000m^3 is at full capacity but might differ depending on material sales.	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Stockpile area: 29°31'33.77"S 30°26'2.39"E	Mr. Naaz Moosa

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WATER USE(S)	**PURPOSE**	**VOLUME (M^3)] / DIMENSIONS**	**PROPERTY DESCRIPTION AS PER TITLE DEEDS**	**CO-ORDINATES**	**PROPERTY OWNER**
Section 21 (c)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course - *Destruction of a portion of a drainage line*	Destruction of Drainage	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Drainage line Start point - 29°31'41.51"S 30°26'6.02"E End point – 29°31'37.93"S 30°26'8.05"E Drainage lines that ultimately flows into the Umngeni River to the east of the mining area. The presence of the drainage lines within the mining footprint	Mr. Naaz Moosa
Section 21 (I)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course - *Destruction of a portion of a drainage line*	Destruction of Drainage	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Drainage line Start point - 29°31'41.51"S 30°26'6.02"E End point – 29°31'37.93"S 30°26'8.05"E Drainage lines that ultimately flows into the Umngeni River to the east of the mining area. The presence of the drainage lines within the mining footprint	Mr. Naaz Moosa

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Section 21 (c)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course – *mining within a 100m of a drainage line*	Mining within 100m of a Drainage Line	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Drainage line Start point - 29°31'41.51"S 30°26'6.02"E End point – 29°31'37.93"S 30°26'8.05"E Drainage lines that ultimately flows into the Umngeni River to the east of the mining area. The presence of the drainage lines within the mining footprint	Mr. Naaz Moosa
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2.6.2 WASTE STREAMS

Waste streams are divided into two main categories namely hazardous and general waste, and then further divided into soil or liquid waste.

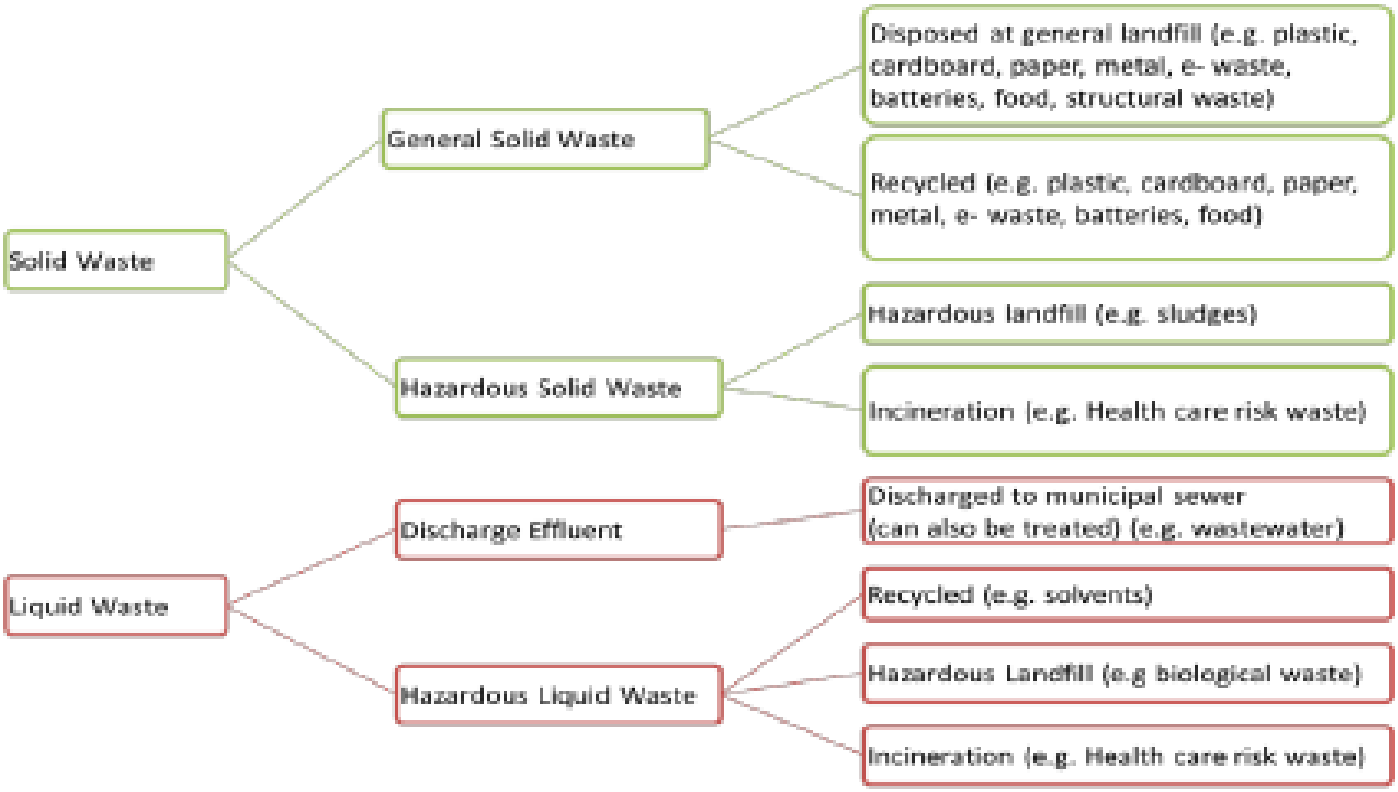

Figure 6: Waste Types arising from the industry (Cape, 2011).

General Waste:

- Domestic/office waste (incl. paper, plastic, glass);
- Uncontaminated PPE;
- Food waste;
- Uncontaminated building rubble;
- Wood;
- Scrap metal; and
- Old tyres and conveyor belts.

Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site

Hazardous waste on site as follows but not limited to:

- Hydrocarbon waste;
- Mine residue stockpiles;

- Batteries;
- Organic compounds and solvents (reagents, chemicals etc.)
- Contaminated soils, metals, plastic, rubber, and wood; and
- Sewage
- Petrol
- Oil
- Diesel
- Grease

This waste must be treated as hazardous waste and must be disposed of at a registered hazardous waste handling facility, alternatively collected by a registered hazardous waste handling contractor.
The dirty rags used to clean the drip trays must be disposed as hazardous waste into a designated bin at the workshop, where it is incorporated into the hazardous waste removal system.
An oil spill kit must be obtained, and the employees must be trained in the emergency procedures to follow when a spill occurs as well as the application of the spill kit. Spills must be cleaned up immediately, within two hours of occurrence.

Waste Management:

Regular vehicle maintenance, repairs and services may only take place at the workshop and service area. If emergency repairs are needed on equipment not able to move to the workshop, drip trays must be present. All waste products must be disposed of in a closed container/bin to be removed from the emergency service area (same day) to the workshop in order to ensure proper disposal. This waste must be treated as hazardous waste and must be disposed of at a registered hazardous waste handling facility, alternatively collected by a registered hazardous waste handling contractor. The safe disposal certificates must be filed for auditing purposes.

If a diesel bowser is used on site, it must be equipped with a drip tray at all times. Drip trays must be used during each and every refuelling event. The nozzle of the bowser needs to rest in a sleeve to prevent dripping after refuelling. Site management must ensure drip trays are cleaned after each use. No dirty drip trays may be used on site. The dirty rags used to clean the drip trays must be disposed as hazardous waste into a designated bin at the workshop, where it is incorporated into the hazardous waste removal system.

Any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognized facility. Proof of safe disposal must be filed for auditing purposes.

- An oil spill kit must be obtained, and the employees must be trained in the emergency procedures to follow when a spill occurs as well as the application of the spill kit.
- Spills must be cleaned up immediately, within two hours of occurrence, to the satisfaction of the Regional Manager (DMRE) by removing the spillage together with the polluted soil and containing it in a designated hazardous waste bin until it is disposed of at a recognised facility. Proof must be filed.
- Suitable covered receptacles must be available at all times and conveniently placed for the disposal of general waste.
- Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., must be stored in a container with a closable lid at a collecting point to be collected at least once a month and disposed of at a recognized landfill site. Specific precautions must be taken to prevent refuse from being dumped on or in the vicinity of the mine area. Proof of disposal must be available for auditing purposes.
- Biodegradable refuse must be handled as indicated above.
- Re-use or recycling of waste products must be encouraged on site.
- No waste may be buried or burned on the site.
- Ablution facilities must be provided in the form of a chemical toilet/s. The chemical toilet must be anchored (to prevent blowing/falling over) and shall be serviced at least once a week for the duration of the mining activities by a registered liquid waste handling contractor. The safe disposal certificates must be filed for auditing purposes.
- The use of any temporary, chemical toilet facilities must not cause any pollution to water sources or pose a health hazard. In addition, no form of secondary pollution should arise from the disposal of refuse or sewage from the temporary, chemical toilets. Any pollution problems arising from the above are to be addressed immediately by the permit holder.
- When small volumes of wastewater are generated during the life of the mine the following is applicable:
- Water containing waste must not be discharged into the natural environment.
- Measures to contain the waste water and safely dispose thereof must be implemented.
    - It is important that any significant spillage of chemicals, fuels etc. during the lifespan of the mining activities is reported to the Department of Water and Sanitation and other relevant authorities.
- Site management must implement the use of waste registers to keep record of the waste generated and removed from the mining area.

2.7 ORGANIZATIONAL STRUCTURE

The Organisational structure for the Applicant is presented below:

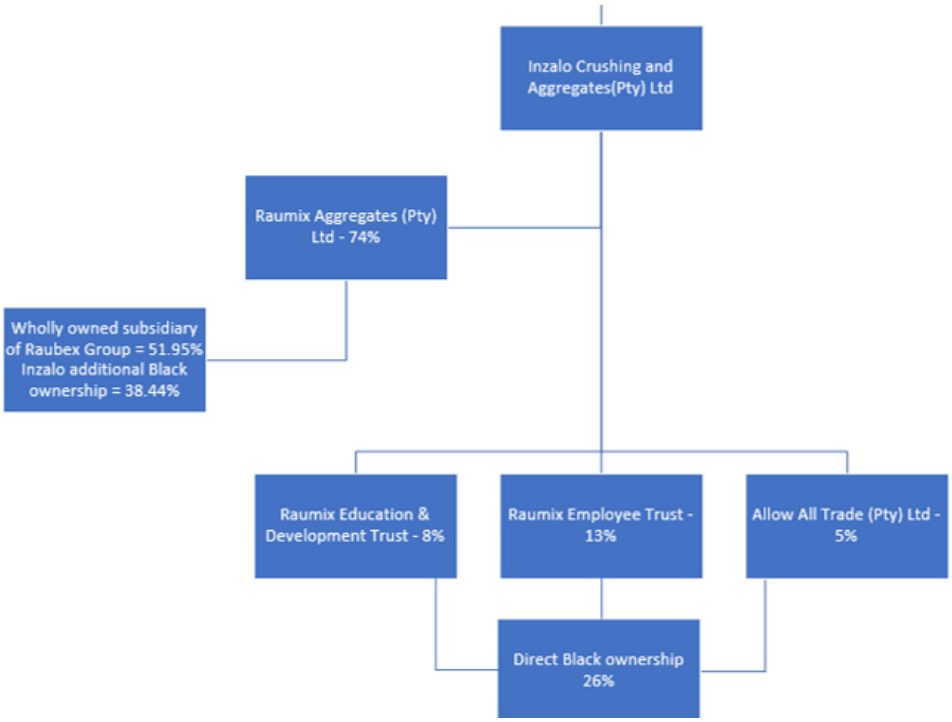

Figure 7: Inzalo Crushing and Aggregates Pty Ltd organizational structure

2.8 BUSINESS AND CORPORATE POLICIES

Inzalo Aggregates has various corporate policies in place related to the environmental processes on the mine. The business and corporate policies have been developed around the internal Health and Environmental Policy which elaborated on commitments of the company employees, the environment and resource, and includes constitutional matter such as the right to an environment that is not harmful to an individual and sustainability of environmental resources for future generations. The list of these policies are included below:

- Environmental Policy
- Health and Safety
- Emergency Preparedness

3. REGULATORY WATER AND WASTE MANAGEMENT FRAMEWORK

3.1 SUMMARY OF ALL WATER USES

The site Naaz Quarry is applying for water use authorisation from the Department of Water and Sanitation (DWS). The IWWMP and IWULA report has been compiled according to the requirements of the NWA and associated Best Practice Guidelines. All water uses on site are detailed and is provided below. The following water uses are included in the application:

Table 7: Water uses Table					
WATER USE(S)	**PURPOSE**	**VOLUME (M^3)] / DIMENSIONS**	**PROPERTY DESCRIPTION AS PER TITLE DEEDS**	**CO-ORDINATES**	**PROPERTY OWNER**
Section 21 (g)	Storing water – Dust suppression – water bought from Municipality.	Volume – Maximum storage required: 4800m^3	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Centre point of site: 29°31'37.12"S 30°26'4.64"E	Mr. Naaz Moosa
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Section 21 (c)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course - *Destruction of a portion of a drainage line*	Destruction of Drainage	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Drainage line Start point - 29°31'41.51"S 30°26'6.02"E End point – 29°31'37.93"S 30°26'8.05"E Drainage lines that ultimately flows into the Umngeni River to the east of the mining area. The presence of the drainage lines within the mining footprint	Mr. Naaz Moosa

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WATER USE(S)	**PURPOSE**	**VOLUME (M^3)] / DIMENSIONS**	**PROPERTY DESCRIPTION AS PER TITLE DEEDS**	**CO-ORDINATES**	**PROPERTY OWNER**
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Section 21 (c)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course – *mining within a 100m of a drainage line*	Mining within 100m of a Drainage Line	Portion of Portion 0 (Remaining extent) of the Farm Thandisizwe no 16691, Umshwathi Municipal Area, Kwazulu-Natal Province	Drainage line Start point - 29°31'41.51"S 30°26'6.02"E End point – 29°31'37.93"S 30°26'8.05"E Drainage lines that ultimately flows into the Umngeni River to the east of the mining area. The presence of the drainage lines within the mining footprint	Mr. Naaz Moosa
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3.2 EXISTING LAWFUL WATER USES

There are no existing lawful water uses registered on the property.

3.3 RELEVANT EXEMPTIONS

Regulations on Use of Water for Mining and Related Activities, aimed at the Protection of Water Resources (GN704) are designed to protect water resources from mining and associated activities and stipulate, inter alia, the following:

- (a) locate or place any residue deposit, dam, reservoir, together with any associated structure or any other facility within the 1:100-year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, borehole or well, excluding boreholes or wells drilled specifically to monitor;
- (b) except in relation to a matter contemplated in regulation 10, carry on any underground or opencast mining, prospecting or any other operation or activity under or within the l:50-year flood-line or within a horizontal distance of 100 metres from any watercourse or estuary, whichever is the greatest;
- (c) place or dispose of any residue or substance which causes or is likely to cause pollution of a water resource, in the workings of any underground or opencast mine excavation, prospecting diggings, pit or any other excavation; or
- (d) use any area or locate any sanitary convenience, fuel depots, reservoir or depots for any substance which causes or is likely to cause pollution of a water resource within the 1:50 year flood-line of any watercourse or estuary."

No exemptions from the GN704 are required

3.4 GENERALLY, AUTHORISED WATER USES

There are no existing water uses registered on the Farm Thandisizwe No 16691, Portion 0 (Remaining extent), uMgungundlovu Municipal District of the Kwazulu Natal Province

3.5 NEW WATER USES TO BE LICENSED

This report forms part of the application for water use authorisation from the Department of Water and Sanitation (DWS). On the Ewulaas portal application Ref: (WU18568) a summary of all the water uses for which the water license is being sought in terms of this application are listed in the above table in section. 2.6.1

- 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource; and – Dust suppression – water will be obtained from municipality 20m³ per day.
- S21 (g): Stockpile area – 55 000m³
  This is a designated area for stockpiling and the 55 000m³ is at full capacity but might differ depending on material sales.
- 21 (c): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (c): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Destruction of a portion of a Drainage line
- 21 (i): Impeding or diverting the flow of water in a watercourse – Mining within 100m of a Drainage line

3.6 WASTE MANAGEMENT ACTIVITY (NEM: WA)

Waste classification at the mining area has been undertaken in accordance with the waste classification and management regulations No. R. 634 of NEM: WA, and is classified according to SANS 10234 (South African National Standard Globally Harmonized System of Classification and Labelling of Chemicals (GHS)).

The National Environmental Management: Waste Act (No. 59 of 2008) (NEM: WA) came into operation on the 1st of July 2009. It addresses waste classification, generation, and management, including recycling of waste, and Waste Management Licensing (WML).

3.7 WASTE RELATED AUTHORISATION

There is no waste related authorisations registered on the property.

NEM:WA, 2008 – Client to ensure waste related compliance also included in the EMP.

3.8 OTHER AUTHORISATION (EIAS, EMPS, RODS, REGULATIONS)

The Applicant, Inzalo Crushing and Aggregates (Pty) Ltd, applied for environmental authorisation to mine dolerite from a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691 in the uMgungundlovu Magisterial District of the KwaZulu-Natal Province.

The proposed project triggers listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations 2014 (as amended 2017) and therefore requires an environmental impact assessment (basic assessment process) that assess project specific environmental impacts and alternatives, consider public input, and propose mitigation measures, to ultimately culminate in an environmental management programme that informs the competent authority (Department of Mineral Resources and Energy) when considering the environmental authorisation. This report, the Final Basic Assessment Report, forms part of the departmental requirements, and presents the assessment report of the EIA (basic assessment) process.

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4. PRESENT ENVIRONMENTAL SITUATION

4.1 CLIMATE

The Naaz Quarry lies within a subtropical climatic region (Weiseer and Muller, 1983). Rainfall occurs throughout the year and the climate category can be described as humid and warm to hot during the summer months and cool and dry during the winter months.

Temperature data for the project area was obtained from the South African Weather Services (SAWS) meteorological station 0239812 A, as presented in below table. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures range from 12.4°C in June to 21.2°C in January. The region is the coldest during June when the mercury drops to 5.1°C on average during the night.

Table 8: Temperature Recorded for Years 1950 – 2000 at SAWS 0239812 A

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Temperature (°C)	21.2	19.4	20.4	17.5	15.4	12.4	13.2	14.7	16.2	17.5	18.1	20.3
Min. Temperature (°C)	16.0	14.7	15.0	11.6	8.6	5.1	5.5	7.3	9.8	11.5	12.8	14.8
Max. Temperature (°C)	26.4	24.1	25.8	23.5	22.2	19.8	20.9	22.2	22.6	23.5	23.4	25.8

4.1.1 Rainfall and Evaporation

Rainfall data for the project area was obtained from the SAWS rainfall station 0239812 A. This rainfall station is located approximately 3.3 km south east from the project site and was selected based on its record period and the reliability of the historical rainfall data. The details of this rainfall station are presented in the above table.

The **mean** monthly rainfall amounts over the period 1950 to 2000 are presented in below table. From heron, it is evident that most of the rainfall falls over the summer period (October to March). It is also noted that low rainfall values are recorded over the winter months (April to September).

Table 9: Rainfall Station Details (MEAN monthly rainfall)

Station Number	Station Name	MAP (mm)	Years Assessed	Reliability (%)	Longitude	Latitude
0239812 A	Bloemendal	885	1950 - 2000	67	30^0 28’	29^0 31’59"

Table 10:Average Rainfall Depths Recorded for Years 1950 – 2000 at Rainfall Station 0239812 A

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	MAP
Rainfall Depth (mm)	145.7	121.7	100.8	53.4	26.9	13.0	17.9	30.0	55.5	88.6	104.8	127.1	885

There is a high degree of variation in the annual rainfall in the data obtained from rainfall station 0239812 A. The lowest recorded annual rainfall value over the assessed period is 460.6 mm, recorded in the year 1992. The below table presents the 10 wettest years over the 1950 to 2000 period, indicates the wettest recorded year over this period was 1 447.6 m in 1987.

Table 11: Ten Wettest Years Recorded for Period 1950 – 2000

Ranking	Year	MAP (mm)
1	1987	1 447.6
2	1976	1 155.6
3	1985	1 149.8
4	1957	1 083.3
5	1959	1 062.2
6	1991	1 057.7
7	1990	1 046.3
8	1978	1 030.0
9	1956	1 027.8
10	1996	1 022.9

While rainfall is generally variable on a month-to-month basis, this is not the case with evaporation. Evaporative demands do not vary significantly from one year to next (i.e. evaporation in one October-month, for example, is similar to evaporation in the next October-month). Therefore, it is generally considered to be acceptable to apply 12 average monthly evaporation values over the year. The evaporation data used for the Naaz Quarry was obtained from Evaporation Zone 30B (Middleton and Bailey, 2008). Catchment evapo-transpiration is calculated by applying 12 monthly evapo-transpiration conversion factors, as presented in below table. Similarly, evaporation losses from an exposed water body are calculated by applying 12 monthly lake evaporation conversion factors, as presented in below table. The annual potential evaporation rate for the area is 1 200 mm (WR, 2012). the highest evaporation rates occur during the hotter summer months of October to March.

Table 12: Naaz Quarry Potential Evaporation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Evaporation Rate (mm)	145	124	120	87	70	57	62	74	90	107	124	140	1 200
Lake Evaporation Factor	0.84	0.88	0.88	0.87	0.85	0.83	0.81	0.81	0.81	0.81	0.82	0.83	
Evapotranspiration Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.80	0.80	0.80	1.00	1.00	

4.1.2 Design Rainfall

The 24-hour design rainfall depths (point rainfall) for the 1:2, 1:10, 1:20, 1:50, 1:100 and 1:200-year recurrence intervals were extracted using the Design Rainfall Estimation Utility (Smithers and Schulze, 2003).

Table 13: Hour Design Rainfall Depths

Duration (hr)	Rainfall Depth (mm)						
24	1:2	1:5	1:10	1:20	1:50	1:100	1:200
	62.9	91.5	115.5	143.2	187.3	227.6	275.4

4.2 SURFACE WATER

The following studies were completed by JG Africa:

- Appendix: Wetland and Aquatic Assessment
- Appendix: Baseline Hydrological Assessment
- Appendix: Floodline Study
- Appendix: Geotechnical Study
- Appendix: Geohydrological Study
- Appendix: Stormwater Management Plan

The watercourse which proceeds from the mine site no longer discharges directly into the unnamed stream, which flows northwards to join the Umgeni River. The lower part of the channel has, for many years, been diverted as the result of development of a quarry which yields shale for brick making. The original lower course is now not distinguishable on the ground and, instead, the watercourse flows into a disused part of the shale quarry where any surface water could accumulate.

4.2.1 Water Management Area

The project site is located in the uMngeni River Catchment within the Quaternary Catchment U20G of the Umvoti to Umzimkhulu Water Management Area (WMA No. 11). Based on Department of Water and Sanitation (DWS) river coverages and 5 m contours, a drainage line (unnamed drainage line) alongside the eastern boundary of the proposed quarry drains into an unnamed tributary and eventually into the uMngeni River (*cf*. **Figure 8**). The uMngeni River is located approximately 9.3 km downstream of the project site.

The catchment area of the unnamed drainage line and its tributaries, within the vicinity of Portion 0 (Remaining Extent) of the farm Thandisizwe No. 16691 and the proposed Naaz Quarry, is approximately 16.74 km^2, as depicted in Figure 8. For the purposes of this study, this is considered the local catchment area. Quaternary Catchment U20G (considered as the regional catchment for the purposes of this study), within which the quarry is located, has a catchment area of 498 km^2 and a Mean Annual Runoff (MAR) of 49.68 million cubic meters (MCM). Details of the Quaternary Catchment U20G, including its associated MAR volume and MAR depth are provided in **Table 14** (WR, 2012).

Table 14: Quaternary Catchment Details

Quaternary Catchment	Catchment Area (km^2)	Evaporation Zone	Rain Zone	Water Management Area	MAR (MCM)	MAR Depth (mm)
U20G	498	30B	U2C	11	49.68	99.8

4.2.2 Surface Water Hydrology

The Naaz Quarry lies within a subtropical climatic region (Weiseer and Muller, 1983). Rainfall occurs throughout the year and the climate category can be described as humid and warm to hot during the summer months and cool and dry during the winter months.

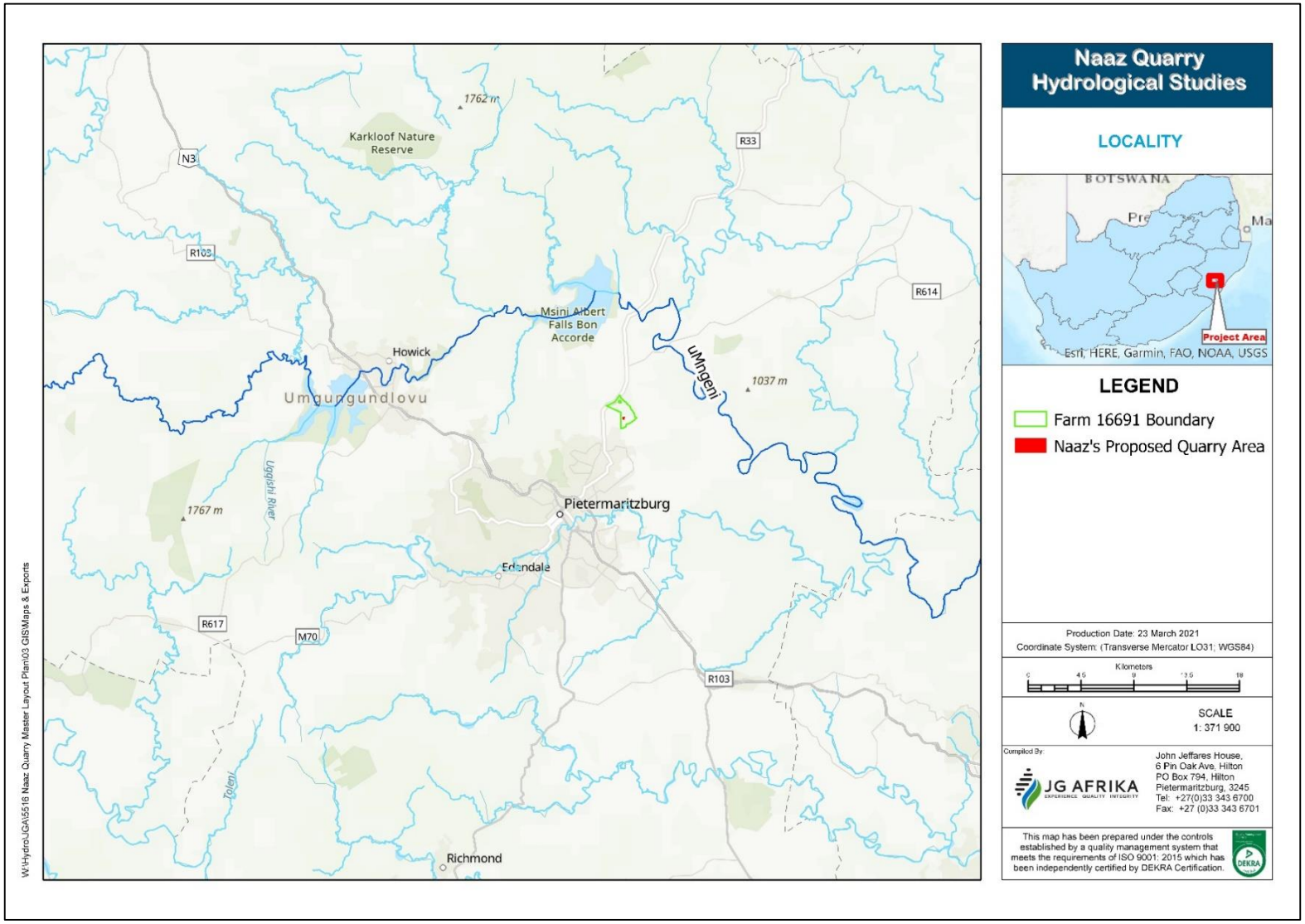

Figure 8: Hydrological Locality Map (JG Africa- Baseline Hydrological and Impact Assessment Study)

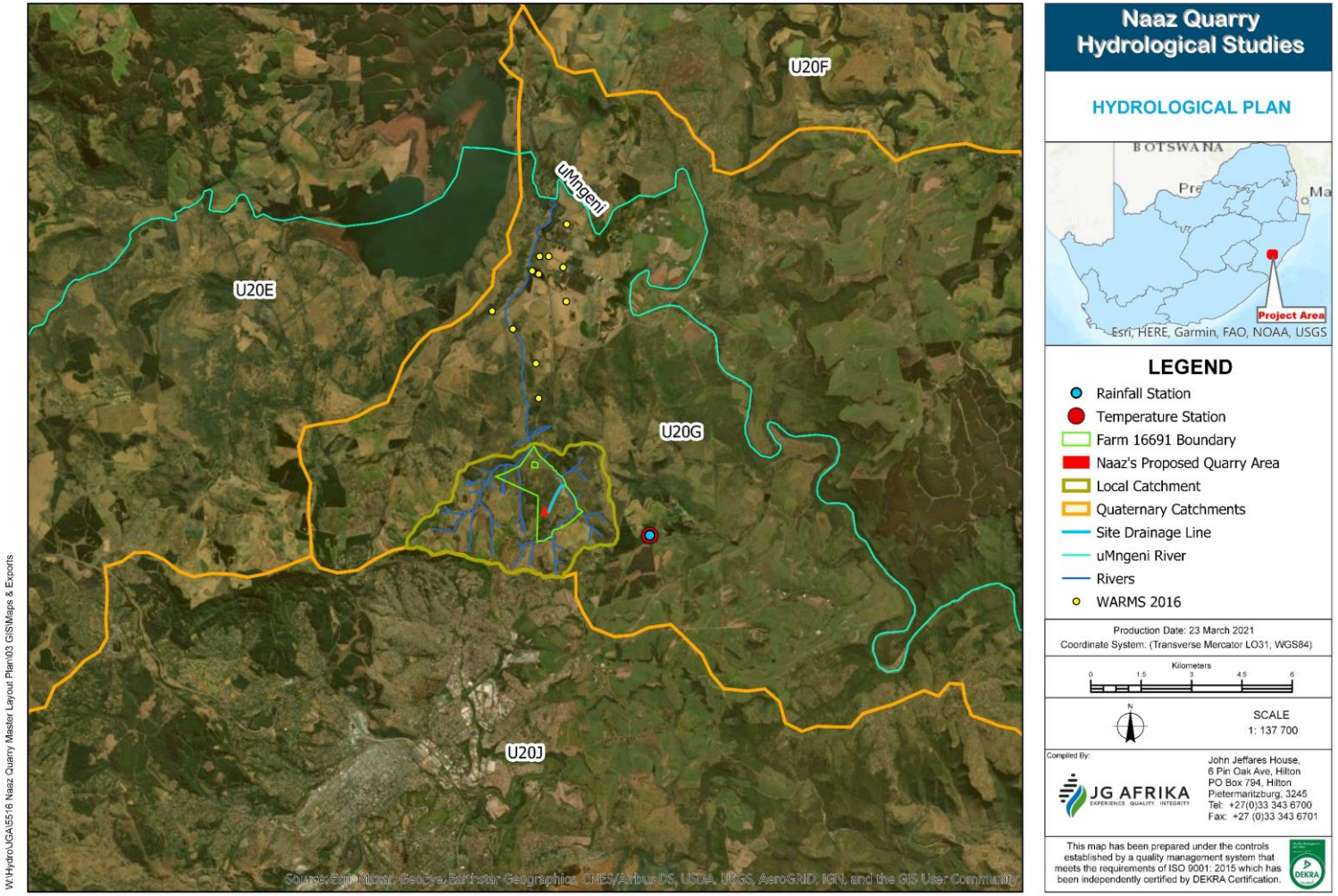

Figure 9: Hydrological Plan (JG Africa- Baseline Hydrological and Impact Assessment Study)

Baseline Hydrology Study

As part of this assessment, a general hydrological characterisation of the area in which the proposed Naaz Quarry is located was undertaken. This included defining the MAP, MAR and MAE for the project site. In order to determine the potential impact of the quarry on the local and regional hydrology, the catchment areas corresponding to these regions were defined. The local catchment area was defined as the catchment area of drainage lines in the vicinity of Portion 0 (Remaining Extent) of the farm Thandisizwe No. 16691, which included the unnamed drainage line along the eastern side of the quarry and the tributaries of the uMngeni River within the vicinity of the quarry site. The regional catchment area was defined as the Quaternary Catchment U20G, in which the quarry is located.

In addition to the hydrological characterisation of the quarry site, an impact assessment of the quarry on the local and regional hydrology was undertaken. Mitigation measures to reduce the significance of the identified potential impacts were provided. The potential impacts and mitigation measures identified included:

- Changes in catchment water resources. Based on the assessment undertaken, it was found that the potential impact of the quarry on catchment water resources (volume of water available to downstream users) is likely to be negligible. Based on this, no mitigation measures were recommended. Further to this, no wetland areas have been identified immediately downstream of the project site.
- Changes in catchment water quality. The sources of contamination were identified as increased sediment (from the crushing plant and stockpiles), hydrocarbon spills (through fuel stores and machinery on site), domestic and sewage waste. In order to reduce the risk of surface water contamination, numerous recommendations were made, largely with respect to management of contaminants at their source.
- Changes in catchment flood hydrology. The increase in impervious areas and changes in catchment landcover characteristics associated with the quarry, poses a possibility of an increase in the peak discharge values. It was recommended that all stormwater runoff from roofed areas is diverted to JoJo tanks for reuse at the project site (this will serve to reduce discharge rates from the project site). Stormwater runoff from parking or road areas is likely to be increased from what would occur under natural conditions. This needs to be addressed as part of the stormwater management plan. However, it is noted that that the quarry will include an excavation of materials (i.e. the open pit), from which stormwater runoff will not discharge. Therefore, discharge rates from the project site, as a whole, is likely to be reduced from that under natural conditions.

It is concluded that if the proposed Naaz Quarry is compliant with the various regulations guiding the management and protection of water resources (as outlined in this report), the impact of the quarry on the local and regional hydrology will be low. In order for the quarry to be fully compliant, it is recommended that a formal stormwater management plan is implemented on site. It is also recommended that a floodline study is undertaken for the unnamed drainage line, located adjacent to the project site. This will inform the safe location of infrastructure associated with the proposed quarry.

4.2.3 Surface Water Quality

Only Groundwater monitoring was required: Determined in Hydrology assessment- Changes in catchment water quality. The sources of contamination were identified as increased sediment (from the crushing plant and stockpiles), hydrocarbon spills (through fuel stores and machinery on site), domestic and sewage waste. In order to reduce the risk of surface water contamination, numerous recommendations were made, largely with respect to management of contaminants at their source.

It is concluded that if the proposed Naaz Quarry is compliant with the various regulations guiding the management and protection of water resources (as outlined in this report), the impact of the quarry on the local and regional hydrology will be low. In order for the quarry to be fully compliant, it is recommended that a formal stormwater management plan is implemented on site. It is also recommended that a floodline study is undertaken for the unnamed drainage line, located adjacent to the project site. This will inform the safe location of infrastructure associated with the proposed quarry.

Downstream Water Users

Table 15: Water Users Downstream of the Naaz Quarry Site

Registration Water Use	Property	Property (Ha)	Volume m3/year	Sector	QUAT	Source
21079379/1	Zeekoegat	295	1500	Schedule 1	U20G	Tributary of Umgeni River
21028102/3	Shallow Drift	125	10000	Clean Water Dam	U20G	Tributary of Mgeni River/Shallow Drift No. 15565 Ptn 28
21028111/1	Shallow Drift	129	193440	Livestock	U20G	Umgeni River
21132604/3	Zeekoegat	162	168000	Clean Water Dam	U20G	Tributary Of Mgeni River/Zeekoegat No 1173 Ptn 18 : Dam 01
21133729/3	Retief	62	2500	Clean Water Dam	U30B	Tributary of Mgeni River/Retief Dam
21154340/1	Zeekoegat	95	87500	Irrigation	U20G	Tributary of Mgeni River
21185637/1	Zeekoegat	81	500	Schedule 1	U20G	Tributary of Mgeni River
21130848/1	Shallow Drift	21	12000	Irrigation	U20G	Mgeni River
21184825/1	Shallow Drift	45	128000	Irrigation	U20G	Tributary of Umgeni River
21184825/3	Shallow Drift	45	170000	Clean Water Dam	U20G	Tributary of Mgeni River/Shallow Drift Dam
21144110/1	Shallow Drift	2	650	Irrigation	U20G	Tributary of Mgeni River

4.2.4 Floodline Assessment

Floodline Delineation

The methodology used to calculate the 1:50 and 1:100-year design flood peak discharge values and the hydraulic model used to simulate the resultant floodlines are discussed in the following subsections.

Peak Discharge Calculation

The design flood peak discharge value (Qp) for a site can be calculated using various methodologies. The appropriate methodology to be applied in calculating peak discharge values depends largely on the size of the contributing catchment and the level of hydrological data available (for example, gauged streamflow values and design rainfall data) for a particular catchment. The catchment area of the site drainage line is approximately 0.27 km2. Based on the size of the catchment, and a lack of available gauged streamflow data, it was decided that the Rational Method is the most appropriate method to calculate the peak discharge values.

The Rational Method is widely used throughout the world for both rural and urban catchments (Alexander, 2001; Pilgrim and Cordery, 1993) and it is the most commonly used method of estimating design flood peak discharge values. The method is sensitive to design rainfall intensity and the selection of the runoff coefficient (C factor). The method assumes that the peak discharge occurs when the duration of the rainfall event is equal to the Time of Concentration (Tc), and that the rainfall intensity is distributed uniformly over the catchment. As a consequence of these assumptions, the Rational Method is best suited to catchments with areas of less than 100 km^2 (HRU, 1972). The final peak discharge values (Q_p) were derived from the Rational Equation (cf. Equation 1) and are presented in below tables.

$$Q_p = 0.278(CIA) \qquad \textit{Equation 1}$$

Where:

Q_p = peak flow (m^3/s)

C = run-off coefficient (dimensionless)

I = average rainfall intensity over catchment (mm/hour)

A = effective area of catchment (km^2)

Design rainfall is required as an input into the Rational Method for calculating design flood peak discharge values associated with various recurrence interval storm events (floods). Design rainfall for the study site was obtained from the Design Rainfall Estimation Program (Smithers and Schulze, 2003). This Design Rainfall Estimation software calculates the design rainfall depths using a regionalised L-moment Algorithm and scale invariance at any 1' × 1' grid interval in South Africa. The design rainfall depths for the 1:50 and 1:100 year return period used in calculating the design peak discharge calculations are presented below.

Table 16: 1:10, 1:50 and 1:100 Year Return Period Design Rainfall Values			
Duration	**1:10 Year Design Rainfall Depths (mm)**	**1:50 Year Design Rainfall Depths (mm)**	**1:100 Year Design Rainfall Depths (mm)**
5 min	20.90	33.8	41.1
10 min	27.90	45.3	55.0
15 min	33.10	53.7	65.2
30 min	41.90	67.8	82.5
45 min	48.00	77.8	94.6
1 hour	52.90	85.8	104.3
1.5 hour	60.70	98.4	119.6
2 hour	66.90	108.5	131.8
4 hour	77.90	126.3	153.5
6 hour	85.20	138.1	167.8
8 hour	90.80	147.1	178.8
10 hour	95.30	154.5	187.7
12 hour	99.20	160.8	195.4
16 hour	105.70	171.3	208.2
20 hour	111.00	179.9	218.6
24 hour	115.50	187.3	227.6
2 day	124.40	201.6	245.1
3 day	143.10	231.8	281.8
4 day	154.60	250.6	304.5
5 day	164.20	266.1	323.4
6 day	172.50	279.5	339.7
7 day	179.80	291.4	354.1

Catchment C factors, required as an input into the Rational Method, are determined by accounting for a combination of catchment landcover types (Cv), soil types (Cp) and catchment slopes (Cs). The land uses of the contributing catchment areas were classed as rural. The land cover of the study catchments were identified using Google Earth aerial imagery and classed according to the South African National Landcover Database (NLC, 2018) which predominantly consisted of commercial agriculture (sugarcane) and to a lesser degree, grasslands.

The soils of the contributing catchments were classified predominantly as semi-permeable. The surface slopes for the catchment were estimated from a Digital Elevation Model (DEM), created from 5 m contour data of the project area. The surface slopes were classed according to the threshold slopes of < 3%, 3 – 10%, 10 – 30% and >30%. The majority of the study catchments had steep slopes resulting in a higher C-factor. The study site catchments C-Factor calculation inputs are presented in **Table 3-2**. A summary of the input variables used in the Rational Method and the resultant 1:50 and 1:100-year peak discharge values are presented below.

Table 17: Catchment C-Factor Calculation Inputs

Catchment Slope Distribution (%)				**Catchment Soil Permeability Distribution (%)**	**Vegetation Distribution (%)**		**Final C-Factor Value**
>3	**0-10**	**10-30**	**> 30**	**Semi-Permeable**	**Light Bush**	**Grasslands**	
3.44	28.01	61.31	7.24	100	20	80	0.49

Table 18: Summary Inputs for Peak Discharge Calculation and Resultant Peak Discharge Values

Catchment	Site Drainage Line
Catchment Area (km^2)	0. 268
Longest Water Course (km)	0.76
Average Water Course Slope (m/m)	0.10
Time of Concentration (hours)	0.48
1:50 Point Rainfall Intensity (mm)	130.26
1:100 Point Rainfall Intensity (mm)	158.49
1:50 Catchment C-Factor	0.47
1:100 Catchment C-Factor	0.49
1:50 Year Peak Discharge (m^3/s)	**4.52**
1:100 Year Peak Discharge (m^3/s)	**5.79**

Hydraulic Simulations

The HEC-RAS Model (US Army Corp of Engineers) was used to undertake one-dimensional hydraulic modelling to determine the extent of the floodlines corresponding to the 1:50 and 1:100-year return periods. The following sections present inputs to the hydraulic model for simulation purposes.

Survey Data

The hydraulic modelling was based on freely available 5 m contour information. Accurate contour information is important for accurate floodline delineations., however more detailed survey information was not available. The reason for topographical information being so important is illustrated in ***Figure 10***, which indicates that detail in the cross-sectional information can be lost due to coarse spatial information (red line). Detailed spatial information (purple line) represents the actual cross-sectional topography (blue line) far more accurately. Therefore, it is of the view of JG Afrika that the resultant floodlines, based on more detailed spatial information, would be more accurate. The 5 m contours were used to create a DEM of the study site, which in turn allowed for cross-sectional elevations and other topology to be extracted for the project area utilising RAS Mapper. This data was subsequently used for hydraulic modelling of the previously calculated peak discharge values.

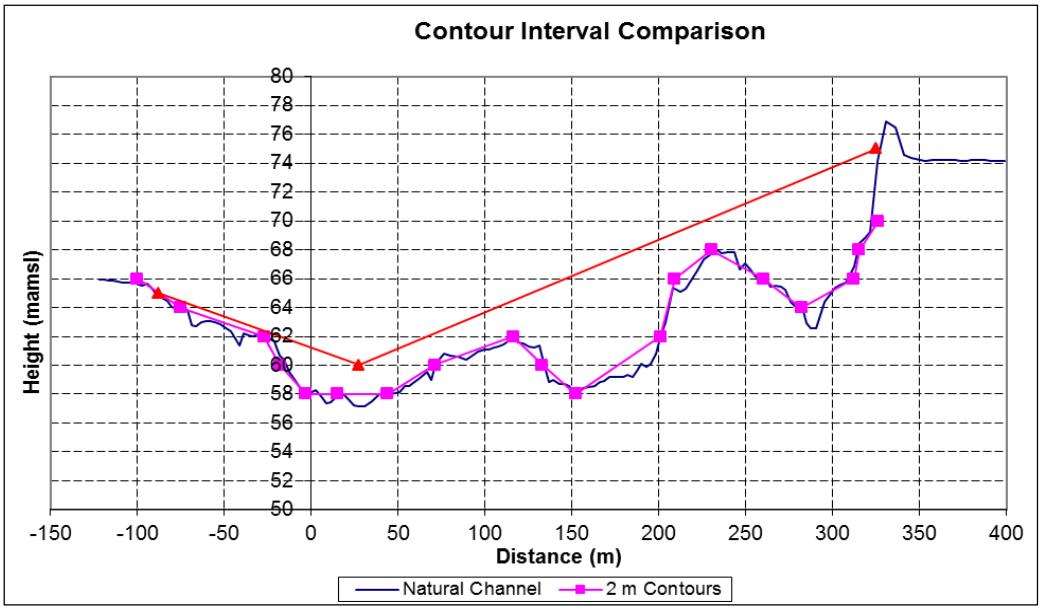

Figure 10: Illustration of Contour Information Representation (example) (JG Africa Floodline study)

Manning's Values

The roughness of the channel and floodplain surface needs to be accounted for within the hydraulic model. In this case, Manning's n values (Chow, 1959) were used to describe the surface roughness within HEC-RAS. The Manning's values were based on aerial imagery (Google Earth Imagery) of the project site as well as the site visit observations. Below table presents the range of Manning's n values used to describe the roughness of the river channels and floodplains of each study catchment. There is a lot of homogeneity within the catchments with regards to the channel and floodplain roughness, and hence, the Manning's n values were similar.

Table 19: Manning's "n" Values Used in the Hydraulic Modelling (Chow, 1959)

Location	Manning's n	Description
Channels	0.050	Very weedy reaches, brush, dense grass
Floodplains	0.045	Medium to dense brush and trees

Floodline Delineation Results

Delineated floodlines for the drainage line adjacent to the proposed quarry property is presented in below figures. As presented in this map, it is likely that a portion of the project site will be inundated during both the 1:50 and 1:100 year flood events. It is noted that the floodlines presented in bleow figrues start within the property area. Upstream of the delineated floodlines, it is expected that runoff will be in the form of sheet flow. It is only from the approximate area of where the floodlines have been delineated that sheet flow becomes defined flow as runoff is more confined to the drainage line.

It is also noted that the 1:50 and 1:100 year floodlines are delineated relatively close together. This is as a result of the coarse nature of the topographic information used in the simulations as the relatively steep nature of the project area.

It is recommended that all mining related infrastructure (including workshops, offices, and parking areas) are located outside of the delineated floodline

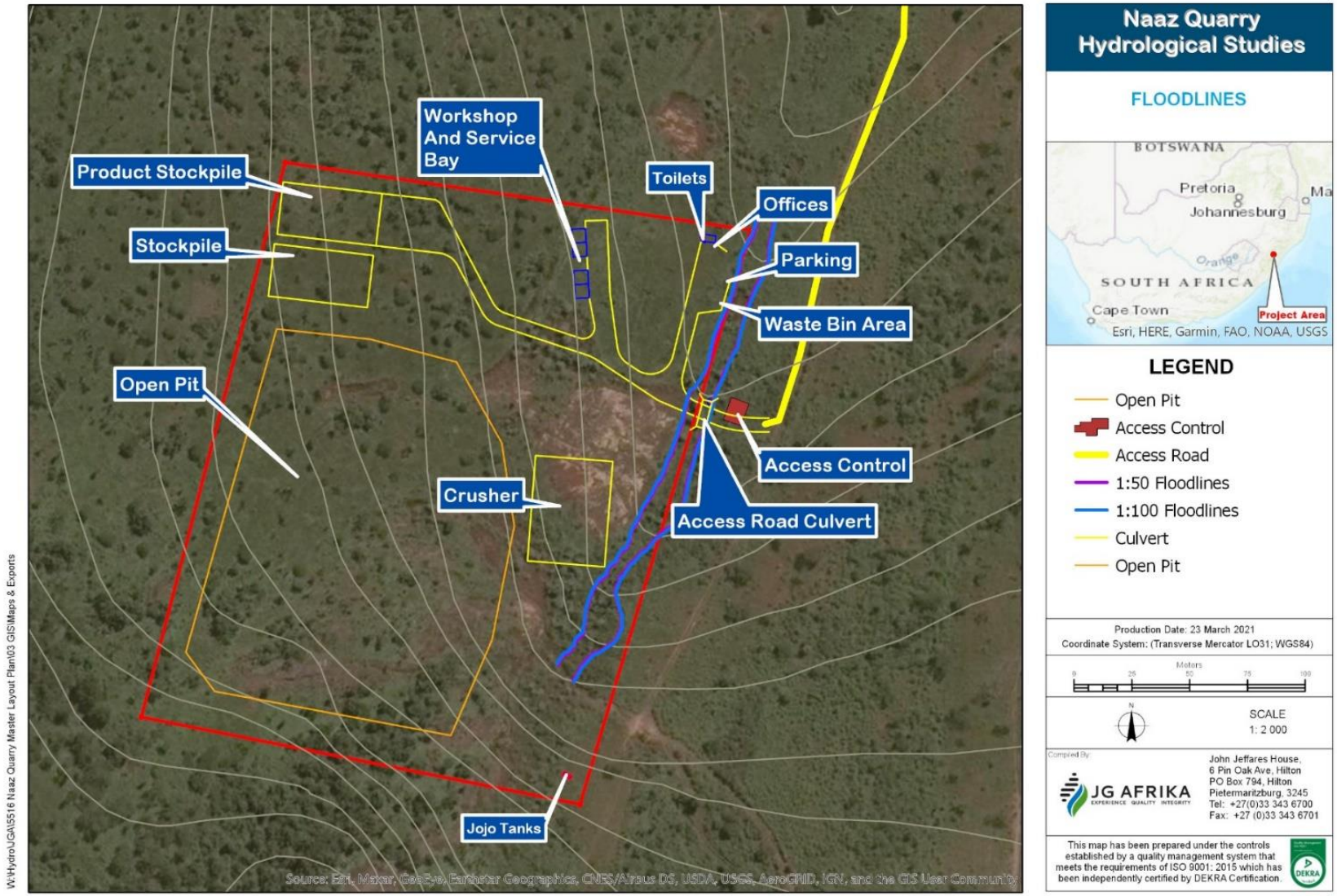

Figure 11: 1:50 and 1:100 Year Floodlines for the Naaz Quarry Drainage Line (JG Afica Floodline Study)

4.2.5 SENSITIVE AREAS SURVEY

A Vegetation Aquatic and Risk Assessment is included (refer to Appendix 15). Section below presents a summary of the findings from the updated Wetland and Aquatic study also included in a separate report as Wetland and Aquatic Assessment in Appendix 15)

4.2.6 WETLANDS

Neither the desktop study nor the field survey revealed any wetlands within the 500 m wide surrounding strip whose presence was not already known. The wetlands in the vicinity of the mine are shown in the NFEPA and Ezemvelo KZN Wildlife wetland databases, as indicated. Only one such wetland exists and it is located along the unnamed stream to the east of the mine area. It is on the extreme edge of the 500 m wide strip mandated for wetlands under the National Water Act and is shown in further detail in Figure 18. In accordance with Ollis et al (2013) it is a Channelled Valley Bottom Wetland.

The results of the watercourse identification and mapping are shown in below Figure. While Surveyor General mapping was used for most of the channels, and accorded with the Google Earth imagery, the alignment of the watercourse which originates near the mine area was problematic, as the detail of its lower reaches have been lost as a result of the development of a shale quarry. The changes started in the late 1900s as a part of a now-defunct brickworks and by 2006 the watercourse was being affected. An aerial image dated 2013 shows the shale quarry to be well developed. As the present brickworks was initiated in 2016 it is likely that it had no role in the earlier changes.

Despite the foregoing, the impacts on the watercourse originating at the proposed quarry, are not believed to be of any significance as the channel is ephemeral (i.e. it only flows only in direct response to precipitation). Even at the end of the above-average rainfalls of the 2020 – 2021 season no trace of water could be found between rainfall events. Two small dam walls have been raised across the stream (as shown in Figure 15), but it appears that they serve no function in regard to water retention or storage.
As part of separate studies, the channel originating from the proposed mining area was included in biodiversity studies, undertaken for the brickworks in 2018 and again in 2020. During these studies, the drainage line was found to be completely dry, despite the fact that the studies were done during the summer rainy season. It is therefore concluded that the drainage line originating from the area of the proposed mine quarry is no more than a surface runoff channel that carries water only after major rainfall events.

The distance from the brickworks area where the mine watercourse originally joined the unnamed stream, to the confluence with Umgeni River, is approximately 11 km.

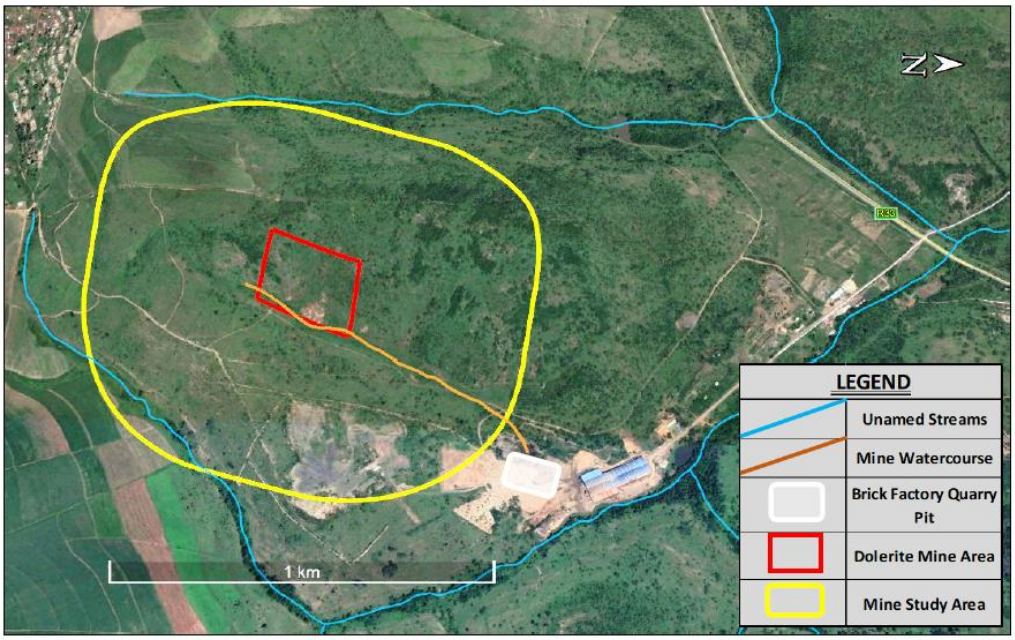

Figure 12: : Watercourses in the vicinity of the dolerite mine (JG Africa Wetland and Aquatic Study).

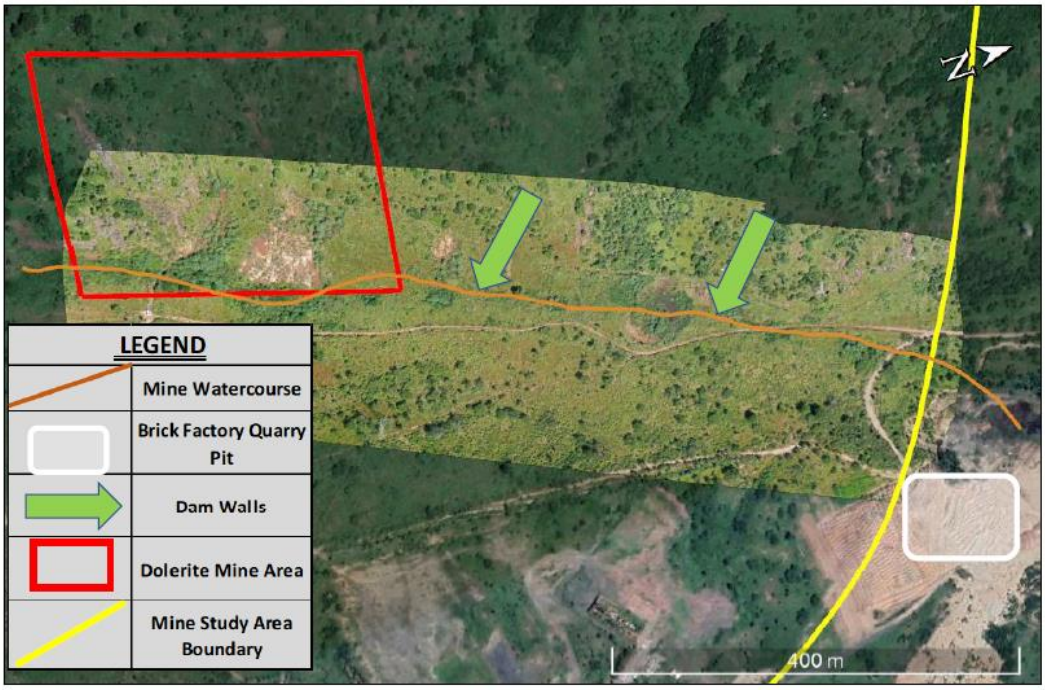

Figure 13: : Recent Aerial image of the mine watercourse (JG Africa Wetland and Aquatic Study)

Figure 14: Project Area (JG Africa Wetland and Aquatic Study)

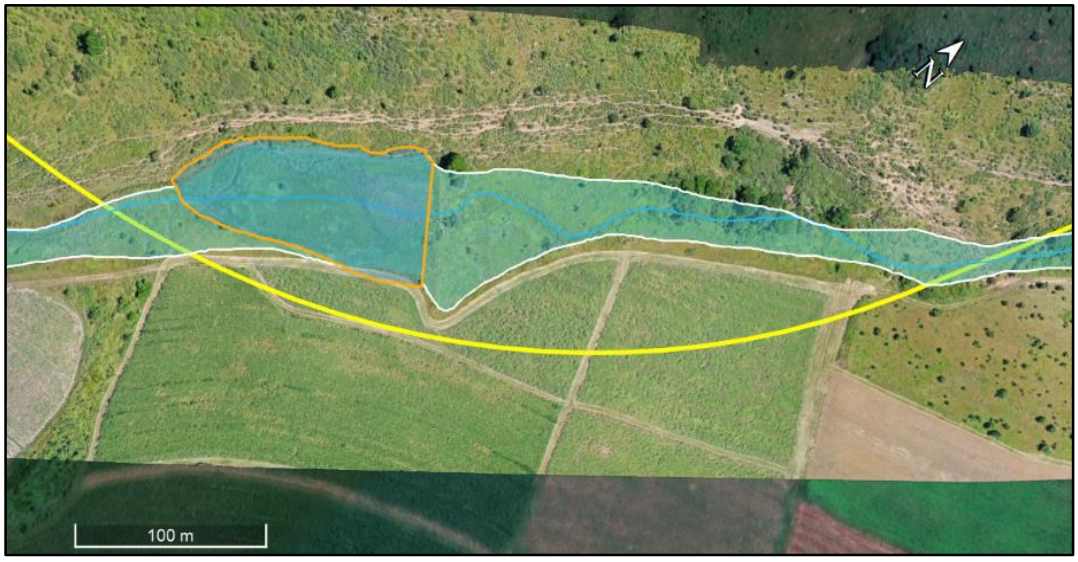

Figure 15: Portion of the wetland, including a dam, located within 500 m wide strip around the dolerite mine (JG Africa – Wetland and Aquatic Study)

Figure 16: View upstream over the unnamed stream wetland with the dam basin in the Foreground (JG Africa – Wetland and Aquatic Study)

Figure 17: View downstream along the unnamed watercourse (JG Africa – Wetland and Aquatic Study)

The outline of a small dam may be seen within it but it appears to have either been filled with sediment or to be leaking as no water was visible, and the basin area contained wetland vegetation. The condition of the wetland is indicated in Table 16 below. As with the assessment of the watercourse, the wetland was not actually delineated and modelled but the condition is based on observations made both in the course of the present and past studies, and on professional experience and opinion.

Table 20:Present Ecological State (PES) of the Channelled Valley Bottom wetland.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Channelled Valley Bottom	1.9	100	2.5	0	5.0	0	1,2	0
PES Category per driver			**C**	→	**D**	→	**B**	→
Overall PES Category of the site			**2.8 Category C (Moderately Modified.** A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.)					

The wetland is not known to hold any species of conservation concern although the area has a rich bird diversity. This is not likely to be impacted on by the mine other than as a result of blasting disturbance. Experience at other sites suggests that the birds will soon become habituated to this and so will not be affected.

The wetland is to be stable for now and so is unlikely to change very much unless there are catchment or climatic changes.

However, despite the wetland being partially within the 500 m wide strip around the mine site it is most unlikely that it will be affected by the mine as it is in a separate catchment area. Figure 18 shows the catchment divides between the mine area and the closest wetlands. It is apparent that the watercourse at the mine area lies in a sub catchment which is separate from the unnamed stream to the east. The two do eventually join but well downstream from the wetland area. Similarly, the two wetlands, which are actually dams, on the watercourse which flows to the west of the mine site, are on the opposite side of a ridge and so will not be affected.

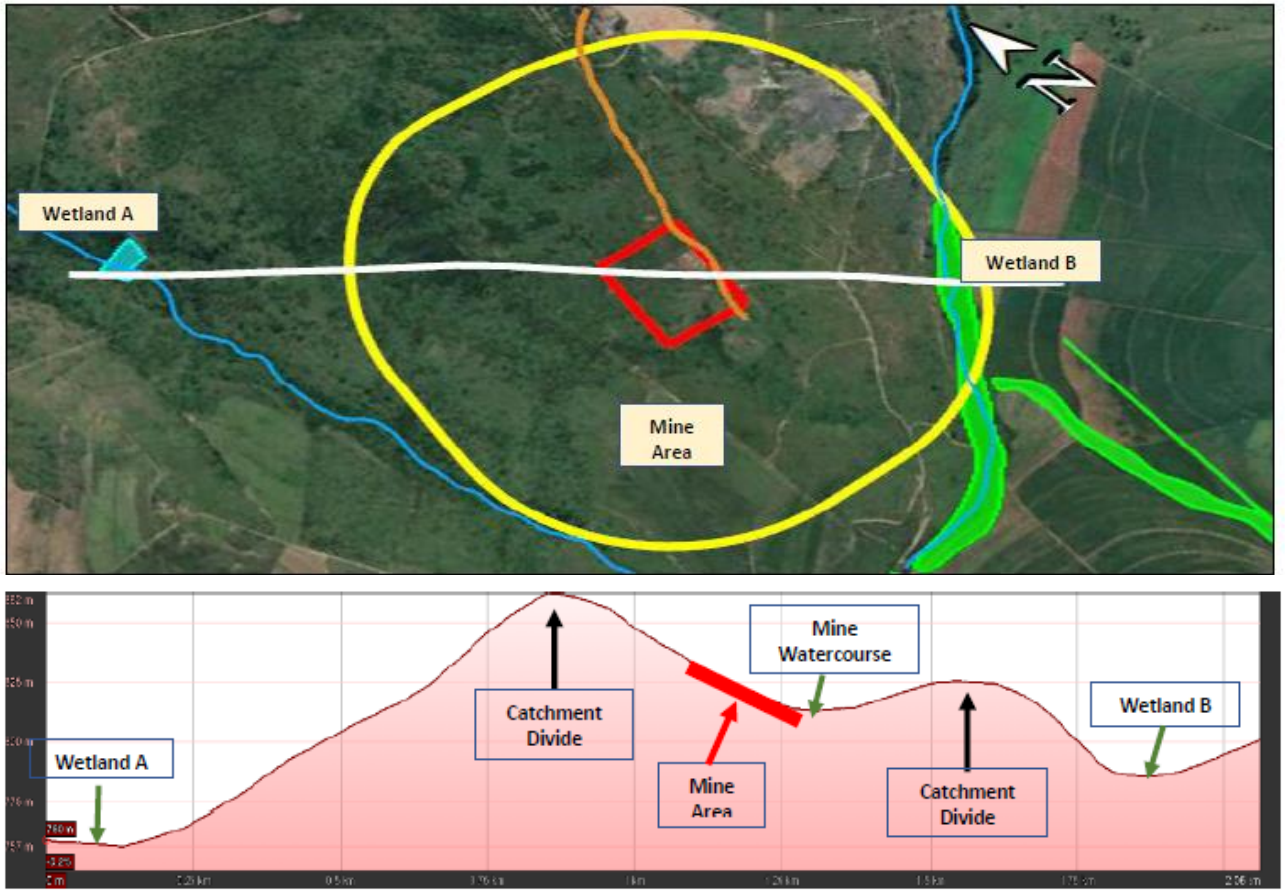

Figure 18: Longitudinal profile through the mine area showing wetlands, watercourse, mine area, and catchment divides (JG Africa – Wetland and Aquatic Study)

4.3 GROUNDWATER

This section detailing the procedures forms the essence of the sampling plan. The recommended procedures are based on Weaver's Ground Water Sampling (2007) and JG Afrika's standard operating procedures for environmental monitoring and field work. A WULA typically requires a sampling plan to be established within six months of issuance of the licence. A monitoring borehole network for the site for unobstructed sampling will be required.

Groundwater monitoring is required during construction, operation and closure phases of the activity. During any of these phases, surface water chemistry should be monitored monthly and groundwater chemistry bi annually. Construction monitoring is required to establish baseline conditions and should include targeted investigation monitoring to assess a comprehensive list of parameters. During operation, the monitoring may be reduced to targeted detection monitoring, and investigation monitoring carried out periodically as indicated by the detection monitoring results. Closure phase monitoring should be conducted for a specified period (2 to 5 years) subject to the results of the operational phase. Alternatives to be considered include SANS241 drinking water standards or South African Water Quality Guidelines for livestock watering subject to end user use of the groundwater systems.

On the basis of the General Limits of the General Authorisations1, investigation and detection monitoring parameters should include the determinants presented in below Table. Refer to Surface and Groundwater Monitoring Plan

Table 21: List of Determinants

Detection (Routine)	**Investigation (Detailed)**	
Faecal coliforms	Faecal coliforms	Dissolved Arsenic
Chemical Oxygen Demand (COD)	Chemical Oxygen Demand (COD)	Dissolved Cadmium
pH	pH	Dissolved Chromium (VI)
Ammonia	Ammonia	Dissolved Copper
Nitrate/Nitrite	Nitrate/Nitrite	Dissolved Cyanide
Chlorine	Chlorine	Dissolved Iron
Suspended solids	Suspended solids	Dissolved Lead
Electrical conductivity	Electrical conductivity	Dissolved Manganese
Ortho-phosphate	Ortho-phosphate	Mercury
Fluoride	Fluoride	Dissolved Selenium
Soap, oil or grease	Soap, oil or grease	Dissolved Zinc
Sodium Absorption Ratio (SAR)	Sodium Absorption Ratio (SAR)	Boron

4.3.1 Sampling Locations

The proposed sample locations have been selected based on downstream receiving environments for surface and groundwater. The sample locations include two (2 No.) surface water locations and two (2 No.) groundwater locations. The locations of the proposed sample points are summarised in below Table and shown in below Figure:

Table 22: Summary Sample Locations

Location ID	South	East	Resource Type	Description
KZN1803092	-29.523505°	30.436720°	Groundwater	Downstream of site
NQBH2	-29.513440°	30.433910°	Groundwater	Downstream of site
SW1	-29.524461°	30.436691°	Surface Water	Downstream of site (non-perennial)
SW2	-29.516905°	30.438783°	Surface Water	Downstream of site (perennial)

Selected proposed locations may be removed following consistent conformance, subject to the discretion of the Department. Additional sample locations may be added subject to the results of the ongoing monitoring and non-conformance.

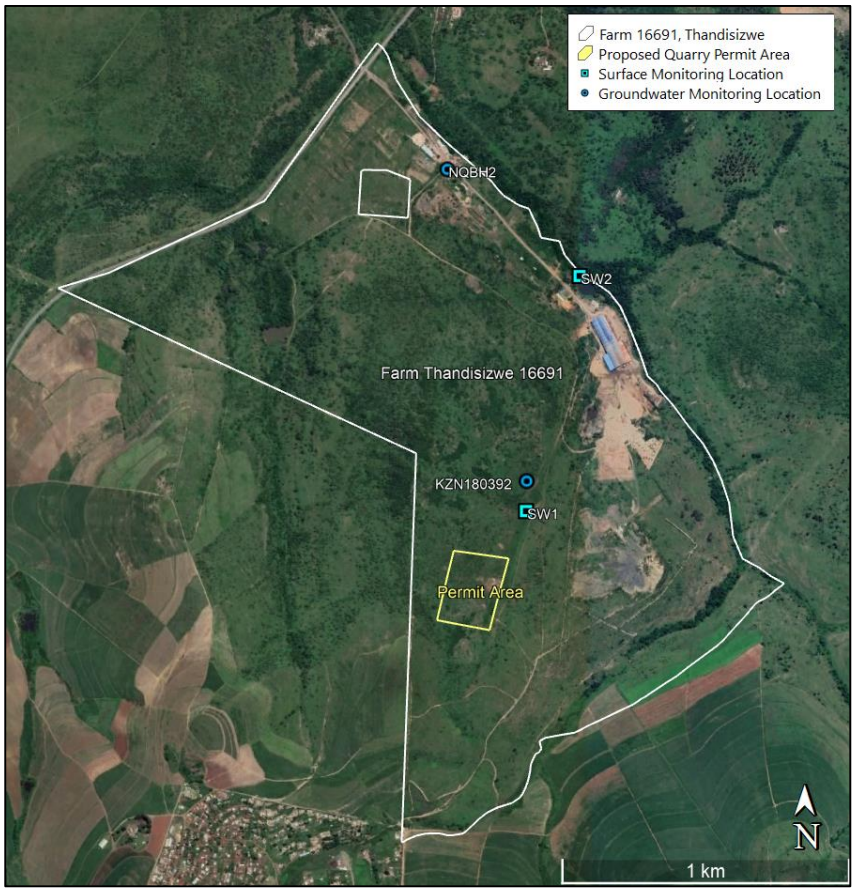

Figure 19: Site Plan Showing Sample Locations (JG Africa Groundwater Monitoring Plan)

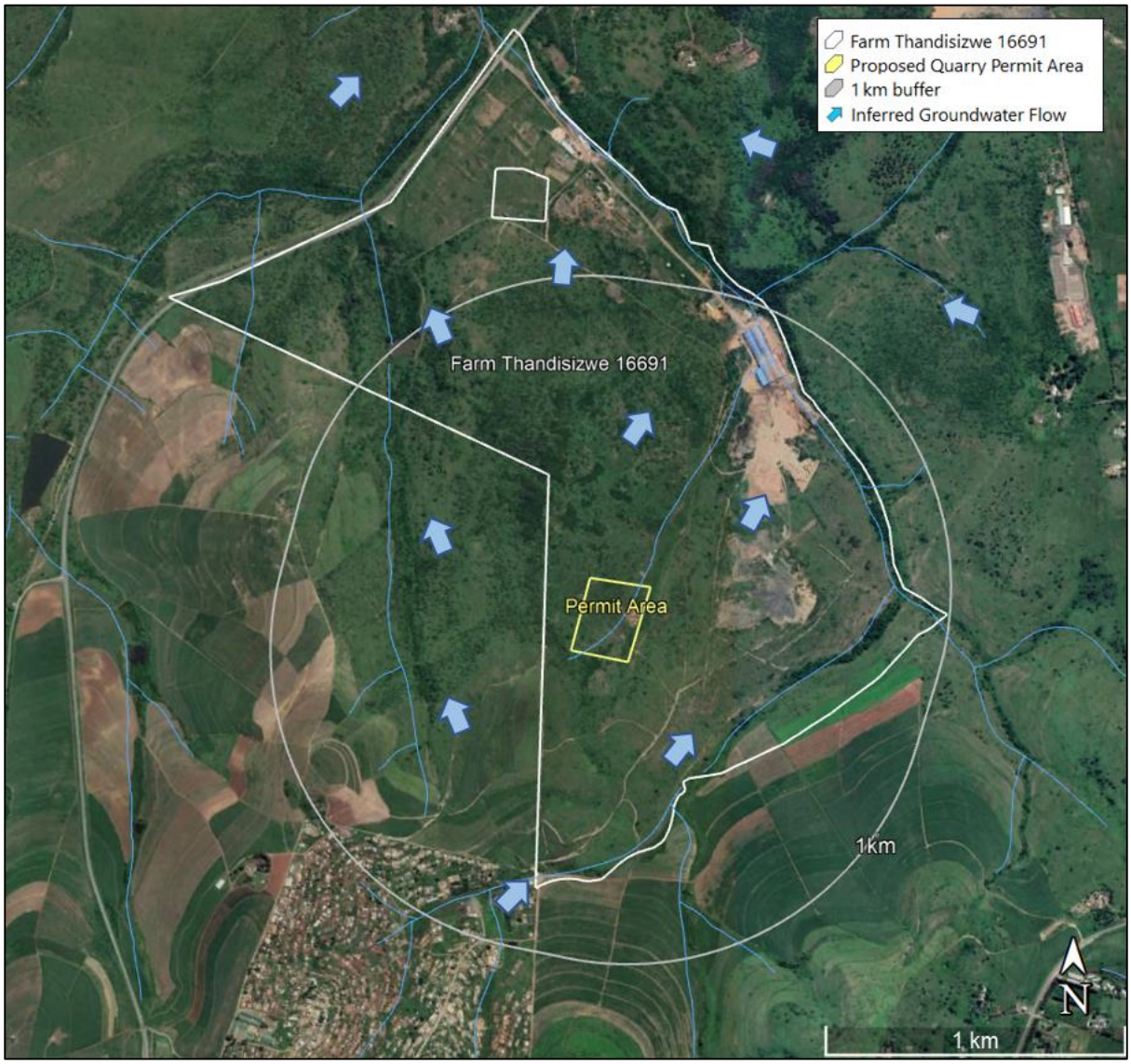

Figure 20: Inferred Groundwater Flow Direction (JG Africa Geohydrology Report)

4.4 GEOTECHNICAL

PRELIMINARY ASSESSMENT OF EXPLOITATION POTENTIAL

The geology of the site comprises shale of the Pietermaritzburg Formation, Ecca Group of the Karoo Supergroup, and a concordant, intrusive post-Karoo dolerite sill. The material of interest in this study is the dolerite sill and its potential to provide economic reserves of hard rock for crushed aggregate production.

Both previous site assessments carried out by Drennan Maud and by Terratest concluded, based upon visual assessment and desk-top level studies, that the site has potential for commercial quarrying for aggregate production.

Drennan Maud indicated, based upon a visual site assessment and ortho-photographic interpretation, that the site offers good potential for development as a quarry, with exploitable reserves of hard rock dolerite estimated to be between eight and ten million cubic metres, but subject to confirmation by the undertaking of a “diamond drilling” programme. This was apparently based upon a maximum vertical thickness of about 40mfor the dolerite sill. This is assumed to have been based upon an overall assessment of dolerite reserves within the property.

Below figures, compiled by Terratest following a brief site visit undertaken in January 2017, shows the approximate delineation of the dolerite rock body (yellow outline), based upon an on-site visual assessment and aerial photographic interpretation. The preferred alternative proposed quarry site, defined by point numbers A, B, C and D has been superimposed on the plan. The preferred alternative site measures approximately 200m by 250m.

The objectives of Terratest’s quotation were to provide an investigation methodology to confirm the suitability of the site, both in respect of the rock quality and the exploitable volumes of good quality hard rock dolerite namely, to confirm the mineable reserves of dolerite. At that stage no preferred alternative site location had been designated and the assessment was of reserves within the property. The proposed method of investigation was to entail a combination of surface mapping, rotary core drilling (“diamond drilling”), percussion drilling, trial pits excavated by means of an excavator and laboratory testing.

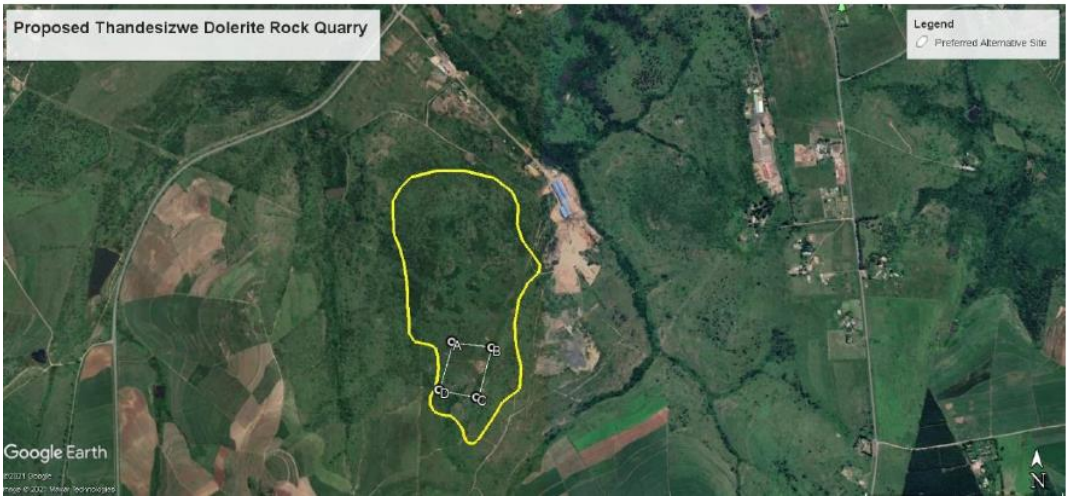

Figure 21: Shows the southern portion of the site forming part of the preferred alternative site. Dolerite outcrop is visual in the sides of the north-east facing hillslope. (JG Africa – Geotechnical Study)

Figure 22: General view of the Preferred Alternative Proposed Quarry site.

4.5 GEOHYDROLOGICAL

Refer to Geohydrological Report by JG Africa.

4.5.1 Site and Project Description

The site is located on a portion of Portion 0 (Remaining Extent) of the farm Thandisizwe No 16691, and is approximately 10km north north east of Pietermaritzburg. The permit area has an area of 4.9 ha. The site can be accessed via a dirt road off the R33 between Pietermaritzburg and New Hanover. The location of the site is shown in below Figure 23Figure 23.

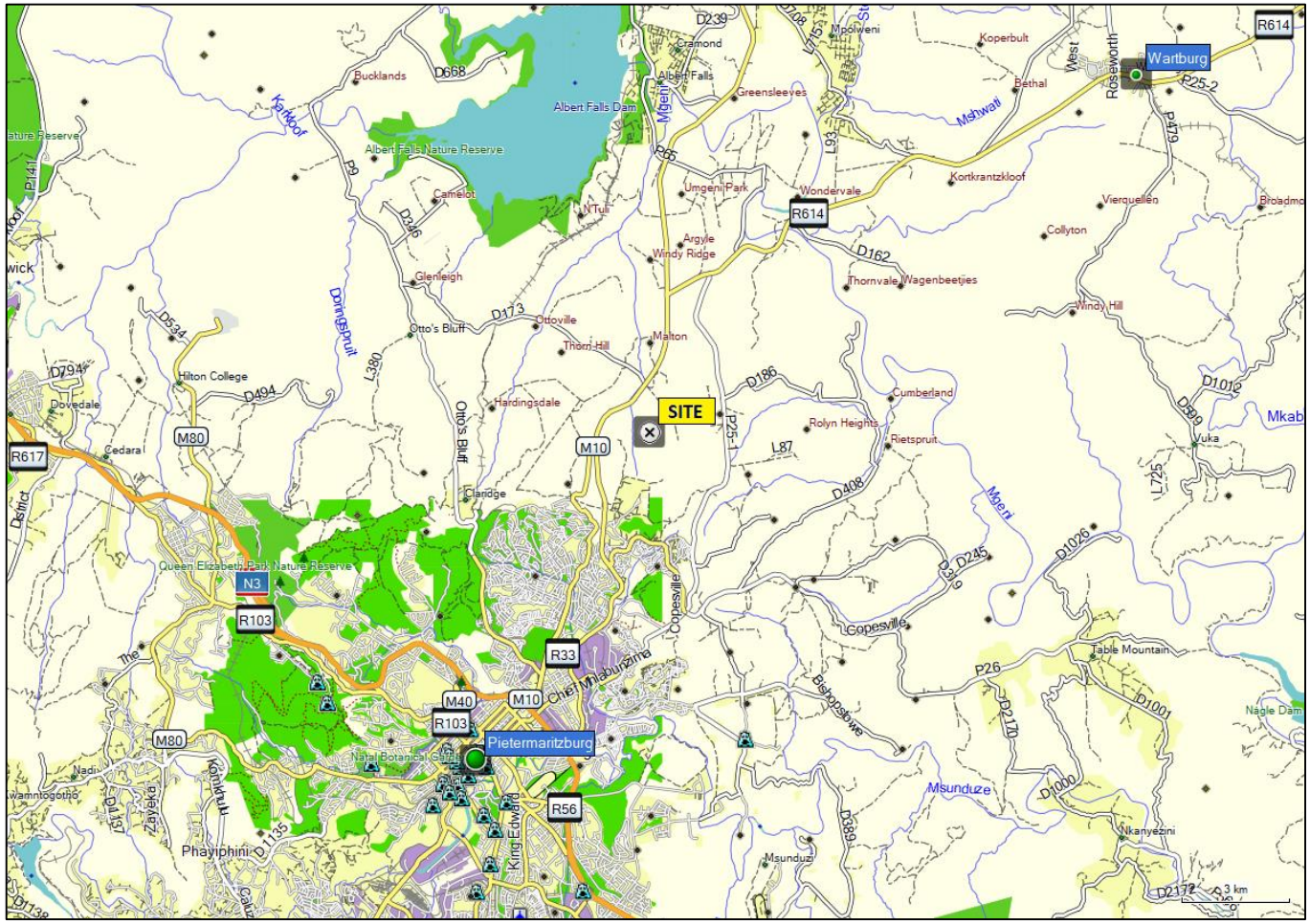

Figure 23: Locality Plan (JF Africa – Geohydrology Report)

The project area comprises a dolerite “koppie” with the east and west side dropping down to valley lines on either side. The permit area is located on the eastern side of the koppie. The approximate elevation range of the surrounding area is 720 to the north, to 880 maMSL to the south. The permit area itself is at an elevation of 857 maMSL in the south western corner, to 796 maMSL in the north eastern corner.

The project area is mostly undeveloped with areas of grassland, bush, trees and farmland. Power lines are present 125 m to the east of the permit area. Adjacent land is occupied by sugar cane farms to the south and west, the R33 road on the north western boundary, a brick works facility to the north east and farmland to the east.

The project area is located within the U20G quaternary catchment. A valley line with possible seasonable stream flow is located on the western side of the koppie. An unnamed perennial stream flows from south west to north east, 400 m to the south east, then turns north west 800 m to the east. A non-perennial water course bounds the permit area on the eastern side and joins the perennial stream 830 m to the north north east. Evidence of small dams along this water course of present. The project area is described as valley thicket of the thicket biome and is characterised by mostly thicket and bushland with some unimproved grassland.

Application for environmental authorisation to mine dolerite has been made for the permit area. The proposed mining method will make use of blasting in order to loosen the hard rock. The material will be loaded and hauled to the crushing plant where it will be screened to various sized stockpiles. The aggregate will be stockpiled until it is transported from site using tipper trucks. The mining related activities will be contained within the approved mining permit boundaries. The permit area is shown in below Figure.

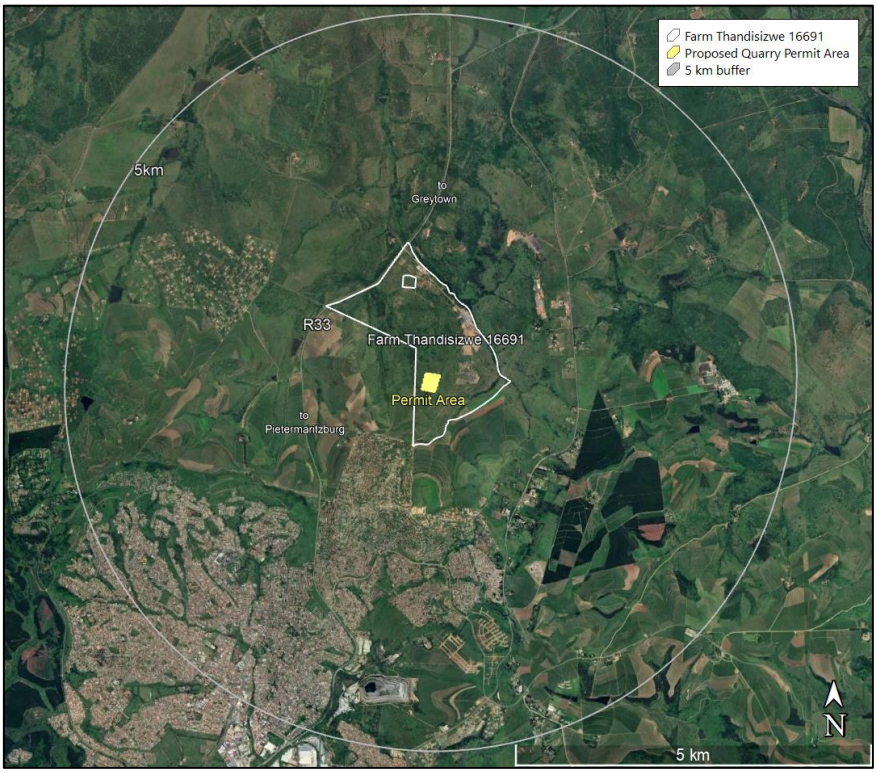

Figure 24: Project Area- (JF Africa Geohydrology Report)

4.5.2 Regional Geology and Structures

The regional geology of the area comprises Ecca Group Permian deposits of the Pietermaritzburg Formation including dark grey shale, siltstone and subordinate sandstone which have been extensively intruded by Post Karoo age dolerite. Regional mapping indicates intrusive dolerite of Jurassic age to be present in the central and eastern portion of the project area.

Regional Faults and Dykes were not evident within 1 km of the site, with the closest regional fault mapped nearly 5 km to the east. A north west to south east trending lineament was located 770 m to the north east, and further east, a near north south trending lineament was evident approximately 2km away. The regional geology and structures of the project area is shown in figure below.

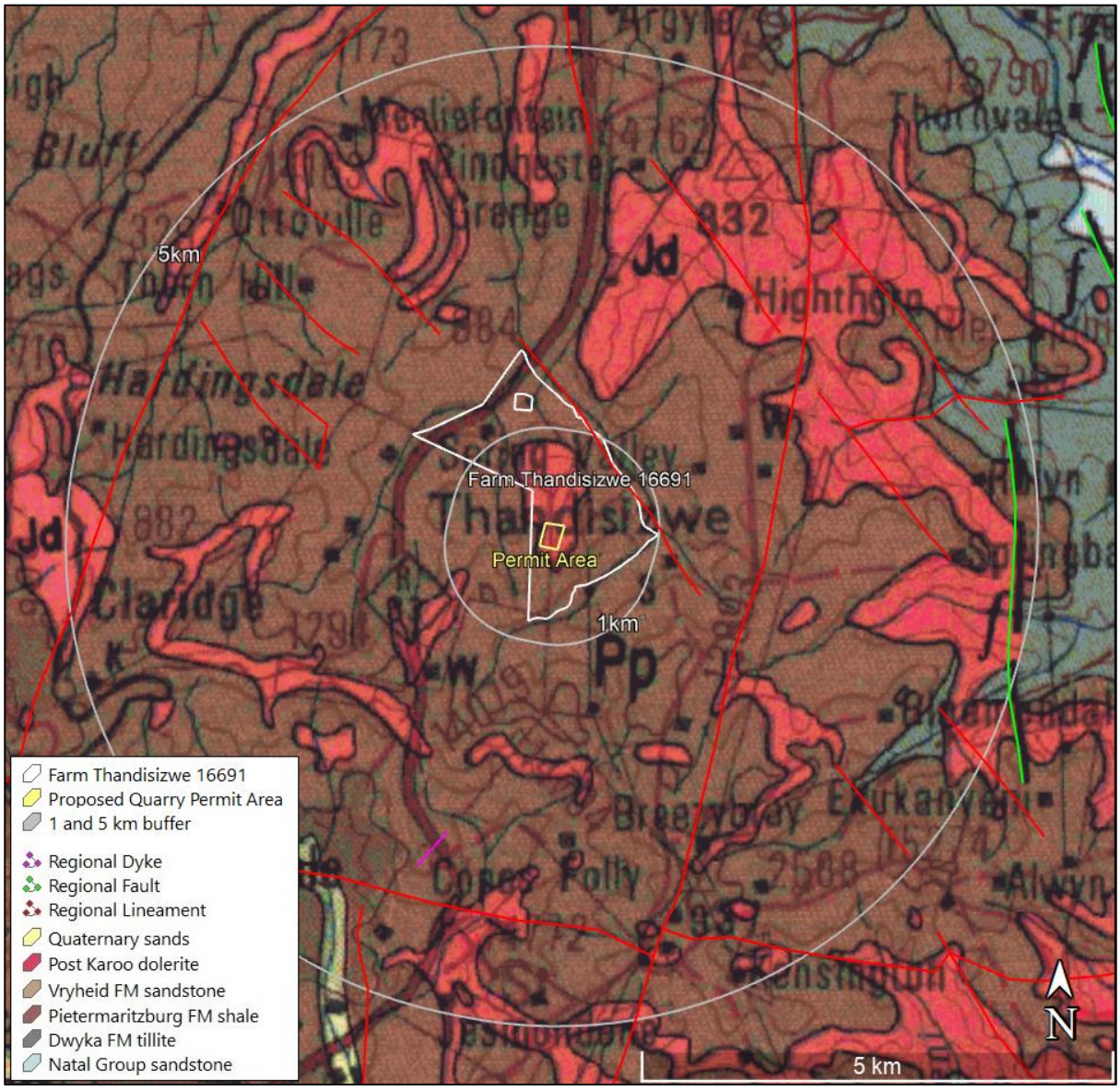

Figure 25: Regional Geology and Structures (JF Africa – Geohydrology Report)

4.5.3 Regional Geohydrology and Conceptual Groundwater Flow

The regional geohydrology of the area can be broadly described as predominantly argillaceous rocks comprising shale, mudstone and siltstone. The principal groundwater occurrence is from an intergranular and fractured aquifer type, with median borehole yields in the range 0.5 to 2.0l/s. The regional geohydrology of the area is presented below

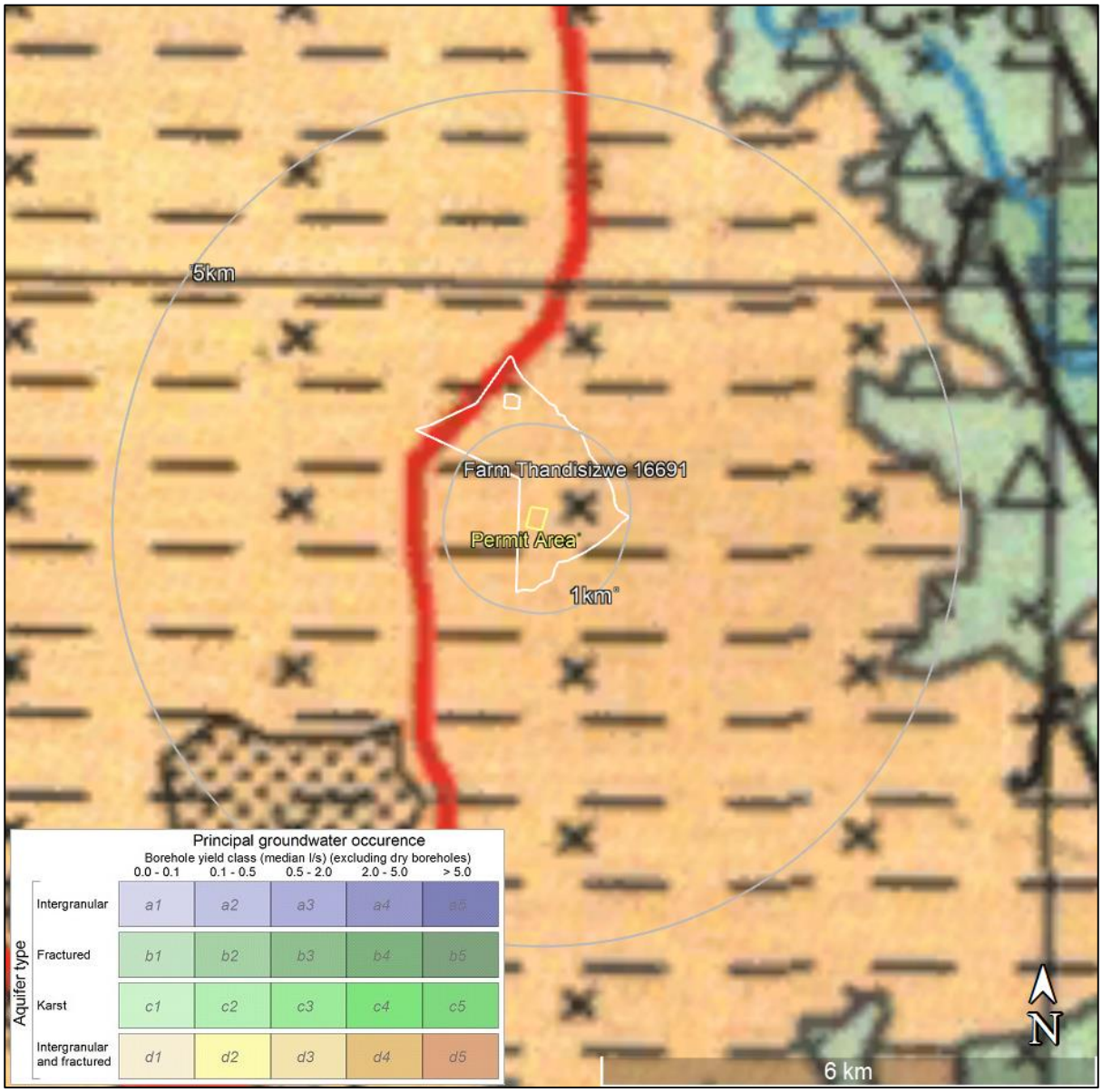

Figure 26: Regional Geohydrology (JF Africa – Geohydrology Report)

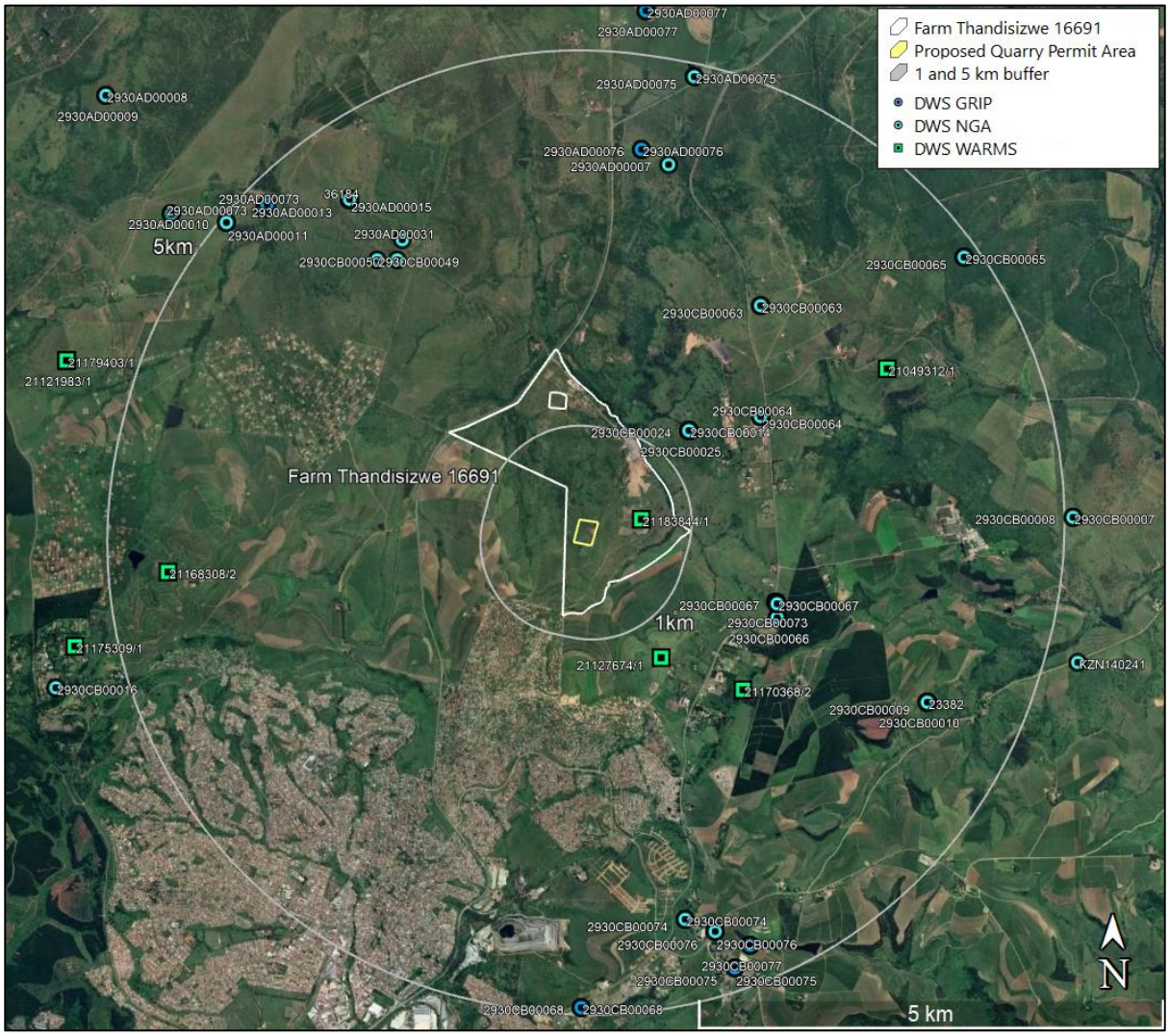

Figure 27: Hydrocensus Resources (JF Africa – Geohydrology Report) – DWS NGA, GRIP and WARMS Datasets

4.5.4 Regional Magnetic Mapping

The regional magnetic mapping with a contour interval of 50 nT for the project area, as generated from mapping of the whole country, is presented in below figure. The mapping indicates that magnetic flux for the project area has a range of 50 to 300 nT. Closer to the site, the flux is consistently 120 to 150 nT, showing the response to the dolerite outcrop on the farm. No major anomalies near the site are evident from the regional mapping. An extensive magnetic high is evident to the south and east of the project area in excess of 1 km from the site. This may be as a result of an extended lithological response.

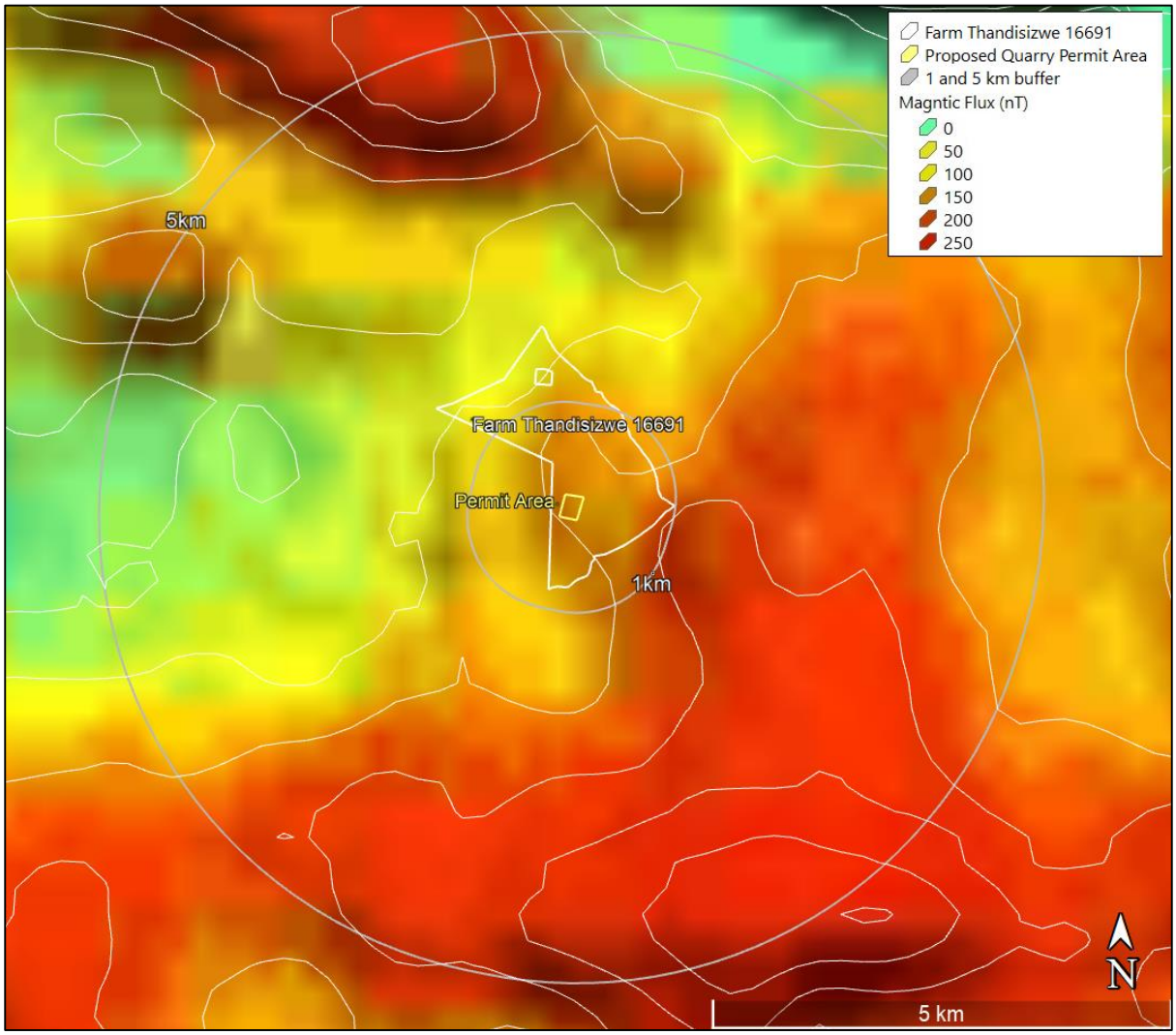

Figure 28: Regional Magnetix Mapping (JF Africa – Geohydrology Report)

Conclusion:

This report presents the results of a preliminary geohydrological assessment for the proposed mining permit area for Naaz Quarry located on Farm 16691, Thandisizwe, near Pietermaritzburg, KwaZulu-Natal. The aim of the assessment was to characterise the geohydrological setting, and to determine the risk of potential impacts by the anticipated activities associated with construction and operation of the quarry site on the receiving groundwater environment.

The project area is underlain by a fractured and intergranular aquifer that is moderate to low yielding. The underlying aquifer is classified as Minor. The inferred depth to groundwater is >10 mbgl.

The Parsons Groundwater Quality Management System gives the site a Low Level of Protection index for the second variable vulnerability, and a Medium Level of Protection index for the second variable strategic value. Existing potential contaminating sources in the project area include the surrounding agricultural practises and industry including the brick works.

The quantitative environmental risk assessment determined all identified activities to score LOW, with the following to score at the upper end of LOW:

- Exploratory drilling and creating conduits to groundwater system
- Excavations areas and increased turbidity and micro biological loads
- Chemical stores, explosives etc (small scale)
- Washday, workshop and plant storage areas
- Leachate from stockpiles.

All activity scores can be reduced with appropriate mitigation. As per the operational guidelines and regulations for water use;

- The quarry must prevent water containing waste or any substance which causes or is likely to cause pollution of a water resource from entering any water resource, either by natural flow or by seepage, and must retain or collect such substance or water containing waste for use, re-use, evaporation or for purification and disposal
- Abstraction, storage, discharge and any controlled activity must be authorised in terms of Section 21 and 22 of the National Water Act (Act No. 36 of 1998)
- The quarry must have appropriately designed stormwater, dirty water and recycle water systems
- No sanitary convenience, fuel depots, reservoir, or depots for any substance which causes or is likely to cause pollution of a water resource may be located within the 1:50 year flood-line of any watercourse
- All domestic waste water which cannot be disposed of in a municipal sewage system is to be disposed of in terms of an authorisation.

It is further recommended that

- Temporary sanitation facilities provided at the site must be appropriately managed/maintained
- Earthwork plant/machinery spills must be remediated immediately by appropriate removal of all impacted soils
- Refuelling of plant and machinery must be carried out in a controlled environment as per the Environmental Management Plan
- Any hazardous store areas should be placed undercover on hardstand or in bunded areas

Bi annual water quality monitoring must be carried out as per the Water Quality Monitoring Plan.

4.6 SOCIO-ECONOMIC ENVIRONMENT

The proposed mining area is located in ward 10 of the uMshwathi Local Municipality (uMLM). The uMLM is situated within uMgungundlovu District Municipality immediately adjacent to Pietermaritzburg. uMshwathi comprises of four major urban centres (New Hanover, Wartburg, Dalton and Cool Air) as well as the rural residential settlements of Swayimane, Mpolweni, Thokozani and Ozwathini.

According to the revised population estimates based on the 2011 results (Stats SA, 2011), the uMLM has a population of 106 374 with a population growth rate of -0.19%. South Africa as a whole is estimated to have an average annual growth rate of 1.4% and the growth rate of the uMLM it therefore well below the national growth rate.

4.6.1 Demographics

The uMgungundlovu District Municipality is a Category C municipality located in the KwaZulu-Natal Midlands. The district is comprised of the following seven local municipalities, which are based in the accompanying towns: Impendle – Impendle, Mkhambathini – Camperdown, Mpofana – Mooi River, Msunduzi – Pietermaritzburg, Richmond – Richmond, uMngeni – Howick, and uMshwathi – New Hanover/Wartburg. The main city of the area is Pietermaritzburg, which is both the capital city and the legislative capital of KwaZulu-Natal. uMgungundlovu is a water services authority and also a water service provider that continually strives to maintain its Blue Drop and Green Drop Status.

The district offers distinguished education facilities and is a retirement mecca for senior citizens. It also offers excellent sporting, commercial and health facilities. It is an important industrial, timber, dairy and agricultural hub that has a modern, sophisticated infrastructure with easy access to airports, the N3 arterial, and railway stations

Pietermaritzburg, the second largest city in KwaZulu-Natal, falls within the boundaries of Msunduzi municipality. The city is both the administrative and legislative capital of the province, which boosts investor confidence, resulting in the city's economy growing at an astounding rate. Pietermaritzburg is more than just a favourable investment destination; it is one of South Africa's most desirable residential cities with well-laid-out suburbs (uMgungundlovu District Municipality IDP 2012/13). The census 2011 conducted by Stats SA estimates the total population of Pietermaritzburg to be 618,536.

The racial composition of Pietermaritzburg is as follow:

- Black 81.1%
- Coloured 2.9%
- Asian 9.8%
- White 6%
- Other 0.3%

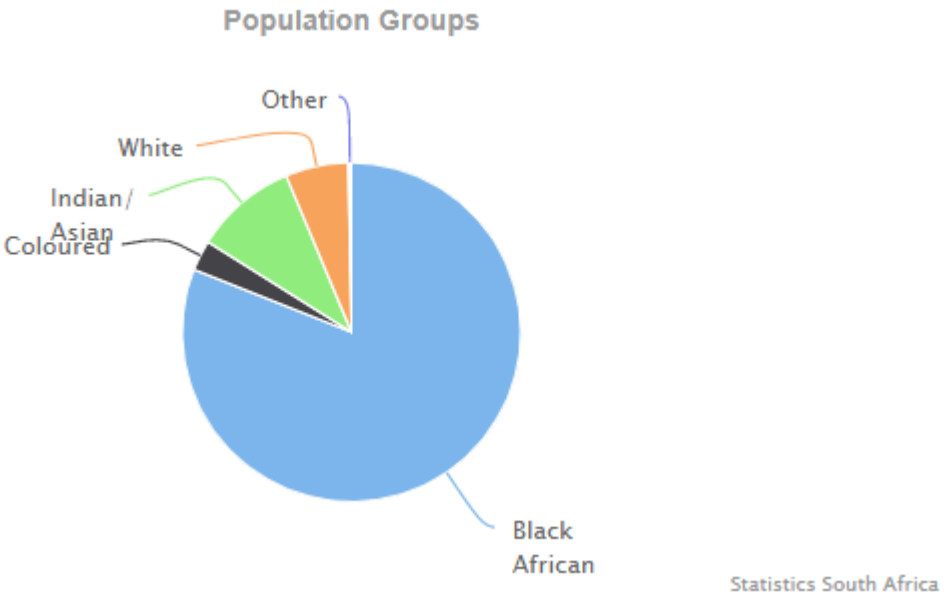

Figure 29: Population groups of Pietermaritzburg (SA Stats, 2011)

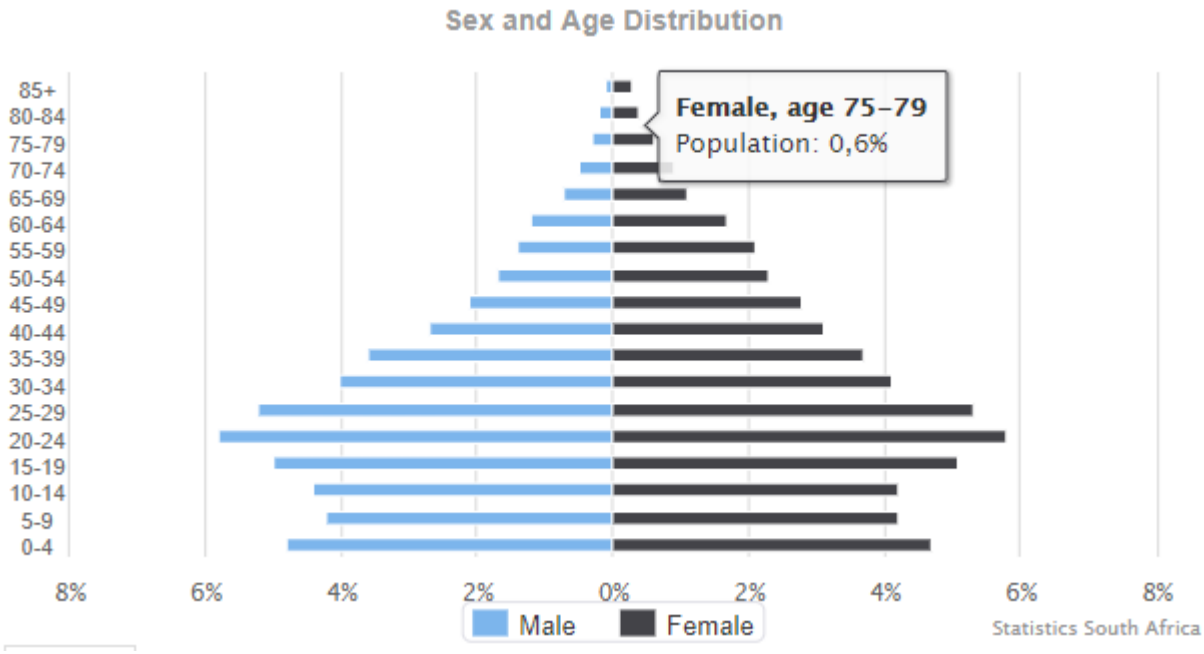

Figure 30: The population by age and gender Pietermaritzburg (SA Stats, 2011)

4.6.2 Education and Employment

The effects of education (or non-education) are extensive throughout society. Education links directly to poverty-reduction efforts, with poverty levels tending to be lower among families in which the head of the household has had some education, than in those where the head of the household has no education. Education is also directly related to improve health and adversely related to premature death rates among children. Even with improved education levels, jobs may still be hard to find, although education considerably enhances the chances of finding employment.

The Pietermaritzburg and the surrounding areas are a centre of educational excellence, in both provincial and national contexts. Pietermaritzburg is home to a number of institutions of higher education, including the University of KwaZulu-Natal (UKZN), Durban University of Technology (DUT), various TVET Colleges and technical colleges. It is also home to a host of both private and government-owned institutions of primary and secondary education. Even within the rural and peri-urban areas, schools within the Msunduzi municipal area are situated within the national standards of a primary school within 2km and a secondary school within 5km of all residential areas. A continuous challenge is the standard of school buildings, and access to schools in various areas within Edendale and Vulindlela in the Msunduzi and other rural areas throughout the UMDM. The illiteracy rate in Pietermaritzburg City is high with over 5.5% of the population being functionally illiterate.

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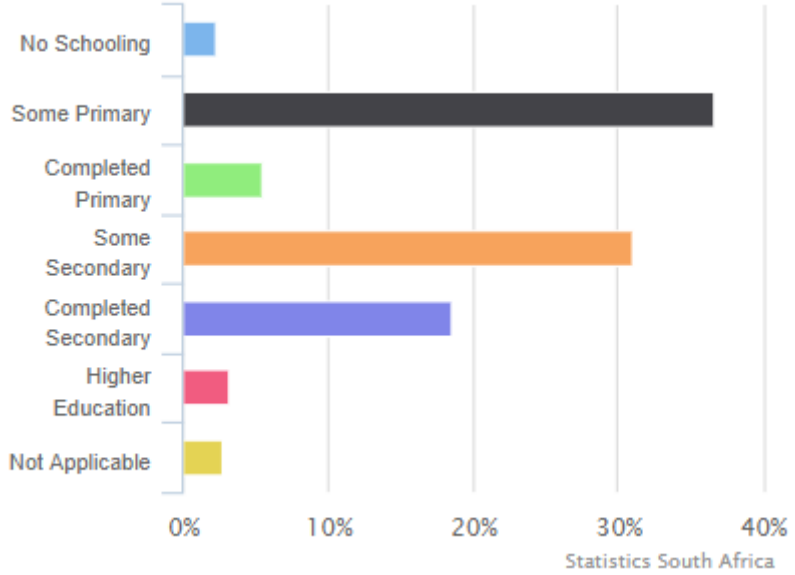

Figure 31: Highest Educational Level Pietermaritzburg (SA Stats, 2011)

4.6.3 Housing

There is an increasing demand for sustainable housing in the Msunduzi. According to Stats SA (2011), more than 61% of the population of Msunduzi is categorized as living in poverty. This indicates the profound depth of the housing predicament within the Msunduzi. Its stated that that out of the seven municipalities in the uMgungundlovu District, the Msunduzi contributes more 50% of the housing backlog in District – at 44 263 out of 79 998 housing backlogs.

The settlement type of the Pietermaritzburg City is as follows:

- Urban 75.4%
- Tribal/ Traditional:24%
- Farm: 0.6%

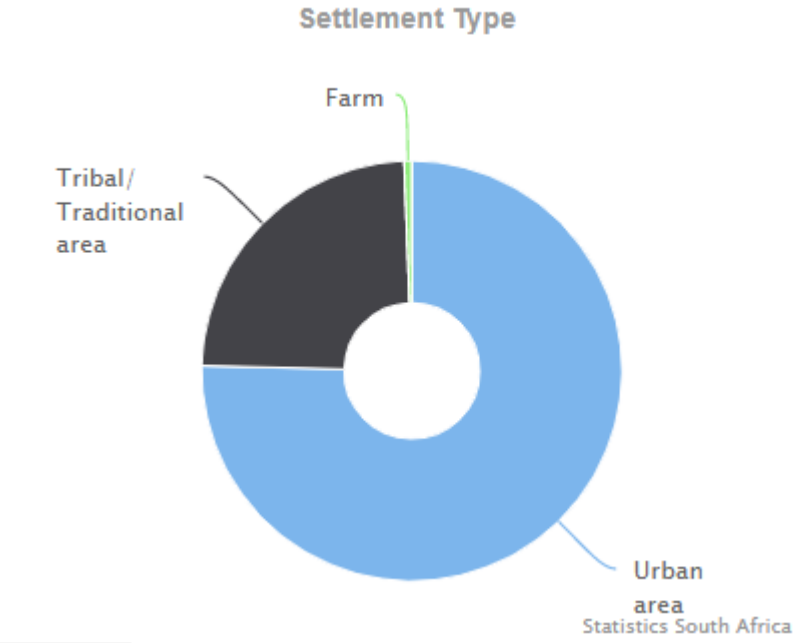

Figure 32: Settlement Type Pietermaritzburg (SA Stats, 2011)

4.6.4 Services

Water:

Piped water is accessed by 40% of South Africa's households and 26% has piped water inside their yard. A further 25% has piped water on community stands – half of these are more than 200m from their dwellings. A tenth relies on a natural water supply (boreholes, rainwater tanks, dams, rivers, streams or springs).

Since the launch of the Blue Drop System in 2008, Msunduzi Municipality has participated in this excellence approach to drinking water provision and water quality performance. uring the first round of the Blue Drop assessments Msunduzi Municipality managed an overall score of 92%. Blue Drop criteria however became stricter within the second round, with emphasis on excellence, which impacted on the scoring. Msunduzi Municipality's overall score for the second round, which was conducted in 2010, was 73.2% and was based on the evaluation of two systems. It is important to note that Blue Drop Assessments are not only of drinking water quality but also the business of the provision of drinking water which includes areas of Water Safety Plans, process control, drinking water quality programmes and credibility, as well as drinking water compliance and submission of drinking water results with the inclusion of publication of results and asset management

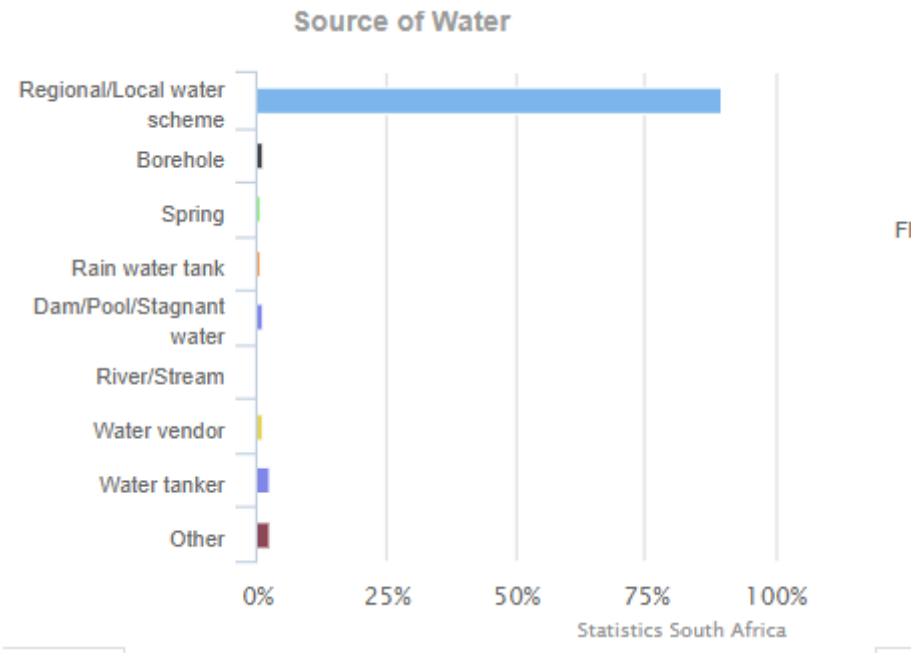

Figure 33: : Access to water of Pietermaritzburg (SA Stats, 2011)

Sanitation

Sanitation service levels reflect those of water, as flush toilets tend to be more closely aligned to the establishment of formal houses. Therefore, buckets are usually provided to informal settlements as an interim measure until the establishment of a formal human settlement. About 79% of the population in both the UMDM and the Msunduzi Municipality have adequate access to sanitation, which implies a backlog of about 21% and about 51.6% of households have access to a flush toilet.

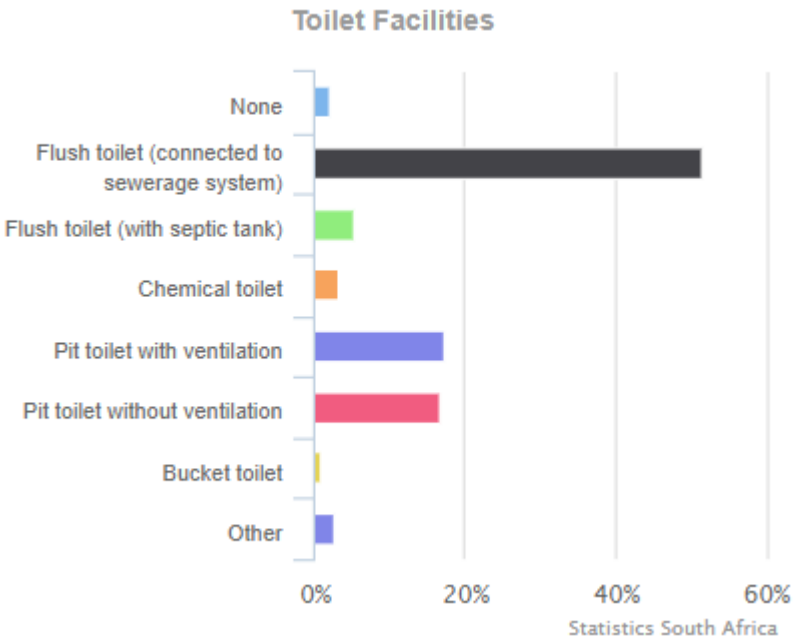

Figure 34: Access to toilet Facilities in Pietermaritzburg (SA Stats, 2011)

Electricity and Energy

Households with electricity for lighting have increased from 85.8% in 2001 to 91.9% in 2011, which is well above the provincial average of 77.9% of households. According to the Community Survey (2016) results, the majority of the households within the Msunduzi Municipal area utilize electricity as a main energy source for cooking (95.23%), water heating (94.62%) space heating (84.68%) and lighting (97.37%). The results also revealed that there are households that still have no access to electricity in uMgungundlovu; Mpofana LM has the highest percentage (18%) while Msunduzi LM has the lowest percentage (2%).

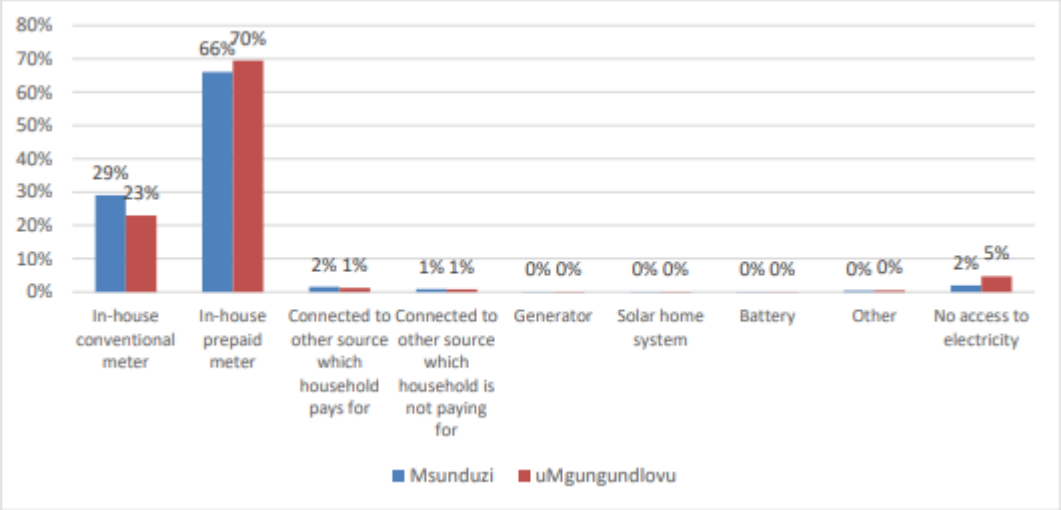

Figure 35: Access to Electricity in Pietermaritzburg (SA Stats, 2019)

5. ANALYSIS AND CHARACTERISATION OF THE WATER USE ACTIVITY

This section contains an analysis or characterisation of all the water use and waste management aspects of an activity. This will provide an overview of three key areas, namely process water, storm water, and waste.

5.1 SITE DELINEATION FOR CHARACTERIZATION

A key requirement for the SWMP is to identify the clean and dirty water areas and to come up with a plan to intercept dirty water and to temporary store the dirty water in a pollution control dam which will meet the Norms and Standards as set out by the Department of Water affairs. The proposed MP project will therefor entail the:

5.2 WATER AND WASTE MANAGEMENT

Each of the key processes and associated water uses have been characterised under the three main key areas essential to IWWMP formulation (storm water, process water, and waste).

5.2.1 PROCESS WATER

Water required for the implementation of the project will be sourced from the municipality and transported to the mining area (in a truck) where it will be stored in three jojo tanks until used. Presently, no washing of material is proposed and Inzalo will therefore mainly use water for dust suppression purposes on denuded areas, the processing plant, and access road (when needed).

5.2.2 POTABLE WATER SUPPLY

Potable water will be bought and brought to the site daily.

5.2.3 STORMWATER (CLEAN AND DIRTY MANAGEMENT)

An effective storm water management system is essential to ensure operations at the quarry are uninterrupted and to protect the downstream water resources and ecosystems. The main purpose of this SWMP is to ensure that the risk of polluting water resources downstream of the Naaz Quarry site is minimised. This entails the management of dirty water generated at the crusher plant, overburden stockpile areas, product stockpile and fuel and hydrocarbon stores.

The Department of Water and Sanitation (DWS) Best Practice Guidelines (BPGs)-A1 (2006), which were developed specifically for stormwater management in small-scale mining, was used as a basis for the development of this SWMP. These guidelines are based on the requirements of General Notice 704 (GN 704) of the National Water Act (Act 36 of 1998). The basic principles of a SWMP, which were followed in this study, are outlined below:

- Clean water must be kept clean and be routed to a natural watercourse by a system separate from the dirty water system, while preventing, or minimising, the risk of spillage of clean water into dirty water systems.
- Dirty water must be collected and contained in a system separate from the clean water system and the risk of spillage, or seepage, into clean water systems must be minimised.
- The SWMP must be sustainable over the life cycle of the dirty areas, over different hydrological cycles and it must incorporate principles of risk management.
- The statutory requirements of various regulatory agencies and the interests of stakeholders must be considered and incorporated.

The following SWMP has been divided into two parts, namely, that dealing with clean stormwater runoff and secondly that dealing with dirty stormwater management.

5.2.3.1 Clean Stormwater Runoff Management

As per principal one of the BPG - A1 (Small Scale Mining), clean stormwater runoff must be kept clean and be routed to a natural watercourse by a system separate from the dirty water system, while preventing or minimising the risk of mixing clean and dirty stormwater runoff. In order to accomplish this at the Naaz Quarry site, two clean water diversion berms are proposed, as presented in below figures

1. These include:

- Berm 1, which is proposed to divert clean stormwater runoff around the western and northern boundary of the project site;
- Berm 2, which is proposed to divert clean stormwater runoff around the southern boundary of the project site;

In order to meet with statutory requirements, clean stormwater diversion infrastructure needs to be sized to accommodate the 1:50 year design flood event. The method used to calculate the 1:50 year peak discharge used to provide recommendations pertaining to the dimensions of the clean diversion berms was the Rational Method, as described in Section 3.2. Due to the size of the catchment areas, a minimum time of concentration of 15 minutes was used for all catchments.

In addition to the diversion berms, a culvert is also required along the access road to the project site. Due to the culvert not being associated with the diversion infrastructure, it is not required to be sized to convey the 1:50 year peak discharge rate. Instead, the culvert was sized based on the 1:10 year design flood peak discharge rate.

Catchment characteristics of areas contributing flow to the proposed stormwater diversion berms and proposed culvert, including catchment C Factors and resultant peak discharge values are presented in Tables 23 and Table 24. Based on the calculated 1:50 year peak discharge values, dimensions of the proposed stormwater management infrastructure are presented in Table 25 (diversion berms) and 26 (access road culvert) As presented in Table 25, significant flow velocities are expected along both of the diversion channels/berms. It is therefore recommended that erosion protection measures are implemented along the bed and walls of the channels. This may include rocks from the mining operations, imbedded along the channel bed and/or concrete lining along the respective channels. The lining mechanism should be confirmed during the detailed design phase of the project.

Table 23:Diversion Berms and Culvert Catchment Characteristics

Catchment	Catchment Area (km^2)	Stream Length (m)	Slope (m/m)	Time of Concentration (hrs)
Diversion Berm 1	0.16	0.35	0.17	0.25
Diversion Berm 2	0.07	0.44	0.15	0.25
Access Road Culvert	0.16	0.37	0.19	0.25

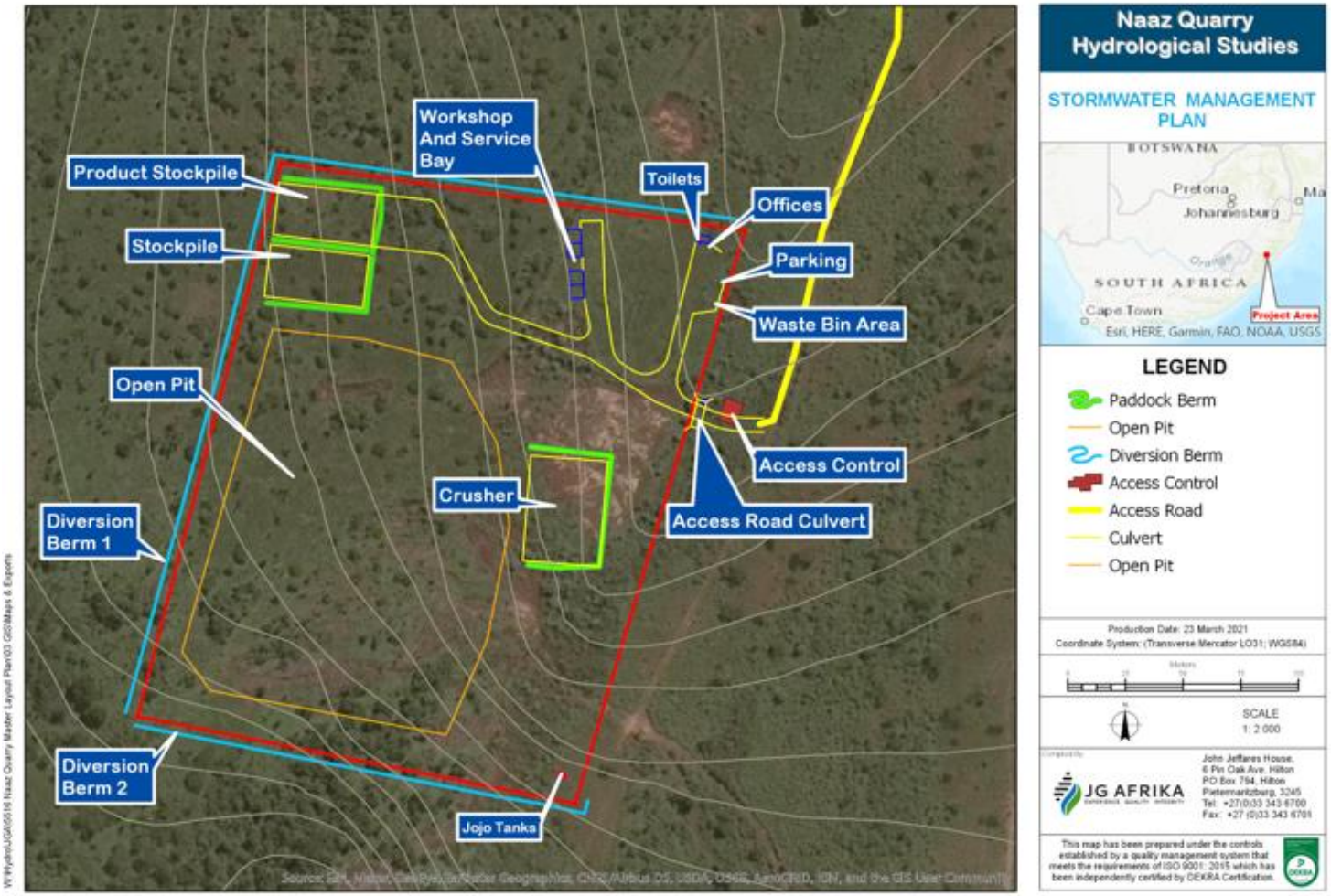

Figure 36: Proposed SWMP infrastructure (JG Africa SWMP)

Table 24:Clean Stormwater Management infrastructure Peak Discharge Calculation Results

Channel Name	1:50 Year Average Rainfall Intensity (mm) (PI), Based on Tc of 15 minutes	Catchment C Factor	1:10 Year Peak Discharge (m^3/s)	1:50 Year Peak Discharge (m^3/s)
Diversion Berm 1	214.80	0.48	**Not Applicable**	**4.28**
Diversion Berm 2	214.80	0.51		**1.94**
Access Road Culvert	214.80	0.48	**2.40**	**Not Applicable**

Table 25:Proposed Clean Stormwater Diversion Berm Dimensions

Channel Name	Type*	Slope (m/m)**	Height/Depth (m)	Side Slopes of Channel	Flow Velocity (m/s)
Diversion Berm 1	V-Drain/ Embankment	0.08	**0.65**	**1:3**	**3.5**
Diversion Berm 2B	V-Drain/ Embankment	0.09	**0.50**	**1:3**	**2.9**

Table 26:Proposed Clean Stormwater Diversion Berm Dimensions

Channel Name	Type*	Slope (m/m)**	Diameter (m)	Number of Pipes
Access Road Culvert	Concrete Pipe	0.01	**0.75**	**4**

5.2.3.2 Dirty Stormwater Runoff Management

As per principle two of the BPGs - A1 (Small-Scale Mining), dirty water must be collected and contained in a system separate from the clean water system and the risk of spillage or seepage into the clean water systems must be minimised. In line with this, the main objectives of the dirty SWMP includes the following:

Ensure all sources of hydrocarbon contamination are contained at the source of the pollutant. Hydrocarbons (oils and fuels) are considered hazardous to the downstream environment. Therefore, it is a requirement of GN704 that no hydrocarbons emanate from the project site into the downstream environment or infiltrate into the groundwater stores.

- Limit the volume of fine sediments discharging from quarry site and entering the downstream environment. Although sediments are not a hazardous pollutant, it is still considered detrimental to the downstream environment and therefore considered as dirty water.

As presented previously, the design philosophy of infrastructure associated with the quarry is that all infrastructure will be mobile. Therefore, recommendations towards dirty stormwater management presented in this report are mostly generic in nature. Once details around specific areas (such as the workshop and service bay for example) of the quarry have been confirmed (i.e. during detailed design), more detail pertaining to specific sizes of bunds and oil traps, specifically for hydrocarbon management, can be developed.

The following sections present recommendations towards prevention of the contamination of the downstream environment. This has been sub-divided into the management of areas containing hydrocarbons, and secondly, areas likely to be a source of sedimentation.

5.2.3.3 Management of Areas Containing Hydrocarbons

It is recommended that the following is considered for stormwater management around all areas likely to be a source of hydrocarbon contamination (i.e. the workshop, service bay, fuel and oil stores, waste disposal facilities and parking areas for Heavy Duty Vehicles):

- Areas used to store hydrocarbons and/or fuels should be concrete lined, bunded (wall constructed around the perimeter of the storage area) and roofed if possible. The capacity of the area within the bund walls should, at a minimum, have sufficient capacity to contain the volume of fuel or oil being stored within the bunded area. This will ensure that if the integrity of a storage container is compromised, there is sufficient storage capacity in the bunded area to ensure that there will be no spillage to the downstream environment.
- Workshop areas and service bays should be located on a concrete lined area and should be roofed. Due to the high likelihood of hydrocarbon spills associated with workshop areas, it is important to ensure that the risk of seepage of hydrocarbons into the ground is minimised. This will be achieved though concrete lining of the area. Further to this, though ensuring that these areas are located under roofed areas, the likelihood of rainfall and runoff mixing with hydrocarbons will also be minimised.

Construction of an oil sump at the workshop and service bay area. It is good practice to have all areas from within the workshop and service bay area draining towards an oil sump. This will ensure the effective management of hydrocarbons in this area.

- Oil collected in the oil sumps should be appropriately disposed of through pre-approved service providers that are able to deal with discarded hydrocarbons.
- Diversion channels should be constructed around the workshop and service bay areas, if required. This will ensure that these areas are not flooded though stormwater runoff from upstream of the respective facilities.
- It is recommended that drip trays are placed under each of the mining vehicles at the end of each day. This will ensure that any leaks from the vehicles will be captured on the drip trays and not directly onto open ground.

5.2.3.4 Management of Areas Likely to be a Source of Sedimentation

An effective means of management of sediments associated with quarry sites, is the construction of permeable berms downstream of areas likely to be a source of sediments. The berms are constructed from fine aggregate from the crushing plant. The rock aggregate berms allow water to filter through the berm, and through this process capture sediment on the upstream side of the berm. The advantage of permeable berms is that they are able to be implemented and relocated as the dynamics of quarry (location of stockpiles for example) change over time. As presented in below figures, three berms have been proposed to be constructed for the Naaz Quarry. These include:

- Paddock Berm 1, which is proposed to control and collect dirty stormwater runoff from the Crusher area;
- Paddock Berm 2, which is proposed to control and collect dirty stormwater runoff from the Stockpile area; and
- Paddock Berm 3, which is proposed to control and collect dirty stormwater runoff from the Product Stockpile area.

Although there are no specific requirements on the dimension of the berms (apart from the fact that they should be effective in trapping sediment), it is recommended that a minimum berm height of 0.5 m is used for all of the above-mentioned areas.

The floodline analysis was undertaken for the 1:50 and 1:100 year flood events, and was based on a drainage line located adjacent to the eastern boundary of the proposed mining area. The floodline delineation was been undertaken in line with the requirements of General Notice (GN 509) of the National Water Act (Act 36 of 1998). The floodline study was based on present day conditions.

Conclusion:

In order to undertake floodline delineations, initially the 1:50 and 1:100 year return period peak discharge values were estimated using the Rational Method. Peak discharge rates of approximately 4.5 m^3/s and 5.8 m^3/s for the 1:50 and 1:100 year flood events respectively were estimated. Based on this, the peak discharge rates were hydraulically simulated using the HEC-RAS Model. A typical floodline investigation requires detailed spatial information in the form of cross-sectional survey data and/or detailed contour information to produce accurate floodline delineations. Unfortunately, no detailed spatial information was available for this study. Therefore, freely available contour data at a resolution of five metres (5 m) was sourced from the Chief Surveyor General, Department of Land Affairs. This data was used to undertake the hydraulic modelling to simulate the flood water extents associated with the 1:50 and 1:100 year design floods. The floodline analysis results indicated that portions of the quarry site are inundated during both the 1:50 and 1:100 year flood events. It was therefore recommended that all infrastructure associated with the proposed quarry is located outside of the delineated floodlines.

The SWMP was developed in line with the requirements of General Notice (GN) 704 of the National Water Act (Act 36 of 1998) as outlined in the Department of Water and Sanitation (DWS), Best Practice Guidelines (BPGs) - A1 (2006). The objective of this study was to develop a conceptual stormwater management plan for Naaz Quarry. As per principal one of the DWS, BGPs - A1, clean stormwater runoff must be kept clean and be routed to a natural watercourse by a system separate from the dirty water system, while preventing or minimising the risk of mixing clean and dirty stormwater runoff. Based on this principle two clean stormwater runoff diversion berms were recommended. Each of the berms were sized based on the 1:50 year storm event. Based on the hydraulic analysis used to size the proposed diversion berms, it was noted that flow velocities associated with the berms were high. It was therefore recommended that erosion protection measures are implement along the proposed diversion berms. The specific means of erosion protection should be confirmed during detailed design. However, this could include the lining of the channels with concrete or rock discard embedded in the channel bed.

In order to ensure that the integrity of the downstream environment is not compromised through the operation of the proposed quarry, several recommendations towards the management of areas containing hydrocarbons and sources of fine sediment were provided. Management of areas containing hydrocarbons predominantly included the following:

- Areas used to store hydrocarbons and/or fuels should be concrete lined, bunded (wall constructed around the perimeter of the storage area) and roofed if possible. The capacity of the area within the bund walls should, at a minimum, have sufficient capacity to contain the volume of fuel or oil being stored within the bunded area.
- Workshop areas and service bays should be located on a concrete lined area and should be roofed.
- An oil sump should be constructed at the workshop and service bay area. Further to this, oil collected in the oil sumps should be appropriately disposed of through pre-approved service providers that are capable of dealing with discarded hydrocarbons.
- Diversion channels should be constructed around the workshop and service bay areas, if required (depending on the final location of the workshop and service bay areas).
- Drip trays should be placed under each of the mining heavy duty vehicles at the end of each day.

In order to ensure fine sediments from stockpile and crusher areas are effectively managed, it was recommended that permeable berms are constructed downstream of areas likely to be a source of sediments. The berms should be constructed from fine aggregate from the crushing plant. In theory, rock aggregate berms allow water to filter through the berm while capturing sediments on the upstream side of the berm.

5.2.4 GROUNDWATER MANAGEMENT

5.2.4.1 Sample Handling

All samples will be collected in bottles provided by the laboratory and packaged and stored in a cooler box on site prior to being shipped to the laboratory. All details pertaining to the sampling processes will be recorded on field sample sheets. Samples will be dispatched to the laboratory under signed chain of custody documents signifying ownership. The laboratory will be issued with a laboratory analysis request. Sample handling documents are presented in Annexure B. No allowance has been made for QA/QC sampling.

5.2.4.2 Laboratory

Water samples will be analysed by an SANAS accredited laboratory. It is recommended that Talbot Laboratory be used for the analysis and this lab be used consistently through the monitoring programme to ensure repeatability. Samples will be analysed in terms of the analysis suite as presented in Table 21 (unless alternate screening guidelines are required).

5.2.4.3 Reporting

The results of water level monitoring, purging details, and sampling and analysis are to be presented in a factual report. The results of analysis are to be compared to appropriate screening guideline values (General Limits / SANS241) to give a comparative indication of chemistry trends and possible contamination. Any negative findings will be highlighted and recommendations made for future sampling and possible remedial measures.

5.2.5 WASTE MANAGEMENT

Solid (general) waste, generated during the operational phase, will be contained in sealable refuse bins that will be placed at the office area until the waste is transported to a recognised general waste landfill site. A recognized contractor will service the chemical toilets that will serve as ablution facilities to the employees. Due to the nature of the project very little generation of hazardous waste is expected, and will mainly be the result of accidental spillages or breakdowns. Such contaminated areas will be cleaned up immediately (within two hours of the occurrence) and the contaminated soil will be contained in designated hazardous waste containers that will be kept in a bunded area with impermeable surface until it is removed from site by a registered hazardous waste handling contractor to an approved facility.

A temporary workshop will be established on site where minor servicing and emergency repairs of mining related equipment/machinery will take place.

General Waste:

- Domestic/office waste (incl. paper, plastic, glass);
- Uncontaminated PPE;
- Food waste;
- Uncontaminated building rubble;
- Wood;
- Scrap metal; and
- Old tyres and conveyor belts.

Waste material of any description, including receptacles, scrap, rubble and tyres, must be removed entirely from the mining area and disposed of at a recognized landfill facility. It will not be permitted to be buried or burned on the site

Hazardous waste to be typically found on site but not limited to:

- Hydrocarbon waste;
- Mine residue stockpiles;
- Batteries;
- Organic compounds and solvents (reagents, chemicals etc.)
- Contaminated soils, metals, plastic, rubber, and wood; and
- Sewage
- Petrol
- Oil
- Diesel
- Grease

This waste must be treated as hazardous waste and must be disposed of at a registered hazardous waste handling facility, alternatively collected by a registered hazardous waste handling contractor.
The dirty rags used to clean the drip trays must be disposed as hazardous waste into a designated bin at the workshop, where it is incorporated into the hazardous waste removal system.
An oil spill kit must be obtained, and the employees must be trained in the emergency procedures to follow when a spill occurs as well as the application of the spill kit. Spills must be cleaned up immediately, within two hours of occurrence.

Waste Management:

Regular vehicle maintenance, repairs and services may only take place at the workshop and service area. If emergency repairs are needed on equipment not able to move to the workshop, drip trays must be present. All waste products must be disposed of in a closed container/bin to be removed from the emergency service area (same day) to the workshop in order to ensure proper disposal. This waste must be treated as hazardous waste and must be disposed of at a registered hazardous waste handling facility, alternatively collected by a registered hazardous waste handling contractor. The safe disposal certificates must be filed for auditing purposes.

If a diesel bowser is used on site, it must be equipped with a drip tray at all times. Drip trays must be used during each and every refuelling event. The nozzle of the bowser needs to rest in a sleeve to prevent dripping after refuelling. Site management must ensure drip trays are cleaned after each use. No dirty drip trays may be used on site. The dirty rags used to clean the drip trays must be disposed as hazardous waste into a designated bin at the workshop, where it is incorporated into the hazardous waste removal system.

Any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognized facility. An oil spill kit must be obtained, and the employees must be trained in the emergency procedures to follow when a spill occurs as well as the application of the spill kit.

- Spills must be cleaned up immediately, within two hours of occurrence, to the satisfaction of the Regional Manager (DMRE) by removing the spillage together with the polluted soil and containing it in a designated hazardous waste bin until it is disposed of at a recognised facility. Proof must be filed.
- Suitable covered receptacles must be available at all times and conveniently placed for the disposal of general waste.
- Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., must be stored in a container with a closable lid at a collecting point to be collected at least once a month and disposed of at a recognized landfill site. Specific precautions must be taken to prevent refuse from being dumped on or in the vicinity of the mine area. Proof of disposal must be available for auditing purposes.
- Biodegradable refuse must be handled as indicated above.
- Re-use or recycling of waste products must be encouraged on site.
- No waste may be buried or burned on the site.
- Ablution facilities must be provided in the form of a chemical toilet/s. The chemical toilet must be anchored (to prevent blowing/falling over) and shall be serviced at least once a week for the duration of the mining activities by a registered liquid waste handling contractor. The safe disposal certificates must be filed for auditing purposes.
- The use of any temporary, chemical toilet facilities must not cause any pollution to water sources or pose a health hazard. In addition, no form of secondary pollution should arise from the disposal of refuse or sewage from the temporary, chemical toilets. Any pollution problems arising from the above are to be addressed immediately by the permit holder.
- When small volumes of wastewater are generated during the life of the mine the following is applicable:
- Water containing waste must not be discharged into the natural environment.
- Measures to contain the waste water and safely dispose thereof must be implemented.
    - It is important that any significant spillage of chemicals, fuels etc. during the lifespan of the mining activities is reported to the Department of Water and Sanitation and other relevant authorities.
- Site management must implement the use of waste registers to keep record of the waste generated and removed from the mining area.

5.2.6 WATER CONSERVATION AND DEMAND MANAGEMENT (WCDM)

The water is undertaken, managed, and controlled in a way to ensure that pollution of the water resources is minimised and avoided. Social and economic development will be facilitated, which will ensure that the use of the water resource will be of benefit to the local communities. Goods and services are being sourced from local businesses as far as possible, to enhance the economic benefits of the mine. A general overview of the WCDM to be developed is provided below.

5.2.6.1 Domestic Water Conservation

The following aspects have been addressed as part of reducing water demand:

- The impact that the mine has on the groundwater adjacent to pits will be managed by monitoring existing boreholes;
- Samples from boreholes is analysed to determine water quality exceedances and trends;
- Develop a management plan to deal with groundwater quality;
- Implement water conservation measures; and
- Ensure that no leakages occur in water pipelines.

5.3 OPERATIONAL MANAGEMENT

Management of operational risk is a key consideration for mines operating within the social and economic context of South Africa. Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk. Operational risks and impacts are managed through the implementation of the Safety, Health, Environment and Quality (SHEQ) system.

5.3.1 Organizational Structure

The organizational structure for the Applicant is presented in Section 2.7 above. The sections below include a discussion of resources and competencies, as well as the internal and external communication processes that are implemented by the Applicant.

5.3.2 Resources and Competence

The success of Environmental Management is dependent upon the commitment of the organisation, at all levels, to environmental excellence. Commitment to the structured and effective Environmental Management Plans (EMPs) will benefit both the organisations business success, and the community in which it operates. This commitment requires that the organisation provide the necessary resources for employee training, reference material, and reporting procedures. Senior executives and line managers needs to be held responsible and accountable for the health and safety of personnel while on duty, as well as the environmental impacts caused by mining activities.

5.3.3 Education. Training and Awareness Raising.

Training and environmental awareness is an integral part of environmental management of a mine. The mine must ensure that all relevant employees are trained and capable of carrying out their duties in an environmentally responsible and compliant manner and are capable of complying with the relevant environmental requirements. Environmental Awareness at the mine is addressed and conducted by means of two (2) main components namely training and communication.

Environmental awareness training at the mine will be attended to during induction for new employees and in refresher courses for ex-leave employees. Apart from own employees, the operation also makes use of numerous contractors to undertake different components of their mining activities. Each contractor will be responsible for its own environmental awareness training for its employees.

The principles to be adhered to by the mine and the contractors are based on the following:

- Environmental awareness is addressed at top management level;
- Workers receive awareness training on all environmental and SHE procedures;
- Training aids includes the use of photographs, posters and live demonstrations;
- The workers whose jobs have the greatest potential for environmental impact are identified and receive specific training in impact prevention and remediation; and
- Records are kept of environmental awareness training and all new employees receive induction before they are allowed to work on site.

5.3.4 Internal and External Communication

Public Participation Process (PPP) is a requirement of several pieces of South African Legislation. The aim of public participation is to ensure that all relevant interested and affected parties (I&AP's) are meaningfully notified, consulted, and their opinions considered during the course of the project. The methodology applied to the PPP, must be one of openness, transparency, and collaboration between the EAP and I&AP's. All documentation pertaining to the IWWMP will be made available to the public for comment in accordance with the relevant regulations.

Site notices were placed on the 9th of April

5.4 MONITORING AND CONTROL

Monitoring regimes will allow Naaz Quarry to update and refine proposed mitigation measures in order to further reduce the impact on the receiving water resources.

5.4.1 Groundwater and Surface Water Monitoring

5.4.1.1 Sample Frequency

The following sampling plan includes for construction, operation and closure phases. The construction phase is considered the "baseline" for the water quality monitoring and has a limited duration of three months (quarter cycle). Thereafter, all monitoring is considered operational phase monitoring. Monitoring should be carried out in accordance with the schedule presented in below Table. The following monitoring should be compared with the water quality status quo results as presented in the Geohydrological report[1].

Refer to Surface and Groundwater Monitoring Plan.

[1]

Phase	Analysis Suite	Type	Monitoring Points	Frequency
Construction (Baseline)	Investigation + turbidity	Groundwater	KZN180392 NQBH2	Quarterly (at least 2 Events)
		Surface water	SW1 SW2	Monthly (3 Events)
Operation (Lifespan)	Detection	Groundwater	KZN180392 NQBH2	Bi annually
		Surface water	SW1	Monthly (flow permitting)
			SW2	Quarterly
	Investigation	Groundwater	2930CB00100 2930CB00112 21135086/1	Biennially
		Surface water	SW1 SW2	
		Groundwater	Any location should be subject to investigation monitoring if any screening limit is exceeded successively or a determinant shows significant variance	Ad hoc (bi annually) for at least 3 events provided water quality reverts to within screening limits
		Surface water		Ad hoc (monthly) for at least 3 events provided water quality reverts to within screening limits
Closure* (subject to monitoring during previous phases)	Detection	Groundwater	KZN180392 NQBH2	Bi annually
		Surface water	SW1	Monthly (flow permitting)
			SW2	Quarterly

5.4.1.2 Groundwater Sampling

It is recommended that groundwater sampling be carried out in accordance with the Water Research Commission's Comprehensive Guide for Groundwater Sampling, as presented by Weaver and Cavé of Groundwater Sciences, CSIR (WRC Report No TT 303/07).

For boreholes that are already in operation, samples can be collected from the existing borehole pump outlets (preferably at a reservoir or tap outlet at the wellhead). No purging will be required due to ongoing operation of the borehole, however, sample taps need to be sanitized and flushed prior to sample collection.

Un equipped Boreholes will be purged using a submersible pump where appropriate. Purging of at least three well volumes is required. Groundwater samples will be collected from the discharge of the portable submersible pump and placed directly in sample bottles supplied by the laboratory. At the time of sampling, field measurements of pH, EC and temperature should be recorded on the sample log. Sample bottles will be labelled and cooled in an insulated cool box on site. All samples will be dispatched to the laboratory within the laboratory's required sample holding times for the designated analysis. All sampling and monitoring equipment will be rinsed and decontaminated between each sampling point.

A detailed description of the groundwater sampling process is presented in the Surface and Groundwater Monitoring plan. All information pertaining to the sampling of boreholes will be recorded on groundwater sampling field sheets as presented in Annexure B in the report.

5.4.1.3 Surface Water Sampling

Surface water sampling is carried out at locations that will be representative of the surface water body. Locations where stagnant water and/or fast running water occur are not generally suitable. Surface water samples will be collected by the grab method. Samples will be collected directly in sample bottles provided by the laboratory unless a preserving agent is already in the bottle. In this case, samples will be collected in a disposable container and decanted into the sample bottles to prevent spillage and loss of preservative. Field measurements will be taken from the disposable container after collecting samples using a handheld multi meter. Parameters will be recorded on the field sampling sheets and will include temperature, pH, EC and TDS.

Samples will be collected from immediately below the surface of the water body. The sample container should be inverted before placing it through the water surface. Once below the surface a portion of air should be displaced from the container in an inverted position by pressing the container sides. The container should then be re inverted to the upright position while under water to allowing water from below the surface to enter the bottle. Once full, the bottle should be slowly raised out of the water body preventing any unnecessary water movement in and around the sample container.

A detailed description of the surface water sampling process is presented in Annexure A. All information pertaining to the sampling of surface water will be recorded on sampling field sheets as presented in Annexure B.

5.4.2 Dust Monitoring

Dust suppression equipment such as a water car, water dispenser and sprayers on the crusher plant. surrounding environment by the use of; inter alia, water spraying and/or other dust-allaying agents. Ensure continuous assessment of all dust suppression equipment to confirm its effectiveness in addressing dust suppression. Limit speed on the haul roads to 20 km/h and 40 km/h on the access road to prevent the generation of excess dust. Consider weather conditions upon commencement of daily operations. Limit operations during very windy periods to reduce airborne dust and resulting impacts.

5.4.3 Waste Monitoring

The Naaz Quarry IWWMP is a living document, with the review process being an ongoing process. The plan must therefore, be reviewed and revised periodically whenever new information or waste management practices, standards, legislation or any changes must be made to plan. The plan should be reviewed.

To ensure this WMP is working 'on the ground', Naaz will require the Site Manager to undertake daily inspections of the following:

- General waste bins;
- Hydrocarbon spills;
- Co-mingled recycle bins;
- Waste oil;
- Monitoring of proper storage of the hazardous substances on site;
- Rags and oil filters;
- Scrap metal; and
- Empty oil and grease drums.

The emphasis with the daily inspection will be:

- To prevent cross contamination;
- To determine the volume collected (any additional bins required); and
- Allocate the correct location for the waste wheelie bins.

Monthly inspection will be undertaken by the Site Manager, and or supervisors to monitor the daily records and the overall implementation of the WMP. The aim of the monthly inspections is to identify return, re-use, recycling, and minimisation initiatives which will also include the following checks:

- Housekeeping;
- Cross-contamination;
- Regulated and liquid waste volumes and storage;
- A register of all hazardous substances should be kept up to date with the Material Safety Data Sheets (MSDS) of each substance brought to site with the substance; and
- Recurrent problem issues arising on a daily basis.

These inspections will be documented using site specific inspection sheets. The inspections highlight any areas of concern and assist in the programming of collections and waste tracking. Where non-conformances are observed, the person responsible for the areas are notified immediately to ensure the issue is rectified.

Naaz Quarry will develop and maintain a comprehensive database of all waste generated on site and how they have been managed. This database will be updated on a monthly basis and will capture all records of waste removed by the licensed contractors.

Internal audits will be undertaken by Naaz Quarry at a corporate level, on a quarterly action from audits will be entered and tracked in Naaz Quarry Database. The extent of the compliance with the conditional requirements and commitments in the Legislation part of this report (Section 2) arising from the internal audits, will be reported in the Annual WMP Review report.

Waste monitoring objectives includes:

- Ensure that vehicle repairs only take place within the service bay area, and all waste products are disposed of in a closed container/bin inside the emergency service area.
- Collect any effluents containing oil, grease or other industrial substances in a suitable receptacle and removed from the site, either for resale or for appropriate disposal at a recognised facility.
- Clean spills immediately to the satisfaction of the Regional Manager by removing the spillage together with the polluted soil and by disposing of them at a recognised facility.
- If an in-house ammonium nitrate mechanism, Bio-remediation cell is to be used the appropriate waste license will be required prior to the treatment of any soil.
- Ensure the availability of suitable covered receptacles at all times and conveniently placed for the disposal of waste.
- Place all used oils, grease or hydraulic fluids therein, and remove these receptacles from the site on a regular basis for disposal at a registered or licensed hazardous disposal facility.
- If an in-house ammonium nitrate mechanism, Bio-remediation cell is to be used, the appropriate waste license will be required prior to the treatment of any soil.
- Store non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., in a container with a closable lid at a collecting point. Collection should take place on a regular basis and be disposed of at a recognised landfill site. Prevent refuse from being dumped on or in the vicinity of the mine area.
- Biodegradable refuse to be handled as indicated above.
- Start a waste register of waste generated at the site recording the amount of different types of waste generated by the mine in excel spreadsheet format.
- Store all hazardous materials or substances in a closed storage facility with an impermeable floor.
- Storage area to meet the following conditions:
    - Construct storage area on a level area.
    - Floor of the storage area should be impermeable.
    - Storage area should be outside the 1:100-year flood line or further than 100m from the edge of a watercourse, whichever is greatest.
    - Access to the materials/substances may only take place with the prior notification of the site manager.
- Fuel storage tanks should have an impermeable bund wall and base within which the tanks sits, raised above the floor, on plinths. Ensure that the bund capacity is sufficient to contain 110% of the tanks maximum capacity.
- Consider the distance and height of the bund wall relative to that of the tank to ensure that oil does not spout beyond the confines of the bund.

- Establish a formal inspection routine to check all equipment in the bund area, as well as the bund area itself for malfunctions or leakages. Inspection should be at least weekly and any accumulated rainwater should be removed.
- All valves and outlets should be checked to ensure that they are intact and closed securely.
- Slope the bund base towards a rainwater sump of sufficient size.
- Contain contaminated water until it can be collected by a registered hazardous waste handling contractor or be disposed of at a registered hazardous waste handling facility.
- Ensure availability of drip trays underneath all stationary equipment or vehicles.

5.4.3 Stormwater Structures : Civil designs

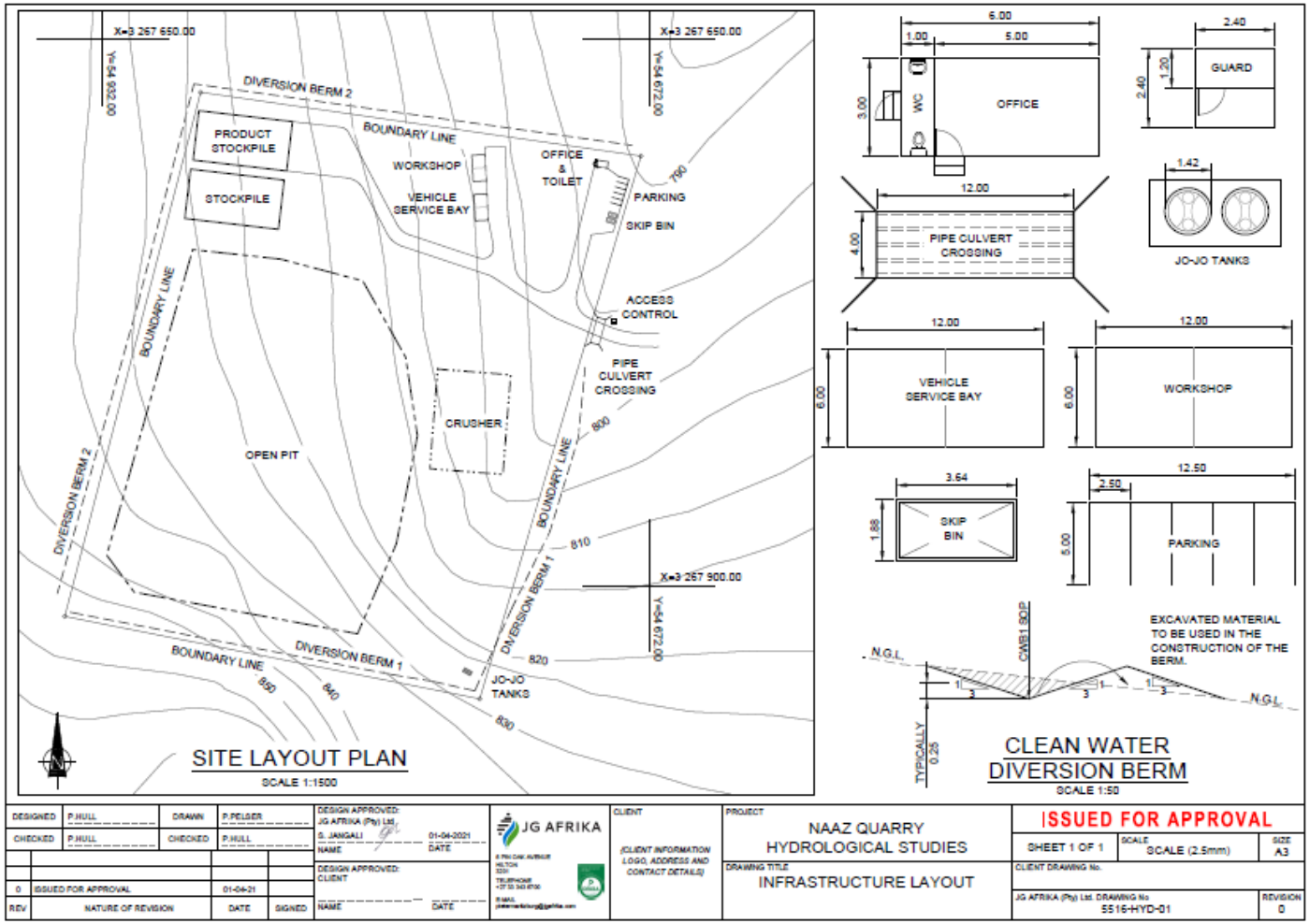

Figure 37: Civil Designs and stormwater structures (JG Africa Civil Design

5.5 IMPACTS, RISK ASSESSMENT / BEST PRACTICE ASSESSMENT

This section deals with the identification of risks/impacts and their mitigation measures. This section focuses only on water related impacts and proposed mitigation measures.

The DWS risk assessment focussed on the Proposed Dolerite Quarry near Pietermaritzburg, Mshwati Municipality, KwaZulu-Natal, South Africa. The results for the risk assessment and all components scored a moderate to high impact significance. Borderline risk scores were manually adapted and reduced all components to a low to moderate impact significance with the application of various mitigation measures. Based on the results of the DWS risk assessment, a Water Use Licence (WUL) is required for the Proposed Dolerite Quarry, as per Section 21 of the National Water Act No. 36 of 1998 and Notice 509 of 2016. It is, however, the prerogative of the DWS to advise on whether the quarry activities can be authorised under a WUL or not.

The Risk Assessment was done prior to pre-application meeting.by Alletson Ecological & Amanzi Aquatics Pty Ltd in September 2020 – Refer to Vegetation Aquatic and Risk Assessments for the proposed dolerite quarry outside Pietermaritzburg area,

Table 27: Presents the Risk Matrix Assessment by Alletson Ecologicals & Amanzi Aquatics Pty Ltd in September 2020

No.	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Control Measures	Borderline Low Moderate Rating Classes
1	Construction	Establishment of the construction camp and activities for quarry mining	Direct modification and destruction of instream and riparian habitats and loss of water recharge due to construction activities	Direct modification, fragmentation and destruction of instream and riparian habitat	1	2	2	1	4	2	2	8	4	5	5	3	17	136	Moderate	102	Moderate
2	Construction	Establishment of the construction camp and activities for quarry mining	Flow modification, erosion and sedimentation	Removal of vegetation will temporarily destabilise soils and make them subject to potential erosion, increased dust, altered flow regimes and lead to possible water quality deteriorations	3	3	3	1	4	3	5	12	4	5	5	3	17	204	High	160	Moderate
3	Construction	Establishment of the construction camp and activities for quarry mining	Increased in hardened surfaces, dust and toxic chemicals from hydrocarbons, metals, nutrients etc from construction vehicles	Pollution of water and soil environments	3	3	3	2	4	3	4	11	4	4	5	3	16	176	High	150	Moderate

No.	Phases	Activity	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk Rating	Control Measures	Borderline Low Moderate Rating Classes
4	Operational	Quarry Mining	Operation and maintance of infrastructure	Direct modification, fragmentation and destruction of instream and riparian habitats	1	3	3	1	3	3	3	9	4	4	5	3	16	144	Moderate	120	Moderate
5	Operational	Quarry Mining	Pollutition associated with quarry mining	Pollution of water and soil environments	3	3	3	2	4	3	4	11	4	4	5	2	15	165	Moderate	130	Moderate
6	Operational	Quarry Mining	Stormwater associated with quarry mining	Flow modification and increase turbidity and sedimentation due to increased hardened surfaces and stormwater discharges into watercourse	3	3	3	2	4	3	4	11	4	4	5	2	15	165	Moderate	130	Moderate
7	Decommissioning	Quarry Closure	Post disturbance invasion of ruderal and alien invasive species	Recruitment of alien plant species	3	1	3	3	3	3	3	9	4	4	5	2	15	135	Moderate	50	Low

Mitigation Measures:

In order to minimize the impacts on the vegetation and fauna at the site of the proposed quarry the following mitigatory measures are recommended:

- All quarry activities may only be undertaken within the registered and mapped space of the quarry site. This site must be clearly pegged out and be fenced prior to the start of operations.
- In accordance with Mine Health and Safety Requirements, the walls of the pit will be stepped with near vertical sections being reduced in height by a series of horizontal steps which will be formed (cut) as a part of the mining operations.
- Ablutions should be provided onsite, at least one for every 15 workers, and should be located at least 50m away from the edge of the riparian zone (until the unnamed tributary is completely transformed into a quarry).
- Regularly check vehicles, machinery and equipment operating on site, to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid.
- All temporary and permanent erosion and sediment control structures must be monitored for the duration of the construction phase and repaired immediately when damaged.
- A search-and-rescue for desirable plants should be undertaken by an ecologist prior to vegetation clearing. All interested parties, including plant nursery operators may be invited to take part.
- Vegetation clearing may only be done on an “as-needed” basis. This means that only areas that are about to be worked may be cleared.
- As far as possible all wood and other resources, including Aloes, should be made available to the local community for their use.
- Cleared vegetation to be retained at any time may not be burned but must be mulched and be stockpiled. Ideally the heaps will be covered with stockpiled topsoil and the material be retained for future site rehabilitation purposes.
- All spoil heaps and stockpiles must be provided with a vegetation cover consisting of indigenous grasses. Recommended species include the following:
  Love Grass. Eragrostis curvula
  Couch Grass Cynodon dactylon
  Finger Grass Digitaria eriantha
- All infrastructure, including the containers, machinery and crushers etc are to be removed from the processing area and the footprint will be landscaped, compacted areas will be ripped and the topsoil will be returned and the area seeded with the listed grass species.
- Once mining operations are over, pit overburden material must be pushed back into the pit to fill the upper step or steps to produce a sloped surface. Topsoil from the stockpiles must then be pushed down so that a substrate for vegetation growth may be established. The listed grass species may be used for this purpose.
- All waste is to be removed from site and any stockpiled dolerite (product) will either be sold or returned to the quarry pit and used in the sloping of the quarry sides.

- From the start of operations an alien weed programme must be implemented for the entire property including the working areas where relevant. This programme must be pre-planned and approved and specific targets must be set.
- After closure, the alien weed control measures will continue right through the maintenance and aftercare period of the quarry.
- Dust management measures must be set in place so as to minimise the dust from the crushers being blown into the surrounding areas.
- Undisturbed areas of vegetation must be suitably managed. This management will include the alien weed control programme but must also make provision for some protection from over frequent fires. This will require burning of a firebreak around the periphery in autumn every year. The area inside the break should be burned on a biennial (every second year) basis. The relevant veld burning legislation must be adhered to.
- A licence, in terms of the Forests Act will be required to clear trees in those parts of the quarry site where the vegetation is deemed to be a “Natural Forest”3. The appointed ecologist will delineate any such areas.
- A Monitoring programme must be followed to determine if the activities from the proposed quarry have any negative impacts on the downstream watercourses. All impacts must be mitigated and rectified immediately.
- The implementation of these measures will be the responsibility of the mine manager, but it is recommended that an environmental specialist be appointed to guide and assist as is necessary

5.5.1 CHANGES IN CATCHMENT WATER RESOURCES

A hydrological analysis of the local (unnamed drainage line adjacent to the quarry and tributaries within the vicinity of the quarry) and regional (U20G quaternary catchment) catchments hydrology was undertaken to determine the potential impact of the quarry on the local and regional hydrology. The hydrological analysis consisted of assessing catchment Mean Annual Evaporation (MAE), MAP and MAR, based on results obtained from the Water Resources of South Africa Study (WR2012) undertaken in 2012. Furthermore, an analysis of the licensed water abstractions downstream of the quarry, within the U20G Quaternary Catchment was undertaken using the 2016 DWS Water Authorisation and Registration Management System (WARMS) database. The database indicated that there are number of licenced water users located downstream of the study area, between the quarry and the uMngeni River. These licenced abstractions mostly include water users for irrigation and domestic purposes, as presented in Figure 12 and indicated in Table 14.

5.5.2 WATER QUALITY ASSESSMENT AND SURFACE WATER MONITORING PROGRAM

No Surface Water monitoring was appilcable, Changes in catchment water quality. The sources of contamination were identified as increased sediment (from the crushing plant and stockpiles), hydrocarbon spills (through fuel stores and machinery on site), domestic and sewage waste. In order to reduce the risk of surface

water contamination, numerous recommendations were made, largely with respect to management of contaminants at their source.

5.6 ISSUES AND RESPONSES FROM PUBLIC CONSULTATION PROCESS

During the public participation process the stakeholders and I&AP's were informed of the project by means of Site Notice and Advertisement. The parties who already registered as part of the environmental authorisation process was directly contacted and emailed. An advertisement was placed in the Ilanga News on 9 April 2021 and on-site notices were placed on 9 April 2021 at the entrance to the farm, and the intersection of the R33 and the D173 road turnoff towards the Karkloof Safari Spa. A 60-days commenting period was provided to the public starting on the 9th of April – 9 June 2021.

5.6.1 SURFACE WATER

The management of the site generally conforms to the Best Practice Guidelines (DWS 2009) by implementing appropriate pollution prevention controls (Afrika, Water Quality Assessment and Surface Water Monitoring Program, August 2018).

5.6.2 BASELINE HYDROLOGY STUDY

The objectives of the Baseline hydrological study were to: Refer to Baseline Hydrology Study by JG Africa

- Describe the climatic, hydrological, landuse and topographical conditions of the study area by defining the general catchment conditions of the study site.
- Identify and delineate stream and river channels and their associated catchment areas in the vicinity of the quarry.
- Determine the Mean Annual Runoff (MAR) for the project area and any contributing catchments in the vicinity of the quarry site.
- Undertake an impact assessment of the quarry, focusing on the potential risks associated with the quarry related specifically to local and regional hydrology. Using the impact assessment, mitigation measures have been provided to reduce the risks associated with the identified potential impacts.

5.6.3 AQUATIC STUDY

The aquatic biodiversity in the area is not known to hold any species of conservation concern which might be affected by the mine. The Mocambique Tilapia (*Oreochromis mossambicus*) is present in the area and is Red Data listed. However, the listing is due to corruption of genetic integrity as a result of hybridisation with Nile Tilapia (*O. niloticus*) and will not be affected by the mine. Water quality is not likely to change in either the Umgeni River or the unnamed stream since the mine watercourse is normally dry and mitigatory measures may be taken for those times when there are flows.

The condition of the unnamed stream is probably stable now with there being no noticeable changes anticipated unless there is a significant change in catchment or climatic conditions.

This report forms part of the Wetland Assessment done by JG Africa, Assessment of the Wetlands and Watercourses in the vicinity of a proposed new Dolerite mine nea Pietermaritzburg, Kzn.

5.7 ASSESSMENT OF LEVEL AND CONFIDENCE OF INFORMATION

The specialist information, in this IWWMP is regarded as sufficient to support the compilation of the IWWMP. The IWWMP should be annually amended to ensure effective ongoing management of the Applicant. Focus should be placed on calibrating the ground water model with up-to-date results to ensure the model remains accurate. The assumptions, uncertainties, and limitations for the specialist studies undertaken are provided below.

All specialist studies are conducted to certain levels of confidence, and in all instances know and accepted methodologies have been used, and confidence levels are generally high. This means that in most cases the situation described in the pre-mining environment is accurate at high certainty levels, but there exists a low probability that some issues have not been identified during the studies. Such situations cannot be avoided simply due to the nature of filed work and have therefore not been discussed below.

In situations where species sampling or sensitive site assessment is conducted (fauna, flora, aquatic ecosystems, and wetland assessments), it must be understood that time limitation and conditions on site means that not all species can be identified / sites can be discovered during the surveys. Again, as accepted methodologies are-used, this is not deemed to be a fatal flaw. Therefore, this is not reiterated below for each specialist study. It must be stressed that this has been considered within the EMP, where measures are proposed to reduce impact on specifically protected species, and heritage sites should these be discovered in addition to those identified during surveys. There are inherent errors in GPS and mapping programmes which must be considered when transferring plans to on-site activities.

5.8 WETLAND ASSESSMENT AND AQUATIC ASSESSMENT

The terms of reference for this study call for an investigation into the possibilities that the proposed dolerite mine may impact on watercourses, with particular reference to the Umgeni River and/or wetlands located within 500 m of the site. In the course of addressing these concerns, attention has been given to the linkages between the mine and the various aquatic systems in its proximity. The findings are summarised below.

Refer to the Wetland Assessment done by JG Africa, Assessment of the Wetlands and Watercourses in the vicinity of a proposed new Dolerite mine nea Pietermaritzburg, Kzn.

Watercourses

- It was determined that the proposed mine will not have any effect on the Umgeni River. This conclusion was based on the following reasons:
- The watercourse which proceeds from the mine site is dry for the greater part of the year and has not been seen to be carrying water even after heavy rainfall periods;
- The watercourse which proceeds from the mine site no longer discharges directly into the unnamed stream, which flows northwards to join the Umgeni River. The lower part of the channel has, for many years, been diverted as the result of development of a quarry which yields shale for brick making. The original lower course is now not distinguishable on the ground and, instead, the watercourse flows into a disused part of the shale quarry where any surface water could accumulate;
- The unnamed stream, after it bypasses the mine area in its natural channel, flows approximately 11 km before reaching the Umgeni River, downstream of the Albert Falls Dam. On the way it passes through an agricultural landscape which is characterised with low gradients. As a result, the channel is often heavily overgrown by vegetation and has occasional patches of wetland vegetation. These conditions serve to filter out suspended solids and to assimilate plant nutrients or toxicants; and
- The stream channel passes through six small farm dams which will also trap sediments and nutrients.

On the basis of the above, it is highly unlikely that the dolerite mine will have any effect on the water quality of the Umgeni River.

Wetlands

It was concluded that the proposed mine will have no impact on wetlands. This is based on the following reasons:

- The channel of the watercourse which flows from the dolerite mine area is dry and contains no wetlands;
- There is only one wetland within 500 m of the mine site. It is a Channelled Valley Bottom system and is associated with the unnamed stream which flows in the vicinity of the project area. The shortest distance between this wetland and the mine site is approximately 460 m;
- The wetland is in a separate sub catchment and so is hydrologically isolated from the mine, as shown in Figure 18 above; and
- The stream to the west of the mine site which has two NFEPA wetlands (farm dams) is on the opposite side of a large ridge and is more than 500 m from the closest point of the mine.

Thus, as long as the mine or its associated infrastructure do not cross the divides between the various sub catchments there will be no associated impacts on the wetlands in the area.

Mitigatory Measures and Recommendations

In relation to wetlands and watercourses the greatest threats that the mine poses are the following

- Sedimentation of the watercourses by surface movement of material
  Sedimentation of the aquatic systems would probably occur as a result of soil or rock material being transported into the various waterways directly from the mine or its associated working areas. In order to mitigate against this impact, the following actions are recommended:

  ✓ The two dams in the channel of the mine watercourse must be repaired and brought up to a suitable safety standard. Included in this requirement are wall strength and construction and a suitable spill way.
  ✓ The vegetation along the mine watercourse must be cleared of alien weed species with especial reference to Castor Oil Bush (*Ricinis comunis*), Bugweed (*Solanum mauritianum*), and Lantana (*Lantana camara*). The locally present grasses must be encouraged to develop their density so as to act as a sediment trap.

- Indirect sedimentation of the watercourses by dust or from runoff from the access road(s)
  Blown dust or spillage of rock material from vehicles can lead to indirect sedimentation of watercourses. In order to mitigate against this impact, the following actions are recommended:

  ✓ The roads should be routed as far as possible from any wetlands or watercourses. At the time of writing, the current access road alignment is good in this regard.
  ✓ Dust suppression measures, including water sprays and vehicle bin covers, should be used.

- Threat of hydrocarbon (fuels and oils) contamination from spills or leakage
  Leakage of hydrocarbons into aquatic ecosystems will result in severe loss of aquatic biodiversity. In order to mitigate against this impact, the following actions are recommended:

  ✓ All stores of bulk fuels and oils must be within bunded areas that have at least 110% of the capacity of the substances being stored.
  ✓ Areas where vehicles and machines and plant are repaired and serviced must have impermeable floors from which spills can be collected for proper disposal.
  ✓ Storage bins with stoppers must be on hand for holding used oils prior to their proper disposal at an approved facility.
  ✓ Any spills within the mine area or along roads or other open spaces must be collected immediately and be placed in sealable bins prior to proper disposal at an approved facility.

- ✓ Hazmat clean-up kits of suitable capacity must be available at all times for cleaning up hydrocarbon or other hazardous substances that may have been spilled.

- Risk of contamination from improperly treated waste water

  Waste water which enters the open environment has the potential to contaminate wetlands and watercourses. In order to mitigate against this impact, the following actions are recommended:

  - ✓ The mine must have properly designed and constructed waste water disposal facilities.
  - ✓ Any water running to the open environment from a water treatment plant or from spaces such as workshops must pass through an oil trap and the trap must be cleaned regularly.
  - ✓ Waste water which may have percolated from ablution or toilet facilities should be tested quarterly for coliforms and phosphates.
- Disposal of solid wastes, either domestic or industrial

  The mine will generate quantities of solid wastes including plastics, paper, food containers, cardboard, workshop wastes, cement bags, and the like. These must not be allowed to enter the open environment as they are unsightly and may be transported into aquatic systems. In order to mitigate against this impact, the following actions are recommended:

  - ✓ The material must be collected at those sites around the mine where the waste is generated. Appropriate bins, preferably with lids, must be made available, and these must be emptied on a regular basis of short intervals.
  - ✓ The collected material must then be taken to a central holding point which should be in an enclosed space. The material may then be sorted for recycling or disposal as may be appropriate and be removed from site.
  - ✓ No waste disposal or burning of waste may be done on site at the mine.

The above recommendations are summaries of standard procedures. Further detail is available in the draft mine EMP and should be referred to for greater detail. It is the author's professional opinion that, if the management and mitigatory measures are properly implemented, then the proposed dolerite mine will have no effect of the Umgeni River and no effect on the wetlands in its general vicinity.

6. WATER AND WASTE MANAGEMENT

The following section describes water and waste aspects at the applicant's project area, as well as the related operational processes.

6.1 WATER AND WASTE MANAGEMENT PHILOSOPHY (PROCESS WATER, STORM WATER, GROUNDWATER, AND WASTE)

The general principle of water management is the recognition that water is a scarce resource. This in turn leads to the other principles, such as water use minimisation (water conservation) or re-use of water and pollution prevention or the limitation of pollution of water.

Water that exceeds the quality, as set by DWS shall not be released from site, with the exception of emergency conditions, but it must be re-used, thus reducing the quantity of intake of clean water. The Applicant will endeavour to:

- Continually seeking ways to improve its performance in terms of consumption, and water related impacts;
- Reduce consumption of clean water;
- Implement pollution prevention at source;
- Maximise, recycling, and re-use of dirty stormwater and process water;
- Implementation of process water treatment to facilitate re-use; and
- Collect and contain dirty storm water, and process water on site for preferential use as process water.

The hierarchical management approach comprises the implementation of best practice measures to minimise water consumption and reduce impacts on water resources, by:

- Implementing measures to ensure compliance with relevant water and waste legislation and with other standards to which the organisation subscribes;
- Proactively identifying and implementing actions that are required to achieve the water and waste related objectives;
- Implement these actions in an open and transparent manner;
- Implement on-going water and waste related monitoring to support legal compliance;
- Continually seeking ways to improve the performance of water and waste management systems, process, and objectives; and
- Encourage open and transparent communication with regulatory authorities and other interested and affected parties within the context of the National Water Resource Strategy and Local Catchment Management Strategies.

6.1.1 Storm water

The main objectives of the Stormwater Management Plan (SWMP) are to ensure:

- Protection of life and property from flood hazards;
- Prevention of erosion;
- 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 water courses and their ecosystems;
- Separation of clean and dirty water in accordance with the GN 704 requirements;
- Collection, containment, and conveyance of both clean and dirty water in adequately sized water management infrastructure as stipulated in GN 704;
- Ongoing monitoring and measurement of water quality and quantity to support the wide water balance and water management;
- Construct and maintain adequate stormwater control measure to keep clean and dirty water separate; and
- Monitor water quality at the monitoring positions identified.

6.1.2 Groundwater

- Minimise the impact on groundwater resources through the design and construction of engineered barriers for potential pollution sources;
- Implement ongoing groundwater quality levels to inform the detailed geochemical impact predictions and to validate groundwater models; and
- Implement long term water management by managing groundwater levels though the implementation of an on-site water treatment facility.

6.1.3 Waste

Waste management options for a particular waste are best considered according to the waste management hierarchical approach., which reflects the relative sustainability of each of the options. One of the key principles of the underlying waste management hierarchy is to ensure that waste is dealt with as high up in the hierarchy as possible. Since all waste management options have some impact on the environment, the only way to avoid the impact is not to produce waste in the first place, and waste through re-use and recycling followed by recovery techniques (treatment, compositing, and generating energy from waste) follow, while disposing to landfill least favourable process is at the bottom of the hierarchy.

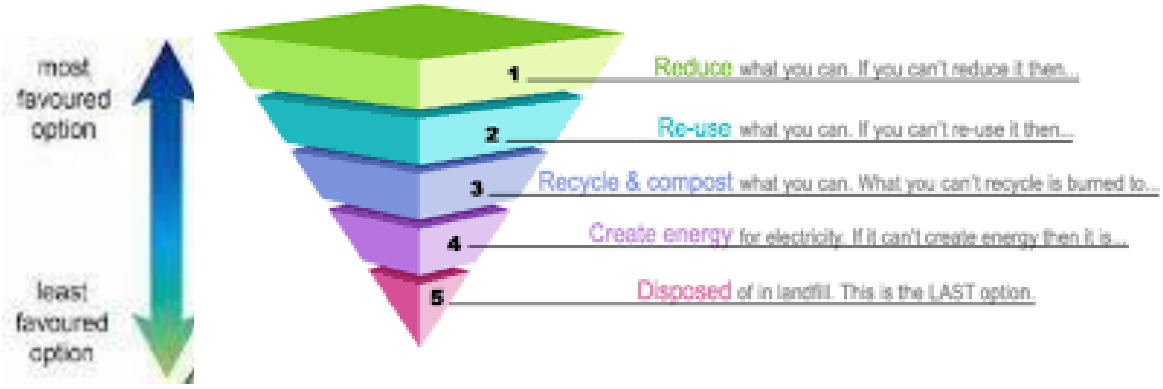

Figure 38: Waste management hierarchy

The principles of waste management hierarchy are the following:

- Polluter pays principles – all cost associated with waste management should, where possible, be borne by the waste generator;
- User pays principle – all cost associated with the use of a resource should, where possible, be included in the price of the goods and services developed form the resource; and
- Product stewardship principle - the producer or importer of a product should take all reasonable steps to minimise environmental harm from the production, use, and disposal of the product.

6.1.4 Waste Mitigation Measures

Waste management at the Quarry is based around the hierarchy of waste management:

- **Return** what you can. If you can't return to suppliers, then:
- **Reduce** what you can. If you can't reduce, then;
- **Re-use** what you can. If you can't re-use, then;
- **Recycle** what you can. If you can't recycle, then;
- Dispose of at a registered **landfill** site.

Specific controls utilised within the Quarry are detailed in the sections below, however, the strategy for the waste management is minimisation and segregation at the source (Quarry). The benefits for minimising and separation waste streams include:

- Reducing the potential for contamination of general waste streams;
- Improve the ease of waste storage, handling, disposal, and tracking;
- Educating employees and contractors of the importance of waste stream segregation and recycling; and
- Reducing the potential disposal cost for some items.

6.1.4.1 Waste Avoidance

Waste avoidance is the first hierarchical step in reducing the amount of waste produced at the Quarry. The generation of waste can be avoided by:

- Substituting inputs for those that generated waste;
- Increasing efficiency and the use of raw materials, energy, water, or land;
- Re-designing processed or products; and
- Improving the maintenance and operation of plant and equipment.

Careful Quarry planning will ensure that the amount of material brought on site for construction and operating of the Quarry is minimised, resulting in a cost saving, and reducing volume of waste generated any excess material, and used chemical containers will, where practical, be returned to the supplier or other local users. Concrete trucks are not permitted to wash-out or dump excess concrete on site.

Naaz Quarry will also consider packaging issues when purchasing resources for the Quarry and will encourage bulk purchasing to reduce the amount of packaging waste.

Where possible, all containers and packaging, particularly drums, will be returned to suppliers of products used within the Quarry. The selection of suppliers recognises their policy towards the return of containers and packaging, for those containers and packaging that can be returned.

6.1.4.2 Reduce

Where possible, opportunities for waste avoidance will be considered during equipment procurement and material purchasing from suppliers purchasing roles, and processes for elimination and reduction included the following.

- All employees / contractors to consider opportunities for waste avoidance when purchasing resources from suppliers; and
- Quarry manager / Supervisors to consider opportunities for waste avoidance when establishing contracts and during equipment procurement.

6.1.4.3 Re-use

Where possible, opportunities to re-use materials will be undertaken to ensure maximum utilisation of the resource is achieved. Waste will be sent for disposal to landfill only after all the other options have been exhausted. Waste streams will be evaluated for potential re-use, prior to transportation to an approved disposal facility. This can be achieved by the following:

- Vegetation waste from site clearing will be used in on-site landscaping where possible;
- Topsoil from disturbed areas will be stored for use in future restoration activities on site;
- Where possible, recyclable materials will be purchased for use throughout the Quarry;
- Recovery of pre-coat emulsions and pre-coated aggregated;

- Solvent, metal, oil, empty oil containers, and empty truck wash chemical drums and reusing these;
- All employees / contractors to consider opportunities for waste avoidance when purchasing resources from suppliers; and
- Quarry manager / Supervisors to consider opportunities for waste avoidance when establishing contracts and during equipment procurement.

6.1.4.4 Recycle

In the event waste materials cannot be re-used Naaz Quarry embraced the need to recycle to assist in the recycling. Designated bins are placed at appropriate locations around the Quarry. Colour coded / labelled bins are provided for the following waste streams:

- General waste;
- Hazardous waste bin (i.e. oily rags, oil filters);
- Scrap metal;

6.1.4.5 Storage and Disposal

Where recycling options are not available, waste classified as general solid waste (putrescible or non-putrescible) is placed in designated skip bins, and transported by a licensed contractor for disposal at a licensed solid waste landfill site. Waste generated by the Quarry will be disposed of in a way that causes the least harm to the environment.

Hazardous waste is segregated from other waste streams and stored in an appropriately bunded area prior to transportation off site. Transportation of hazardous waste is undertaken by a licensed waste transporter for disposal at a suitably licensed facility.

Under no circumstances is waste received at the Quarry for storage, treatment, processing, or disposal.

6.1.4.6 General Waste Management

The following actions / strategies will be implemented across the Quarry to maximise efficient waste management.

- All employees and contractors undergo a site induction and annual re-induction. Each induction includes a section on waste management practices at the Quarry.
- Clear instructions detailing waste segregation procedures and recycling procedures are to be maintained at various location across the Quarry.
- All designated waste bins, skips or storage areas are clearly identifiable.

6.1.4.7 Waste Tracking

All regulated waste movement from the site will be tracked in accordance with the requirements. This will include the completion waste transport certificates for collection, transport and management of regulated waste from the Quarry. Specifically, this will include recording the following information:

- Name, address, local government area, and contact details of the generator;
- Name, address, contact details, and environmental authority number of the receiver;
- Name, address, contact details, and environmental authority number of the transporter;
- The day and time the waste is given to the transporter;
- The load number;
- Registration number of the vehicle transporting the load;
- If the waste is a dangerous good:
    - Type and number of container in which the waste is contained;
    - UN number;
    - Packing group designator; and
    - Dangerous goods class and subsidiary risk.
- Following details of the waste:
    - Type of the waste and its physical nature (solid, liquid, paste, or gas); and
    - Waste code (waste classification).
- Waste origin code for the activity that generated waste.

6.2 STRATEGIES (PROCESS WATER, STORM WATER, GROUNDWATER, AND WASTE)

General Strategies that will be engaged at Naaz Quarry to ensure that the above philosophies can be achieved are discussed below:

- Steering various specialist studies to characterise the site, especially sensitive features and inform impact prediction and formulation of environmental management plans.
- Responsible, thoughtful, and well planned execution of activities on site. This will require proper designs for all dams and trenches are compiled and implemented.
- Formal response procedures are in place for various potential environmental emergencies.
- Ensuring quick access to necessary specialists to assist with any environmental issues to ensure the best possible action can be taken speedily.
- Good house-keeping practices.
- Implementing an adequate monitoring programme and schedule as detailed in this IWWMP to:
    - Ensure that mitigation and management measure are effective.
    - Allow quick detection of potential impacts/risks, which in turn will allow for quick response to issue/impacts.
    - Allow quick implementation of proposed action plans as set out in this IWWMP.
    - Reduce duration of any potential negative impacts.

- Ensure post closure objectives are considered right from the onset and throughout operations to ensure these are attained at closure.

6.2.1 SURFACE WATER

The general principle of water management is the recognition that it is a scarce resource. This principal is guided by water use minimisation (water conservation) or re-use of water and pollution prevention or the limitation of pollution of water.

The goal of Naaz Quarry is to minimise water consumption, impacts to the environment, running costs, and to achieve environmental legal compliance, whilst maintaining adequate water supply as not to compromise the mining operations and supply of gravel to the industry. The objectives of this baseline hydrological study are to:

- Describe the climatic, hydrological, landuse and topographical conditions of the study area by defining the general catchment conditions of the study site.
- Identify and delineate stream and river channels and their associated catchment areas in the vicinity of the quarry.
- Determine the Mean Annual Runoff (MAR) for the project area and any contributing catchments in the vicinity of the quarry site.

- Undertake an impact assessment of the quarry, focusing on the potential risks associated with the quarry related specifically to local and regional hydrology. Using the impact assessment, mitigation measures have been provided to reduce the risks associated with the identified potential impacts.

In order to achieve the above objectives, Naaz Quarry it is committed to uphold the following broad commitments:

- All water that can remain unpolluted will be kept separate and dirty water areas will be minimised;
- The use of water resources for processing and mining activities will constantly be evaluated to ensure that their use is optimised;
- No water will be discharged unless authorised by the DWS, especially water that exceeds the catchments water quality objectives, as set out by the National Authority, with the exception of emergency conditions if safety should demand so; and
- Dirty water catchments will be minimised and kept separate from clean catchments and all water contained here shall be re-used as far as possible, thus reducing the quality or raw water extracted.

All the relevant principles contained in DWS's Best Practice Guidelines (BPG) will be utilised to guide mine design and management practices. Naaz Quarry will also ensure compliance with GNR 704 of the NWA, and is applying for the relevant exemptions indicated in Section 3.3 above.

6.2.2 Process Water

Process water within the mining operation will be sourced from the municipality and transported to the mining area (in a truck) where it will be stored in three jojo tanks until used. Presently, no washing of material is proposed and Inzalo will therefore mainly use water for dust suppression purposes on denuded areas, the processing plant, and access road (when needed).

6.2.3 Wetlands and Aquatic Ecology

The aim and objectives of this study is as follows:

Refer to the Wetland Assessment done by JG Africa, Assessment of the Wetlands and Watercourses in the vicinity of a proposed new Dolerite mine near Pietermaritzburg, Kzn.

To consider the characteristics of the various stream and river channels in the vicinity of the mine and between the mine and the Umgeni River; and

- To consider the possibility of the mine impacting on any wetlands which might be in its vicinity.

6.2.4 Storm water

Principles that were considered during the development of the SWMP: Refer to the Storm water Management plan done by JG Africa.

- Prevent the contamination of clean run-off.
- 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.

Process water consist of stormwater from the mining area that is diverted by means of berms to the settlement dams located on site.

The main objectives of the SWMP are to ensure:

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

6.2.5 Groundwater

Please refer to Section above. Strategies for groundwater management will include:

- Designing and constructing infrastructure as per GN704 (except with regards to granted exemptions) requirements, including the necessary linings to reduce seepage to groundwater table and not constructing structures from contaminating material;
- Recording water abstraction, dewatering, and recycling water on site in order to reduce the need for abstraction of water from clean water resources for make-up water; and
- Ensure strategies are in place to compensate for any water losses to registered water users.

6.2.6 Waste

The following waste management strategies will be implemented:

- The waste management plan shall ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc.;

- The Mine and Contractor(s) shall comply with the environmental management principles referenced in the NEMA. In respect of waste management, the 'cradle-to-grave' principle in particular must be adhered to, to ensure accountability for correct waste handling, storage, and disposal;
- The waste management system shall provide for adequate waste storage (in the form of waste skips and bins with lids), waste separation for recycling, and frequent removal of non-recyclable waste for permanent disposal at an appropriately licensed waste disposal facility. No waste material is to be disposed of on-site. Under no circumstances may there be any burial of waste underground or on the site;
- Waste shall be separated into reusable, recyclable, and non-recyclable waste, and shall be further separated as follows:
    - Hazardous waste, consisting of substances that may be harmful to the receiving environment, and therefore require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel.
    - General waste, consisting of non-hazardous substances, and substances that cannot be recycled. Examples include (but not limited to) construction rubble, excess construction materials that cannot be re-used.
    - Recyclable waste, (where volumes are sufficient to make recycling feasible) shall preferably be deposited in separate bins. Recyclable material includes paper, tins, and glass.
- The mine shall implement a waste removal regime that ensures waste containers do not exceed their capacity before being removed from site for disposal;
- Environmental awareness training given to workers on site shall include appropriate waste management practices to be implemented on site;
- Particular caution is to be exercised with regards to handling of hazardous waste, to ensure that it does not spill or leak from the waste collection containers. Refuse must also be protected from rain, which may cause pollutants to leach out;
- Littering shall be strictly prohibited. The site shall remain in a neat and tidy condition at all times. If required, the Applicant shall make use of regular litter patrols to remove litter and ensure the site remains clean, neat, and tidy;
- The mine shall maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes; and
- The mine shall have the sediments, that are removed from the de- siltation of the dams, analysed. Should the results indicate that the sediments are not suitable for rehabilitation purposes, the Applicant will ensure that the sediments are correctly disposed of.

The table below for detailing any formalised waste minimisation strategies that may be in place.

Table 28: Waste Minimisation Strategies (Cape, 2011).

Do any of the following form part of Inzalo current systems or strategies	Yes/ No	If Yes, please provide a detailed description of the current scope of initiative.
Waste reduction policy	Yes	Waste is reduced as far as possible, by minimising the intake of product into the mining area
Waste prevention initiatives	Yes	Waste is reduced as far as possible, by minimising the intake of product into the mining area. Staff is inducted before work commenced on site about the waste and the appropriate manner to dispose of waste
Waste minimisation	Yes	Waste is reduced as far as possible, by minimising the intake of product into the mining area
Waste separation, internal re-use, or recycling	Yes	Waste is separated on site, into the different categories as per legislation. Wheelie bins are provided for each waste group. The waste is taken to the appropriate disposal facility according to the waste stream
External re-use or recycling	No	
Recover practices	No	
Chemical inventory control system	Yes	At the workshop, the hazardous products and paints are separated and categorised according to their groups. These products are controlled by the workshop manage
Waste reduction or general audits	Yes	An EPA audit will be conducted on a monthly basis. During this audit, the ECO will inspect all waste areas
Housekeeping audits conducted	Yes	An EPA audit will be conducted on a monthly basis. During this audit, the ECO will inspect all waste areas
Replace toxic chemicals in order to reduce the amount or toxicity of waste generated	No	
Change packaging/ product design/ manufacturing procedures to reduce the quantity of hazardous waste	No	An EPA audit will be conducted on a monthly basis. During this audit, the ECO will inspect all waste areas
Purchase equipment that produces less waste	No	
Treatment of effluent or wastewater	No	Chemical ablution facility will be cleaned by contracting company
Staff training in integrated waste management	Yes	Staff is inducted before work commenced on site about the waste and the appropriate manner to dispose of waste
Community / stakeholder participation in integrated waste management	No	Local communities / stakeholders are located 75km away from the proposed site

6.2.6.1 Waste Generated Throughout the Live Phases of the Mine

The waste generated by Naaz Quarry and their proposed management are indicated in the table below. Quantities of waste were estimated based on information for other quarries. Decommissioning of the Quarry component and infrastructure has not been planned at this early stage of the Quarry development. However, decommissioning will be undertaken as and when required, and will be done so in accordance with accepted industry practices, stakeholders, and regulatory requirements.

Waste streams on-site includes the stockpiling area which consist out of aggregates, topsoil, or overburden distinctly.

6.2.6.2 Putrescible Waste

The expected waste stream generated during the phases of the Quarry will comprise of unrecoverable waste streams associated with putrescible. Putrescible waste will be generated through the day to day activities of the site office facilities and kitchen waste amenities. The putrescible waste will then be disposed of off-site on a weekly basis.

6.3 PERFORMANCE OBJECTIVES / GOALS

The Applicant has an approved Safety, Health and Environmental (SHE) policy, which outlines commitment towards environmental management, and which provides the framework for all environmental activities on the mine. There is a continual process of reviewing to assess the impacts of the mines activities on the environment. All internal and external legal requirements pertaining to the Applicant are identified and regularly reviewed. Legal Compliance reporting takes place on an annual basis. The performance objectives are summarised in

Table 29: Performance Objectives

Item	Performance Objective
Process Water	▪ Require water quality standard ▪ Re-use and recycling of process water ▪ Accurate water balance (flow meters)
Groundwater	▪ Prevent deterioration of groundwater quality ▪ Prevent aquifer contamination
Storm / Surface Water	▪ Clean and dirty water separation ▪ Diversion of clean stormwater run-off around the mining area ▪ Collection and containment of contaminated water ▪ Protection of life and property from flood hazards ▪ Prevention of erosion ▪ Protection of water resources from pollution ▪ Ensure continuous operation through different hydrological cycles ▪ Maintaining downstream water quality and quantity requirements; and ▪ Protection of the natural environment with the emphasis on the water courses and their ecosystems (Environment, 2016; Environment, 2016).
Waste	▪ Waste separation ▪ Internal re-use and recycling ▪ External re-use and recycling ▪ Recovery practices ▪ Effluent treatment ▪ Improved inventory control and records kept of losses ▪ Assessment of waste contractors ▪ Records and quantities kept of all waste streams ▪ Records kept of safety disposal certificates ▪ Staff training in integrated waste management ▪ Development and procedure for reporting environmental incidences ▪ Reporting waste quantities to authorities ▪ Moving towards cleaner production and phasing out hazardous substances ▪ Promotion of extended education and awareness around waste management, and promotion of extended producer responsibility.

6.4 MEASURES TO ACHIEVE AND SUSTAIN PERFORMANCE OBJECTIVES

The IWWMP action plan identifies measures to achieve the water and waste related objectives. Refer to Section 6.7 below.

The measure to achieve and sustain the above mentioned objectives are listed in the table below, along with the timeframes and the persons responsible for the implementation of these measures.

Table 30: Measures to achieve performance objectives

Objective	Measures	Responsibility	Timeframe
Protect the biophysical environment as far as possible	Demarcate the CBA area as a no-go area	ECO & General Manager	Immediate Prior to construction
	Place spill kits at all active areas	Site / Plant Manager	Immediate Prior to construction
	All activity areas will be properly demarcated and all activities will remain within the designated areas	ECO & General Manager	Immediate Prior to construction
	Ensure emergency preparedness in terms of spills, water leaks and fires	Site Manager, Plant Manager & ECO	SOPs to be developed and training provided at least annually
Protect natural water resources	All sensitive areas (nearby wetlands and drainage areas) will be demarcated as no-go areas and no activity will take place within these areas	ECO & General Manager	Immediate Prior to construction
	Proper base preparation of coal stockpile areas	Site Manager	Before coal stockpiling in areas
	Ensure all potentially contaminating materials (hydrocarbons, chemicals, cement, etc.) and all wastes are stored within designated areas and stored in terms of national standards and regulations	ECO	Monthly inspections
Clean and dirty water separation	Compile a detailed stormwater management plan; delineate all clean and dirty water areas on the mine plan	ECO	Completed
	Construct and maintain clean water diversion berms and trenches in line with GN704. Construct and maintain dirty water collection trenches in line with GN704	Site Manager & engineer	Immediate before any other activities Continuous inspection and maintenance
	Ensure sufficient capacity in all water management facilities	Site Manager & ECO	Continuous
	Install flow dissipaters, silt traps and / or erosion control measures	Site Manager & ECO	Immediately where monitoring indicates a need for such

Objective	Measures	Responsibility	Timeframe
Use water responsibly and recycle water as far as possible	Update water balance with recorded water usage on site	ECO	Annually
	Install flow meters on all abstraction points	General Manager	Immediate
	Record water usage volumes	General / Plant Manager	Daily with monthly tallying
Prevent erosion	Install flow dissipaters, silt traps and / or erosion control measures	Site Manager & ECO	Immediately where monitoring indicates a need for such
	Install and maintain top and toe perimeter berms on all soil stockpiles	Site Manager & ECO	Immediately and inspect monthly
	Keep all soil stockpiles and berms well vegetated	Site Manager & ECO	Seed during first rainy season and maintain throughout life of mine
Legally compliant waste disposal	Colour code waste skips / bins according to waste type	Plant Manager	Completed
	Compile and implement a waste manifest	ECO	Immediate Prior to construction
Ensure adequate rehabilitation	Compile a mine rehabilitation and closure plan	General Manager / Surveyor and ECO	Update annually
Ensure that residual impacts after closure of the mine are minimal and	Update Geohydrology and groundwater studies on a regular basis	ECO	Every 2 years
Ensure that residual impacts after closure of the mine are minimal and appropriately managed, specifically poor quality decant	Limited contamination plume and no impact on surface water bodies	N/A	N/A
	No Decant expected		
Ensure legal compliance (provincial & national legislation)	Surface and ground water quality monitoring	ECO	On-going
	Bio-monitoring	ECO	On-going
	Conduct Regular inspections & audits	ECO	As stipulated in approved EMP, authorisations and legislation

6.5 OPTION ANALYSIS AND MOTIVATION FOR IMPLEMENTATION OF PREFERRED OPTIONS (OPTIONAL)

Comparison of mine site options 1 and 2

The anticipated impacts on wetlands and watercourses from the two mine site options are presented in Tables below. The impacts include those listed in the earlier report which only considered the Option 1 site but with others now being added. The most important of these relate to the locality of Site 2. Because the site is located a little distance away from Site 1, it raises further issues which include the additional length of access road which will be required and the issue of biodiversity. The length of additional road which will be required is not known since no route has yet been proposed. However, because the site is at the crest of a hill, and not at the base, it may be anticipated that the road will have to climb up the hill at some point. This implies greater risk of surface erosion and runoff of soil toward one or both watercourse channels. The quantity of dust produced will also increase as the distance is extended.

In regard to biodiversity, the original report produced (Amanzi Aquatics, 2020) stated that the area in which Site 2 is located has higher biodiversity conservation value than the area at Site 1. Furthermore, the vegetation along the crest of the ridge is generally in better condition than that on the lower slopes. Since the condition of the aquatic biodiversity is commonly closely linked to terrestrial biodiversity, it follows that impacts on the crest of the ridge may well result in degradation of the adjoining streams and wetlands and so should be included in this study.

In the case of Site Option 1 the impacts are considered in relation to the eastern stream which flows directly to the confluence with the shared watercourse. The reason for basing the assessments on that stream, and not within the watercourse channel which leaves the mine site, is that the channel is dry almost throughout the year and that it does not now actually reach the stream directly. The latter condition was brought about by the opening of a shale quarry which eventually reached into its catchment and caused a diversion into an old mine pit. While the change started over 15 years ago, it is still of relevance at the present time.

In the tables, the Feasibility of Mitigation was determined with the mitigatory measures recommended in Terratest (2021) as the background yardstick. The measures were put forward with the intention that they be both practical to implement, and effective in controlling the associated impacts.

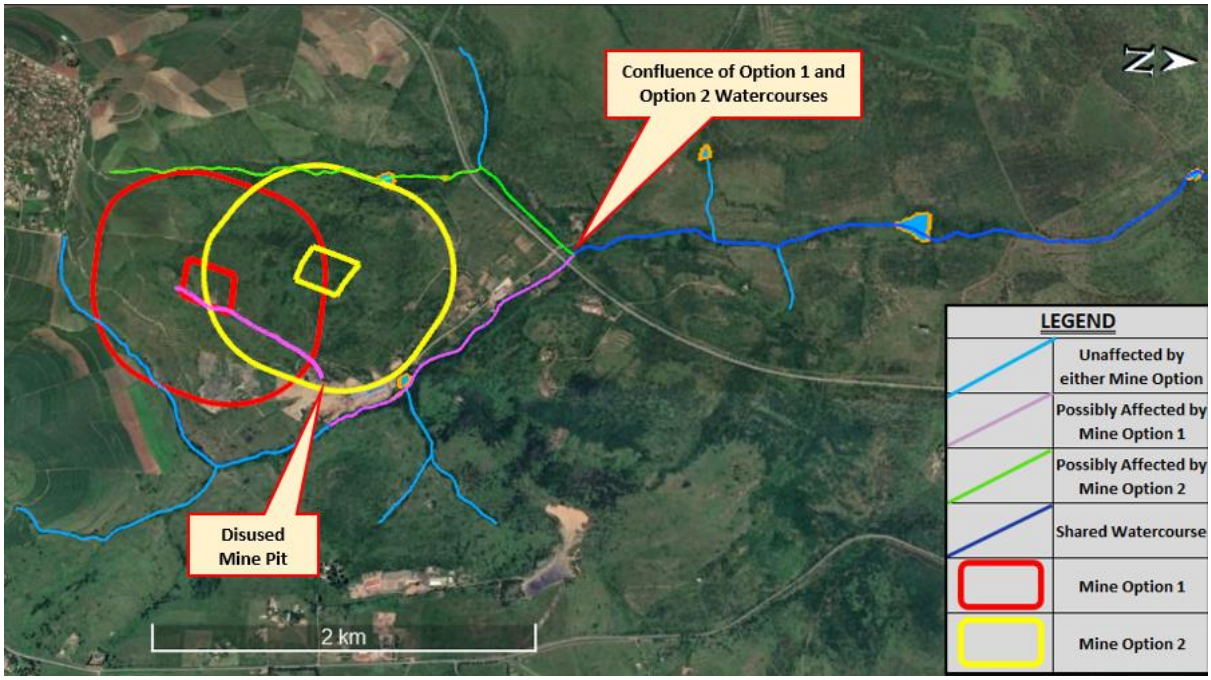

Figure 39: Watercourses in the vicinity of the dolerite mine (JG Africa Alternatives Report)

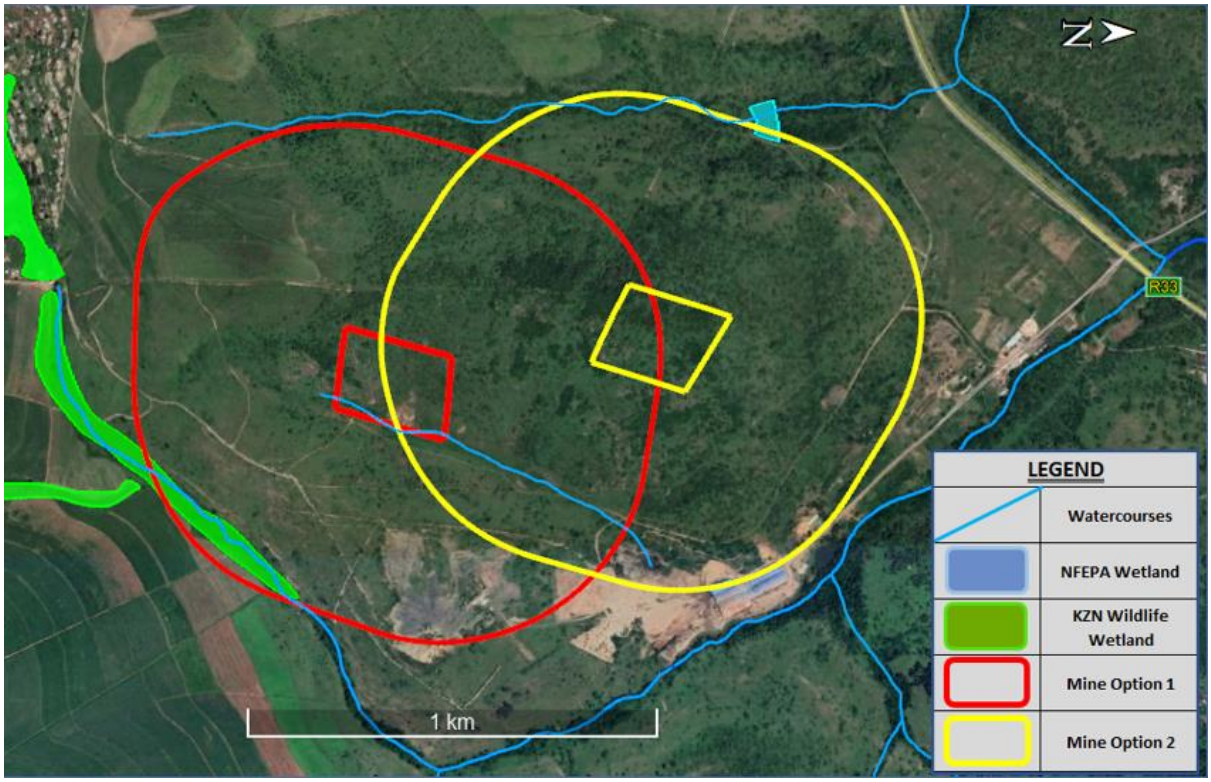

Figure 40: Wetlands located in the vicinity of the two dolerite mine options (JG Africa Alternatives Report)

Conclusions

It is apparent that neither of the two mine site options pose any major threat to the aquatic systems in their vicinity and effectively none at all to the Umgeni River. The reasons for this situation are that the functional watercourses and wetlands in the area are all located at some distance from either mine site and that the systems are generally small and non-perennial. In the case of the channel which emanates from Site Option 1 there would be a considerable degree of threat but the system is dry at almost all times. In addition, it already has two small sediment retention walls within it and it no longer discharges directly into a normal watercourse. Only one wetland has any part of its area within 500 m of a candidate mine site and it is located in a sub catchment which is separate from the nearest mine site.

Despite the foregoing, the mine sites do pose some degree of threat to the aquatic systems. These threats are linked to indirect impacts and relate to the access roads and to the condition of biodiversity in the area. Mine Site Option 1 has an existing access road which approaches along a route which poses little threat to aquatic systems either in terms of sediment runoff, or from blown dust. Mine Site Option 2 has no road access at present and no route has been proposed. However, as the site is at the crest of a ridge it follows that the approach will have to be indirect in order to reduce the gradient, and so will be of some length. The risks of sediment runoff and blown dust are therefore greater than those from Mine Site Option 1.

Finally, Mine Site Option 2 is a greenfields site which is located in vegetation which is in better condition than that at Site 1. The loss of this vegetation would be of concern by itself but there are likely to be knock-on effects on the aquatic systems in terms of water quality, energy pathways, channel structure, and riparian vegetation. These impacts will penetrate for some distance downstream.

Thus, while there is little reason to determine between the two mine sites on the basis of direct impacts, it would seem that that Mine Site Option 1 will have fewer indirect impacts and so is the option supported by this study.

Table 31: Comparison of impacts on watercourses by Mine Options 1 and 2

Impact	Mine Option 1			Mine Option 2		
	Probability of Occurrence	Likely Severity	Feasibility of Mitigation	Probability of Occurrence	Likely Severity	Feasibility of Mitigation
Impact on flow hydrology	Low	n/a	n/a	n/a	n/a	n/a
Risk of soil and sediment inputs	Moderate	Moderate	Moderate to High	Low	Low	Moderate to High
Risk of pollution by fuels and oils	Low	Moderate to Severe	High	Low	Moderate to Severe	High
Risk of pollution by solid wastes	Moderate	Low	High	Low	Low	High
Risk of pollution from blown dust entering the watercourse ecosystem	Moderate to High	Low	Moderate	Low	Low	Low
Risk of pollution by improperly treated waste water	Low	Low	Moderate to High	Low	Low	High
Risk of sediment and dust generation from the access route to the mine.	Low	Moderate	Low	Moderate	Moderate	Low
Risk of impacts on the aquatic biodiversity as a result of degradation of the local catchment area biodiversity	Low	Low	Low	Moderate	Moderate	Low

Table 32: Comparison of impacts on wetlands by Mine Options 1 and 2

Impact	Mine Option 1			Mine Option 2		
	Probability of Occurrence	Likely Severity	Feasibility of Mitigation	Probability of Occurrence	Likely Severity	Feasibility of Mitigation
Impact on flow hydrology	Low	n/a	n/a	n/a	n/a	n/a
Risk of soil and sediment inputs	Low	n/a	n/a	n/a	n/a	n/a
Risk of pollution by fuels and oils	Low	n/a	n/a	Very Low	n/a	n/a
Risk of pollution by solid wastes	Low	Low	High	Low	Low	High
Risk of pollution from blown dust entering the watercourse ecosystem	Low	n/a	n/a	Low	n/a	n/a
Risk of pollution by improperly treated waste water	Low	n/a	n/a	Low	n/a	n/a
Risk of sediment and dust generation from the access route to the mine.	Low to Moderate	Moderate	Low	Moderate to High	Moderate	Low
Risk of impacts on the aquatic biodiversity as a result of degradation of the local catchment area biodiversity	Low	Low	Low	Moderate	Moderate	Low

6.6 CONTINGENCY PLAN

Table 33: Incident action plan

Phase	Activity	Potential Risk	Response Action	Period	Responsible Party
Establishment and Site Preparation	Vegetation Clearing	Increased erosion and sedimentation to downstream watercourses	Construction of stormwater diversion channels and berms (sediment traps)	48 hours	Foreman and Mine Manager
		Dust generation	Dust suppression over area concerned using either water spraying, straw and/or dust -suppressants	Immediately	Foreman
	Topsoil Stockpiling	Mobilisation and sedimentation from stockpiled soil	Construction of stormwater diversion channels and berms (sediment traps)	48 hours	Foreman and Mine Manager
		Dust generation	Dust suppression over area concerned using either water spraying, straw and/or dust-suppressants	Immediately	Foreman
		Seeding of alien invasive plant species	Removal	Immediately	All personnel
	General	Leaks from temporary ablutions	Contain leak	Immediately	Foreman
			Remove and replace unit	Immediately	Mine Manager and Supplier
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Hydrocarbon leaks from vehicles and equipment	Contain leak	Immediately	Operator
			Remove vehicle/equipment for repair	Immediately	Operator
			Clean up using spill kit	Immediately	Foreman
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Unsuitable waste disposal practices	Removal of waste and containment in suitable receptacle for safe disposal	Immediately	Foreman and Waste Contratcor

Phase	Activity	Potential Risk	Response Action	Period	Responsible Party
Operational Phase	Blasting	Damage to power line	Evacuate all personnel to safe distance	Immediately	Safety Officer
			Cordon off affected area	Immediately	Safety Officer
			Inform Eskom (within 1 hour)		Mine Manager
			Facilitate immediate access for Eskom and their representatives	Immediately	Mine Manager
	Stockpiling	Mobilisation and sedimentation from stockpiled rock aggregate	Construction of stormwater diversion channels and berms (sediment traps)	48 Hours	Foreman and Mine Manager
		Inadvertent stockpiling within restricted areas	Relocation of stockpiled material to approved location	48 Hours	Foreman and Mine Manager
		Dust generation	Dust suppression over area concerned using either water spraying, straw and/or dust -suppressants	Immediately	Foreman
	General	Leaks from temporary ablutions	Contain leak	Immediately	Foreman
			Remove and replace unit	Immediately	Mine Manager and Supplier
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Hydrocarbon leaks from vehicles and equipment	Contain leak	Immediately	Operator
			Remove vehicle/equipment for repair	Immediately	Operator
			Clean up using spill kit	Immediately	Foreman
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Unsuitable waste disposal practices	Removal of waste and containment in suitable receptacle for safe disposal	Immediately	Foreman and Waste Contratcor
		Leaks and spills from stored chemicals, fuels and other hazardous materials	Isolate and contain leak/spill	Immediately	Operator and Foreman
			Recovery and storage within suitable container	Immediately	Foreman
			If not contained to bunded area, isolate spill using temporary berms	Immediately	Foreman
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
			Significant events to be reported to the Relevant Authorities	24 Hours	Mine Manager
			Specialists to be appointed to assess significant events	2 Weeks	Mine Manager
			Repair/replace leaking containers	Immediately	Foreman
		Failure of stormwater management infrastructure	Diversion channels and berms to be repaired	48 hours	Mine Manager and Civil Contractor

Phase	Activity	Potential Risk	Response Action	Period	Responsible Party
Closure	Redistribution of topsoil	Mobilisation and sedimentation from stockpiled soil	Construction of stormwater diversion channels and berms (sediment traps)	48 hours	Foreman and Mine Manager
		Dust generation	Dust suppression over area concerned using either water spraying, straw and/or dust -suppressants	Immediately	Foreman
		Seeding of alien invasive plant species	Removal	Immediately	All personnel
	General	Leaks from temporary ablutions	Contain leak	Immediately	Foreman
			Remove and replace unit	Immediately	Mine Manager and Supplier
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Hydrocarbon leaks from vehicles and equipment	Contain leak	Immediately	Operator
			Remove vehicle/equipment for repair	Immediately	Operator
			Clean up using spill kit	Immediately	Foreman
			Removal of impacted soil for safe disposal	Immediately	Mine Manager and Waste Contractor
		Unsuitable waste disposal practices	Removal of waste and containment in suitable receptacle for safe disposal	Immediately	Foreman and Waste Contratcor

6.7 IWWMP ACTION PLAN

The management strategy and the monitoring plan as detailed in the impact assessment tables below and have been devised and specify the applicable phase of mining during which these management and monitoring activities must be undertaken. Also indicated in the monitoring and action plan, is the frequency at which monitoring/inspection is to be conducted, and the person/individual who is responsible for ensuring these monitoring/inspection activities are properly carried out. Therefore, the management strategy and monitoring plan already addresses the short-term, medium-term, and long-term actions that will need to be considered during construction (immediate to short-term action), operations (short to medium-term actions), decommissioning, and post closure (long-term actions) phases of mining. A very brief summary is provided below.

6.7.1 Immediate to Short-Term Actions

Immediate actions necessary are related to environmental authorisations and other authorisations related to the mining activities. Regarding the environmental authorisations the following will be necessary:

- Ensure IWULA is granted by DWS prior to commencement.
- Ensure all the monitoring programmes are implemented immediately and conducted at stipulated frequencies for the life of mine.
- Ensure all activities comply with GN704 unless relevant exemptions are granted by DWS.
- Ensure the management measures and performance assessment measures for construction and upgrade phase, that is indicated as immediate, are applied.
- Ensure the monitoring plans as indicated in Table 34 are applied.

6.7.2 Short-Term Actions

- Ensure the relevant EMPr and IWULA audits are scheduled, carried out, and submitted to the authorities.
- Ensure the management measures and performance assessment measures, as indicated in Table 34 for construction and upgrade phase, that is indicated as immediate and due within the next year, are applied.
- Ensure the monitoring plans as indicated in Table 34 are applied.

6.7.3 Medium-Term Actions

- Ensure the management measures and performance assessment measures operation phase are applied.
- Ensure the monitoring plans as indicated are applied.
- Ensure the relevant compliance audits are carried out and submitted to the authorities.
- Ensure the final rehabilitation plan is drafted as soon as possible.

6.7.4 Long-Term Actions

- Ensure the management measures, associated monitoring, and action plans for decommissioning and closure phases are applied, as well as those measures in the approved EMPr compiled under the MPRDA.
- Ensure the relevant compliance audits are carried out and submitted to the authorities.
- Ensure closure applications are finalised and submitted.

Table 34: IWWMP Action Plan

Activity	Environmental Aspect	Mitigation Measures	Monitoring frequency and tools	Monitoring indicators	Responsible party for implementation and monitoring tool
Staff and Management Awareness					
Staff awareness program and training	Risk mitigation	The Applicant must inform its employees of risk associated with their operations and make sure that all employees are trained prior to undertaking any activity associated with their operations. Ensure that the Contractor and key personnel are aware of the relevant provisions of the EMPr, sensitive environmental features, and agreements made with individual landowners, and/or land users	Permanent / Continuous	Reducing in incidents and identified risks	Management • EMPr
Appoint Contractors Environmental Officer (CEO)	Oversee and enforce EMPr	The Applicant's management to assign a team that will monitor EMPr implementation and compliance by the employees. Enforcement should be applied to those employees that are not complying	Permanent / Continuous	Management satisfied with CEO performance based on EMPr implementation	Management • EMPr • Compliance checklists • Audit reports
Site Operation					
Water for human consumption	Water and soil pollution, health	Water for human consumption shall be available at the site offices and at other convenient locations on site. All drinking water must be from a legal source and comply with recognised standards for potable use. The Applicant shall comply with the provisions of the National Water Act, 1998 (Act No. 36 of 1998) and its Regulations pertaining to the abstraction of water from rivers and streams and the use thereof. All effluent from the office shall be collected and disposed of properly, (e.g. chemical toilets should be emptied). If this is not feasible (due to the construction duration or other difficulties), all effluent water from the camp / office sites shall be disposed of in a properly designed and constructed system, situated so that it will not adversely affect water sources (streams, rivers, pans dams etc.). Only domestic type wastewater shall be allowed to enter this drain. The effluent system should comply with provisions of the NWA	Weekly monitoring of waste and effluent removal/ disposal	• Adequate quantities of potable water • Proper effluent disposal	Management • EMPr • Compliance checklists
Sewage	Soil and water pollution; Waste disposal	The positioning of the chemical toilets shall be done in consultation with the Applicants Environmental advisor. Toilets and latrines shall be easily accessible and positioned within walking distance from wherever employees are employed on the works. Use of the veld for this purpose shall not, under any circumstances, be allowed. Outside toilets shall be provided with locks and doors, and shall be secured to prevent them from blowing over. The toilets shall also be placed outside areas susceptible to flooding. The Applicant shall arrange for regular emptying of toilets and shall be entirely responsible for enforcing their use and for maintaining such latrines in a clean, orderly, and sanitary condition	Weekly monitoring of sewage facilities, maintenance, and disposal	Adequate and operation sewage treatment/disposal	Management • EMPr • Compliance checklists
Waste Management	Soil and water pollution; Waste disposal	Where practically possible, general waste on-site must be re-used or recycled. Bins and containers must be available on-site for collection, separation, and storage of waste streams (such as wood, metals, general refuse etc.)	Weekly monitoring of waste clean-up	No waste or litter accumulation on site	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan					
Activity	**Environmental Aspect**	**Mitigation Measures**	**Monitoring frequency and tools**	**Monitoring indicators**	**Responsible party for implementation and monitoring tool**
Solid Waste	Soil and water pollution; Waste disposal	A refuse control system shall be established for the collection and removal of refuse. Bins and containers must be available on-site for collection, separation, and storage of waste (such as wood, metals, general refuse etc.). Solid waste shall be stored within a designated area that is covered, utilising plastic wheelie bins for collection and disposal. Disposal of solid waste shall be at a DWS licensed landfill site or at a site approved by DWS, in the event that an existing operating landfill site is not within reasonable distance from the site. No waste shall be burned or buried at or near the site offices, or anywhere else on the site	Weekly monitoring	• No waste or litter accumulation on site • Proof of disposal certificates • No burning of waste	Management • EMPr • Compliance checklists
Wastewater	Soil and water pollution	The Applicant shall comply with the provisions of the NWA and its Regulations pertaining to the storage and re-use of wastewater collected on site. Wastewater collection ponds should be lined and in compliance with the NEM:WA and other legal requirements	Monthly monitoring	No ground and water contamination	Management • EMPr • Compliance checklists
Litter	Soil and water pollution; Waste disposal	No littering by construction workers shall be allowed. During the construction and operation period, the facilities shall be maintained in a neat, tidy condition, and the site shall be kept free of litter. Measures shall be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work the contractor shall provide litter collection facilities for later safe disposal at approved sites	Bi weekly monitoring	• No waste or litter accumulation on site • Proof of disposal certificates • Availability and maintenance of litter / refuse collection facilities. No burning of waste	Management • EMPr • Compliance checklists
Hazardous waste	Soil and water pollution; Waste disposal	Hazardous waste such oils etc. shall be disposed of in a DWS approved landfill site. Any spillage shall be attended to immediately and affected areas shall be promptly reinstated to the satisfaction of the engineer	Weekly monitoring	• No spillages or direct disposal • No waste or litter accumulation on site • Proof of disposal certificates • Proof of reinstatement following any spillages • No burning of waste	Management • EMPr • Compliance checklists
Control at the workshop	Soil and water pollution; Waste disposal	Management and maintenance of plant and machinery will be strictly monitored according to the subsections below, regardless whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop). All maintenance, including washing and refuelling of plant on site shall take place at designated locations at the workshop area. All machinery servicing areas shall be bunded	Monthly monitoring	Random visual inspection during site visits	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan					
Activity	**Environmental Aspect**	**Mitigation Measures**	**Monitoring frequency and tools**	**Monitoring indicators**	**Responsible party for implementation and monitoring tool**
Hazardous Material Storage	Soil and water pollution; Waste disposal	Petrochemicals, oils, and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry. The Applicant should ensure that they keep proof that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Before containment or storage facilities can be erected, the Applicant should ensure that preventative measures are put in place to mitigate against pollution of the surrounding environment from leaks or spillage. The preferred method shall be a concrete floor that is bunded. Any deviation from the method will require proof from the relevant authority that the alternative method proposed is acceptable to that authority. The proposals shall also indicate the emergency procedures in the event of misuse or spillage that will negatively affect an individual or the environment	Weekly monitoring	• No hazardous waste accumulation on site • Proof of disposal certificates • No burning of waste • Suitable and adequate hazardous substance storage areas • Proof of submission and approval from the Employers Environmental Manager/Environ mental Officer	Management • EMPr • Compliance checklists
Fuel and Gas Storage	Soil and water pollution; Waste disposal	Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. An adequate bund walls, at least 110% of the volume stored, shall be provided for fuel and diesel areas to accommodate any leakage spillage or overflow of these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. Any leakage, spillage or overflow of fuel shall be attended to immediately. Gas welding cylinders and LPG cylinders shall be stored in a secure, well-ventilated area. Storage of hazardous substances must comply with construction regulations under the OHSA	Weekly monitoring	• Inspect bunded area for leaks / drainage • Proof of disposal certificates • No burning of waste	Management • EMPr • Compliance checklists
Oil and Lubricant Waste	Soil and water pollution; Waste disposal	Used oil, lubricants, and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier. Oils collected in this manner, shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. All used filter materials shall be stored in a secure bin for disposal off site. Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials	Weekly monitoring	• Inspect bunded area for leaks / drainage • Proof of disposal certificates • No burning of waste	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan

Activity	Environmental Aspect	Mitigation Measures	Monitoring frequency and tools	Monitoring indicators	Responsible party for implementation and monitoring tool
Soil and Stockpile Management	Soil erosion	Topsoil shall be removed from all areas where physical disturbance of the surface will occur and shall be stored and adequately protected. The Applicant will provide for the stripping and stockpiling of topsoil from the site for later re-use. Topsoil is considered to be the natural soil covering, including all the vegetation and organic matter. Depth may vary at each site. The areas to be cleared of topsoil shall include the storage areas. All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled or windrowed topsoil shall be removed by hand. Soils contaminated by hazardous substances shall be disposed of at an approved DWS waste disposal site. The topsoil stockpiles shall be stored, shaped, and sited in such a way that they do not interfere with the flow of water to cause damming or erosion, or itself be eroded by the action of water. Stockpiles of topsoil shall not exceed a height of 2m, and if they are to be left for longer than 6 months, shall be analysed, and if necessary, fertility improved before replacement. Stockpiles shall be protected against infestation by weeds. The Applicant shall ensure that no topsoil is lost due to erosion – either by wind or water. Areas to be top soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns	Monthly monitoring	• Visual inspection of stockpiles	Management • EMPr • Compliance checklists
Drainage / Stormwater Management	Soil erosion /stormwater management	The quality, quantity, and flow direction of any surface water run-off shall be established with the aid of a qualified engineer prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities. Before a site is developed or expanded, it shall be established how this development or expansion will affect the drainage pattern. No water source shall be polluted in any way due to proposed development. No wastewater may run freely into any of the surrounding environment or neighbouring properties. The contractor shall implement the stormwater design in accordance with the approved Stormwater Management Plan. The Applicant and Contractor(s) shall ensure compliance with the requirements of the NWA and GN 704. All areas susceptible to erosion shall be protected by ensuring that there is no undue soil erosion resultant from construction and/or mining activities. Berms shall be constructed where necessary to direct all run-off into the stormwater system. Care must be taken to avoid scouring and erosion and suitable measures should be placed in areas where run-off concentrates, in order to detain the sediment load and slow down the run-off. All erosion damage shall be repaired as soon as possible as directed by the Environmental Representative. Consideration shall be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature or where toxic fluids are-used in the construction process. The sedimentation ponds must be large enough to contain run-off so that they function properly under heavy rain conditions	Weekly monitoring	• Visual inspection, no excessive soil erosion or sedimentation	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan					
Activity	**Environmental Aspect**	**Mitigation Measures**	**Monitoring frequency and tools**	**Monitoring indicators**	**Responsible party for implementation and monitoring tool**
Stockpiles	Soil erosion Visual impact Noise	No construction and operation related activities including stockpiling, temporary storage areas, temporary and permanent access routes, and temporary working areas are to take place within the area beyond the demarcated site boundary. The Applicant shall plan their activities so that materials can as far as possible, can be transported directly to, and placed at, the point where they will be used. The areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan, together with the contractor's proposed measures for prevention, containment and rehabilitation against environmental damage. The areas chosen shall have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor shall at all times ensure that they are: • Positioned and sloped to create the least visual impact; • Structurally sound and present no safety risk; Constructed and maintained so as to avoid erosion of the material and contamination of surrounding environment; and Kept free from all alien/undesirable vegetation. After construction, any areas no longer required for operation shall be re-instated to its original condition. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed, and maintained until closure from the Environmental Advisor and the relevant National Authority is received. In all cases, Environmental Advisor shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their clause only when they have been satisfactorily rehabilitated	Weekly monitoring	• Visual inspection, no excessive dust	Management • EMPr • Compliance checklists
Spillages	Soil & water pollution	Watercourses such as streams, rivers, dams, etc. shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, wash water, and organic materials. In the event of a spillage, the Applicant should arrange for professional service providers to clear the affected area. All spills must be dealt with as per the Emergency Response Procedure. Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed	Weekly monitoring	Visual inspection	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan					
Activity	**Environmental Aspect**	**Mitigation Measures**	**Monitoring frequency and tools**	**Monitoring indicators**	**Responsible party for implementation and monitoring tool**
Areas of Specific Importance	• Loss of populations of threatened plant species • Loss of habitat of threatened animal species • Loss of indigenous natural vegetation (primarily grassland) • Erosion and siltation due to change in run-off and drainage patterns • Establishment and spread of declared weeds and alien invader plants • Noise impacts on local residents	Any area, as determined and identified as sensitive or of special interest within the site (e.g. wetlands) shall be treated according to the express instructions contained in these specifications or the approved EMPr. The overriding principle is that such defined areas requiring protection shall not be changed. • No unnecessary vegetation clearing will be allowed in natural vegetation areas	Weekly monitoring	No vegetation has been unnecessary removed, (photo graphic evidence)	Management • EMPr • Compliance checklists
Dust Control	Nuisance pollution	Dust caused by strong winds and operational activities shall be controlled by means of water spray vehicles. Exposed soils and material stockpiles shall be protected against wind erosion. The location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors. A dust monitoring system needs to be put in place to ensure that dust falls within the acceptable limits as per the ambient air quality standards	Monthly monitoring	Routine observation, no complaints from residents	Management • EMPr • Compliance checklists
Alien Vegetation	Habitat destruction	The Applicant shall establish an on-going monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act and Biodiversity Act). The Applicant shall be held responsible for the removal of alien vegetation within the boundary of the site disturbed during construction. This includes, for example, service roads, stockpile areas, and wherever material generated for or from construction has been stored temporarily	Monthly monitoring	Visual inspection, vegetation removal record by contractor, no unnecessary vegetation clearing	Management • EMPr • Compliance checklists
Decommissioning Phase					
Decommissioning	Decommissioning and rehabilitation	Any additional licensing or permitting requirements must be identified prior to any decommissioning activities commence. Prior to the decommissioning a detailed decommissioning plan must be prepared. This plan should aim to follow the waste management hierarchy (re-use, recycle, reduce, and dispose) in order to prevent unnecessary wastes. All waste which require disposal must be disposed of at a suitably licensed facility. An inventory of infrastructure and wastes, together with the ultimate destination (e.g. recycler, waste disposal) should be kept for future records. A rehabilitation plan must be prepared by a suitably qualified specialist. The sites must be rehabilitated to the pre-construction condition or alternatively to align with the surrounding land-uses at the time. The rehabilitated site must be protected from future erosion	Weekly monitoring	Routine check for EMPr availability and awareness	Management • EMPr • Compliance checklists

Table 34: IWWMP Action Plan					
Activity	**Environmental Aspect**	**Mitigation Measures**	**Monitoring frequency and tools**	**Monitoring indicators**	**Responsible party for implementation and monitoring tool**
Decommissioning	Decommissioning and rehabilitation	The area where the site offices are placed will require rehabilitation at the end of the contract. All construction material, including concrete slabs shall be removed from the site on completion of the contract, to the Applicants satisfaction	Weekly monitoring	Routine check for EMPr availability and awareness	Management • EMPr • Compliance checklists
Decommissioning	Decommissioning and rehabilitation	Any disturbed areas should be rehabilitated with natural vegetation endemic to the area as soon as possible after decommissioning	Weekly monitoring	Routine check for EMPr availability and awareness	Management • EMPr • Compliance checklists

6.8 CONTROL AND MONITORING

The monitoring and audit reports discussed below will all be integral to the compilation of the annually updated IWWMP, which will essentially be composed of this IWWMP, with updates to reflect any changes in activities on site, address any new management strategies that need to be incorporated as indicated through monitoring and audit reports, and generally allow for the IWWMP to become a living document which can be updated with new technologies, new alternative management measures, and best practices. In addition, inspection and monitoring logs will be kept on site in terms of the general monitoring and inspection requirements indicated in **Table** 34 above. These logs must be made available to auditors and therefore be kept on site.

6.8.1 Monitoring of Change in Baseline (Environment) Information (Surface Water, Groundwater, and Bio-Monitoring)

A monitoring plan will be developed and the results of the monitoring plan will be submitted to the relevant DWS directorates, as well as other government departments, as well as other government departments as required in terms of management objectives, action plan and applicable legislative requirements.

During an appropriate environmental impact assessment, potential impact on water resources were identified. Mitigation measures were also specified for the prevention and management of the possible impacts. These mitigation measures need to be monitored to be determined if they are being applied and being effective by reducing the environmental impact.

This monitoring programme is described above. Record of the monitoring programme will be kept for future reference. The required water uses should be registered with DWS for the mining operations.

6.8.2 Audit and Report of Performance Measures

It is anticipated that the WUL or other applicable authorisations will require that regular forma audits be undertaken in order to assess the compliance with, amongst others the WUL and IWWMP. As such, the applicant will cater for these requirements through internal and external audit in line with the frequency required by the WUL (usually on at least an annual basis) and the other applicable authorisations.

The monitoring plan has been established to determine if the performance objectives are met through the implementation of the management strategies, as stated in the sections above. Water quality and bio-monitoring reports will be compiled annually for the submission to DWS. These monitoring reports will relate to the findings and trends related to the latest monitoring data in relation to the past monitoring findings. If monitoring activities suggest that issues on site exist, then these monitoring reports should further identify the source and make recommendations to update management strategies in order to rectify or reduce these impacts.

An internal audit should be carried out by the person responsible for the implementation of the IWWMP to ensure that the general monitoring and inspection activities, as indicated in **Table** 34 above, are adhered to and that appropriate and immediate action is taken to address any issues observed. This general monitoring plan (**Table** 34) will also assist in ensuring that the environmental performance objectives are attained and should therefore form part of the audit process on general performance.

6.8.3 Reporting structure

Monthly water and waste management report will be prepared by the Site Manager. These reports will include:

- Volumes of water used and disposed of;
- Volumes of waste returned, re-used, and disposed of; and
- A summary of any water and waste management issues, and actions arising throughout the month.

The approved version of this plan and the monthly water and waste management reports will be available on request. Naaz quarry will report on the performance of the IWWMP in the annual EPA and provide regular updates.

Incident reporting

Environmental incident relating to waste management are recorded on the database. The site and risk manager are to be notified as soon as possible to assist in determining appropriate corrective actions.

6.8.4 Audit and Report On Relevance of IWWMP Action Plan

It is anticipated that the WULA will require, that the efficiency of the measures proposed as part of the IWWMP action plan, will be reviewed and updated in lien with the frequency required by the WUL (usually on an annual basis), and the other applicable authorisations.

An annual audit will be compiled by an external qualified person on the conditions of the WUL, which will be issued by DWS. This will also include an audit of activities against GN704. The conditions proposed by DWS within the WUL, and the requirements of GN704, will be critical to attaining performance objectives. The WUL and GN704 audit will compare activities on site and determine the status of the WUL/GN704 conditions on site. These will then be identified as compliant or noncompliant, and recommendations will be made to rectify any non-compliances identified. The monitoring findings and recommendations will be included within this report, which will be submitted to DWS annually. The IWWMP will be amended annually and will consider recommendations in monitoring and audit reports.

7. CONCLUSION

7.1 REGULATORY STATUS OF THE ACTIVITY

This IWWMP is being submitted with an IWULA for authorisation of water uses. The site is in the process of applying for water use authorisation from the Department of Water and Sanitation (DWS).

Table 35: Water use Description

Section 21	Water Use Description	Naaz Quarry Uses
Section 21 (c & i)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course	Destruction of a Drainage Line
Section 21 (c & i)	Impeding or diverting the flow of water in a watercourse & altering the bed, banks, course or characteristics of a water course	Mining within 100m of a Drainage Line
Section 21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource	Stockpiles, Dust suppression on site

7.2 STATEMENT OF WATER USES REQUIRING AUTHORISATION, DISPENSING WITH LICENSING REQUIREMENT, AND POSSIBLE EXEMPTION FORM REGULATION

In terms of the NWA, it is an offence to pollute any water resources to render it unfit for the propagation of fish and aquatic life, including rainwater, seawater, and subterranean water. An application for the exemption of the provision of GNR 704 is required from 4a, 4b, 4c, 10(2) a-c

7.3 SECTION 27 MOTIVATION

Section 27 of the NWA specifies the following factors regarding water use authorisation that must be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a licence;
- Alignment with the catchment management strategy;
- The impact of the water use, resource directed measures; and
- Investments made by the applicant in respect of the water use in question.
- The motivation in terms of Section 27 for the planned water uses is listed in the table below and is also included the appendices.

Table 36: Section 27 Motivation		
Section of NWA	**Content**	Description of issues
27 (1) (a)	Existing lawful water use	N/A
27 (1) (b)	Redress of past discrimination	The development of the quarry will create at least eleven new job opportunities to local residents, and in doing so the proposed operation will contribute to the local economy of the area, both directly and through the multiplier effect that its presence will create. Equipment and supplies will be purchased locally, and wages will be spent at local businesses, generating both jobs and income in the area.
27 (1) (c)	Efficient and beneficial use of water in the public interest	The dolerite mined from the earmarked area will be sold to the building, construction and road maintenance industry in the vicinity of the property. The mining of the aggregate from the proposed site will benefit the general society in that it will contribute to the upgrading of road infrastructure of the region, thereby enabling road users to safely travel through the district. The upgrading and maintenance of roads is of high priority and contributes to the improvement of the infrastructure network of South Africa.
27(1)(d)	Socio-economic impact	<u>Of the water use or uses if authorised</u> If approved, the quarry will create at least eleven new work opportunities to local residents, and will also contributed an additional source of income (compensation) to the landowner. It is proposed that the quarry will contribute to the local economy of the area, both directly and through the multiplier effect that its presence will create. Equipment and supplies will be purchased locally, and wages will be spent at local businesses, generating both jobs and income in the area. The mining of the dolerite from the proposed site will benefit the general society in that it will contribute to the upgrading of road infrastructure of the region, thereby enabling road users to safely travel through the district. The upgrading and maintenance of roads is of high priority and contributes to the improvement of the infrastructure network of South Africa. <u>Of the failure to authorise the water use or uses</u> Failure to authorise the water use will impend Naas Quarry capacity to: • Preserve jobs; and •Have a positive impact on the local communities through economic development and sustainable social initiatives.

Table 36: Section 27 Motivation		
Section of NWA	**Content**	Description of issues
27(1)(e)	Catchment Management Strategy	The DWS, in the spirit of the NWA recognises the past imbalances relating to water allocation and seeks to regulate water use by enforcing better sharing of water related benefits between the whites who have historically been the “high volume water users” and the historically disadvantaged and mostly poor black population. Catchment Management Agencies (CMAs) are recognised in the NWA as operational institutions to actively support the implementation of integrated catchment (watershed) management policies and strategies at a local level. The agencies are tasked with ensuring that the nation's water resources are protected, used, developed, conserved, managed and controlled in an equitable manner. The CMA is responsible inter alia for: (a) developing and implementing a catchment management strategy that reflects the needs and concerns of all role-players, and (b) coordinating the activities of water users and water. The proposed mining area is situated in the Mgeni sub-water management area that forms part of the greater Pongola-Mtamvuna Water Management Area (ID 4), and Quaternary Catchment U20G. An unnamed tributary (light blue in following figure) originates in the south-west of the study area, flows in a north-easterly direction and joins the upper reaches of the uMngeni River ±1 km downstream. The uMngeni River forms the eastern border of the property.

27 (1) (f)	Likely effect of the water use to be authorized on the water resources and other water users	In order to minimize the impacts on the vegetation and fauna at the site of the proposed quarry the following mitigatory measures are recommended: All quarry activities may only be undertaken within the registered and mapped space of the quarry site. This site must be clearly pegged out and be fenced prior to the start of operations. In accordance with Mine Health and Safety Requirements, the walls of the pit will be stepped with near vertical sections being reduced in height by a series of horizontal steps which will be formed (cut) as a part of the mining operations. Ablutions should be provided onsite, at least one for every 15 workers, and should be located at least 50m away from the edge of the riparian zone (until the unnamed tributary is completely transformed into a quarry). Regularly check vehicles, machinery and equipment operating on site, to ensure that none have leaks or cause spills of oil, diesel, grease or hydraulic fluid. All temporary and permanent erosion and sediment control structures must be monitored for the duration of the construction phase and repaired immediately when damaged. A search-and-rescue for desirable plants should be undertaken by an ecologist prior to vegetation clearing. All interested parties, including plant nursery operators may be invited to take part. Vegetation clearing may only be done on an “as-needed” basis. This means that only areas that are about to be worked may be cleared. As far as possible all wood and other resources, including Aloes, should be made available to the local community for their use. Cleared vegetation to be retained at any time may not be burned but must be mulched and be stockpiled. Ideally the heaps will be covered with stockpiled topsoil and the material be retained for future site rehabilitation purposes. All spoil heaps and stockpiles must be provided with a vegetation cover consisting of indigenous grasses. Recommended species include the following: • Love Grass. Eragrostis curvula • Couch Grass Cynodon dactylon • Finger Grass Digitaria eriantha All infrastructure, including the containers, machinery and crushers etc are to be removed from the processing area and the footprint will be landscaped, compacted areas will be ripped and the topsoil will be returned and the area seeded with the listed grass species. Once mining operations are over, pit overburden material must be pushed back into the pit to fill the upper step or steps to produce a sloped surface. Topsoil from the stockpiles must then be pushed down so that a substrate for vegetation growth may be established. The listed grass species may be used for this purpose. All waste is to be removed from site and any stockpiled dolerite (product) will either be sold or returned to the quarry pit and used in the sloping of the quarry sides.

Table 36: Section 27 Motivation		
Section of NWA	**Content**	Description of issues
		From the start of operations an alien weed programme must be implemented for the entire property including the working areas where relevant. This programme must be pre-planned and approved and specific targets must be set. After closure, the alien weed control measures will continue right through the maintenance and aftercare period of the quarry. Dust management measures must be set in place so as to minimise the dust from the crushers being blown into the surrounding areas. Undisturbed areas of vegetation must be suitably managed. This management will include the alien weed control programme but must also make provision for some protection from over frequent fires. This will require burning of a firebreak around the periphery in autumn every year. The area inside the break should be burned on a biennial (every second year) basis. The relevant veld burning legislation must be adhered to. A licence, in terms of the Forests Act will be required to clear trees in those parts of the quarry site where the vegetation is deemed to be a “Natural Forest”3. The appointed ecologist will delineate any such areas. A Monitoring programme must be followed to determine if the activities from the proposed quarry have any negative impacts on the downstream watercourses. All impacts must be mitigated and rectified immediately. The implementation of these measures will be the responsibility of the mine manager, but it is recommended that an environmental specialist be appointed to guide and assist as is necessary.

Table 36: Section 27 Motivation		
Section of NWA	**Content**	Description of issues
27(1)(g)	Class and resource quality objectives of the water resource	The setting of resource quality objectives (RQOs) will remain the competency of DWS. The Pongola-Mtamvuna Water Management Area (WMA) 4 will be responsible for consolidating standards for resource protection and implementing the RQOs in a phased manner to achieve objectives over an agreed period of time.
27(1)(h)	Investments already made and to be made by the water user in the respect of the water use in question	Specialist studies relating to the project have been undertaken which were paid by the applicant. Those studies serve as investments to ensure the best workmanship is carried out and that the environment is protected. • Initial Vegetation, Aquatic and Risk Assessment. • Wetland and Aquatic Assessment • Civil & Design • Storm water Management Plan • Geotechnical Study • Geohydrological plan • Hydrological Plan • Monitoring (Groundwater) • Master Layout Plan • Contingency Plan • Floodline Report • Alternatives Report
27 (1)(i)	Strategic importance of the water use to be authorised	The approved water application will enable Naaz Quarry to produce dolerite aggregate in the local industry which will contribute to the local economy of the area, both directly and through the multiplier effect that its presence will create. Equipment and supplies will be purchased locally, and wages will be spent at local businesses, generating both jobs and income in the area. • Creating and maintaining jobs; • Developing its people, and in so doing contributing to the transformation of the industry's leadership and skills base; and • By having a positive impact on the local communities through economic development and sustainable social initiatives.
27 (1) (j)	Quality of water in the resource which may be required for the reserve and for meeting international obligations	The study area is situated within the Pongola-Mtamvuna Water Management Area (WMA) 4 and Quaternary Catchment U20G (DWS, 2016). The unnamed tributary originates in the south-west of the study area, flows in a north-easterly direction, and joins the upper reaches of the uMngeni River approximately 1 km downstream. The quality of the surface water due to activities from proposed quarry ensure that it has little to no impact on the downstream watercourses.
27(1)(k)	The probable duration of any undertaking for which a water use is to be authorised	5 years

7.3 KEY COMMITMENTS (PROPOSED LICENSE CONDITIONS).

Inzalo Crushing and Aggregates (Pty) Ltd is committed to the correct implementation of the IWWMP action plan contained in this report and the water use licence conditions that will be stipulated in the authorisation once issued.

8. DISCLAIMER

This report has been produced by Greenmined with the skill and care ordinarily exercised by a reasonable Environmental Consultant at the time the services were performed. Further, and in particular, the Services were performed by Greenmined taking into account the limits of the scope of works required by the Client, the time scale involved and the resources, including financial and manpower resources. None of the work performed during this project shall constitute or be represented as a legal opinion of any kind or nature but shall be a representation of the findings. No warranties or guarantees, expressed or implied, are included in or intended by the report, except that it has been prepared in accordance with the current generally accepted practices and standards consistent with the level of care and skill exercised under similar circumstances by professional consultants or firms that perform the same or similar services. Any reference to legislation in this report should not be perceived as a substitute for the provisions of such legislation. In the event of any inconsistency between this document and such legislation, the latter would prevail. Should additional information become available, Greenmined reserves the right to amend the report.

9. DECLARATION OF INDEPENDENCE

I Murchellin Saal declare that –

- I acted as the independent environmental practitioner, I do not have and will not have any vested interest in the activity other
- than remuneration for work performed in terms of the IWWMP and application process.

APPENDICES

Appendix 1: Certificate of Incorporation
Appendix 2: BEE Certificate/Sworn Affidavit
Appendix 3: Certified Identity Documents (Client contact: Mr. Weideman, Inzalo Directors Mr. S Mazibuko and Mr. R Shedlock).
Appendix 4: Method Statement
Appendix 5: Lease Agreement
Appendix 6: Title Deeds
Appendix 7: Land Claim (No Claim)
Appendix 8: Service Level Agreement (Sanitech Contract)
Appendix 9: Topographic and Locality Map
Appendix 10: Final Basic Assessment Report
Appendix 11: Financial Commitment Letter
Appendix 12: Proof of Payment
Appendix 13: Zoning Certificate
Appendix 14: Section 27 Motivation Report
Appendix 15: Vegetation Aquatic and Risk Matrix – September 2020 & Wetland and Aquatic Assessment April 2021
Appendix 16: Mining permit application acceptance letter
Appendix 17: Contingency Plan
Appendix 18: Updated Master Layout Plan
Appendix 19: Baseline Hydrology Report
Appendix 20: Groundwater Monitoring Report
Appendix 21: Geotechnical Report
Appendix 22: Flood line and Storm water Management Plan
Appendix 23: Civil Designs
Appendix 24: Alternative Report and Maps

END OF REPORT