BASIC ASSESSMENT REPORT:

THE CONSTRUCTION OF A SCHOOL AND ASSOCIATED WATER PIPELINE ON THE REMAINDER OF GENERAALSDRAAI 429 JS AND THE REMAINDER OF PORTION 16 OF GENERAALSDRAAI 423 JS, WONDERFONTEIN

Report prepared for: Umsimbithi Mining (Pty) Ltd.

Report dated: April 2018 (Draft)

Report number: BA 2017/01

DARDLEA ref: 1/3/1/16/1N-118

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PROJECT INFORMATION SUMMARY

PROJECT TITLE	The construction of a school and associated water pipeline on the Remainder of Generaalsdraai 429 JS and the Remainder of Portion 16 of Generaalsdraai 423 JS, Wonderfontein

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UNDERTAKING BY EAP

as required in terms of Section 2(j) of Appendix 2 of the Environmental Impact Assessment Regulations, 2014 (as amended).

I, ..., hereby confirm that:

- *the information provided in this Draft Basic Assessment Report is, to the best of my knowledge, correct as at the time of compilation thereof;*
- *comments and inputs obtained from stakeholders and interested and affected parties through the public participation process conducted to date have been included in this Draft Basic Assessment Report;*
- *information provided to interested and affected parties (to date) has been included in this Draft Basic Assessment Report;*
- *inputs and recommendations from the specialist reports are included in this Draft Basic Assessment Report.*

Signed at..... on this ..... day of..... of 2018.

Signature:.....

Company:.....

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Signed at..... on this ..... day of..... of 2018.

Signature:.....

Company:.....

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1. INTRODUCTION

Umsimbithi Mining (Pty) Ltd. intends to relocate Morelig Combined School to the Remainder of Generaalsdraai 429 JS, Wonderfontein. The site is located west of the Afgri Silos and is 4.8777 ha in extent. Services (i.e. water, sewage, electricity) will be installed as part of the project.

The Minister of Environmental and Water Affairs listed in terms of Sections 24(2), 24(5), 24D and 44, read with section 47A(1)(b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), a number of activities that require an environmental impact assessment (either a Basic Assessment or a full Environmental Impact Assessment) before undertaking these activities.

The proposed activity would involve the following listed activities as identified in terms of Section 24(2) and 24D of the National Environmental Management Act, 1998:

Listing	Activity
Listing Notice 1 (GN R327 of 7 April 2017; previously GN R983 of 4 December 2014) Listed Activity 12:	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or **(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a water course;-** excluding (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.
Listing Notice 1 (GN R327 of 7 April 2017; previously GN R983 of 4 December 2014) Listed Activity 19:	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock **of more than 10 cubic metres from a watercourse** but excluding where such infilling, depositing, dredging, excavation, removal or moving – (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan (c) falls within ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.
Listing Notice 1 (GN R327 of 7 April 2017; previously GN R983 of 4 December 2014) Listed Activity 28:	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.
Listing Notice 3 (GN R324 of 7 April 2017; previously GN R985 of 4 December 2014) Listed Activity 14:	The development of (i) dams or weirs, where the dam or weir including infrastructure and water surface area exceeds 10 square metres or (ii) **infrastructure or structures with a physical footprint of 10 square metres or more;** where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. In Mpumalanga - (i) Outside urban areas in (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

In order to obtain environmental authorisation, a Basic Assessment must be conducted as described in Regulations 19 and 20 of the Environmental Impact Assessment Regulations 2014 (as amended) as promulgated in terms of Section 24(5) and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998).

The objective of the Basic Assessment process is to, through a consultative process:

a) Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
b) Identify the alternatives considered, including the activity, location, and technology alternatives;
c) Describe the need and desirability of the proposed alternatives;
d) Through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations and the risk of impact of the proposed activity and technology alternatives on these aspects to determine: (i) the nature, significance, consequence, extent, duration and probability of the impacts occurring; and (ii) degree to which these impacts (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.
e) Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to: (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.

AdiEnvironmental cc. was appointed as independent environmental consultant to conduct the required Basic Assessment and compile the necessary documentation. This Basic Assessment Report (BAR) is compiled in accordance with Appendix 1 of the Environmental Impact Assessment Regulations, 2014 (as amended) and indicates the environmental outcomes, impacts and residual risks of the proposed activity.

Diagram 1 provides a schematic description of the Basic Assessment process followed. This process is strictly according to the above-mentioned Regulations. The aim of the process is to ensure that the environmental impacts are considered, the relevant I&APs are consulted and the decision making authorities are provided with sufficient information to make an informed decision.

The decision making authority is the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA). This Department will decide to grant or refuse the approval of the project. On approval, an Environmental Authorisation and Record of Decision will be issued in the name of the project applicant.

The project applicant will be responsible for complying with the conditions set in the Environmental Authorisation and Record of Decision.

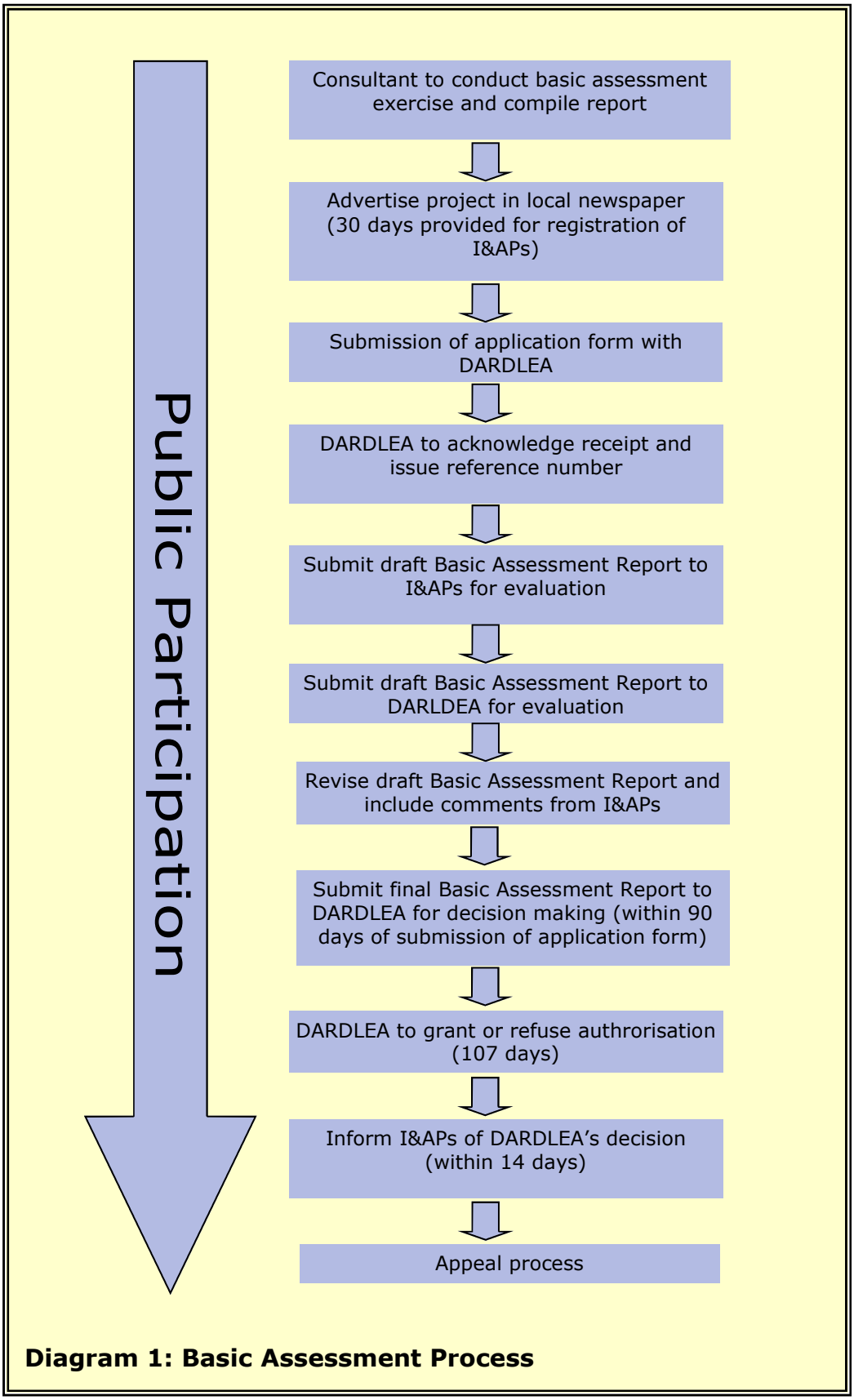

Diagram 1: Basic Assessment Process

2. DETAILS OF THE PROJECT APPLICANT AND ENVIRONMENTAL CONSULTANT

Name and address of applicant: Umsimbithi Mining (Pty) Ltd. Suite MW 113, Private Bag X1838 Middelburg 1050	
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A copy of the application form and the declaration of independence by the applicant and environmental consultant are provided in Appendix 1.

Curriculum Vitae of both Mrs. A. Erasmus and Ms. R. Janse van Rensburg are provided in Appendix 2 together with a list of projects completed to date.

3. DESCRIPTION OF THE ACTIVITY

3.1 Description of the site, design, size and scale of the development

3.1.1 Introduction

Morelig Combined School located near Wonderfontein needs to be relocated due to mining activities of Umsimbithi Mining (Pty) Ltd. Various sites were investigated (see Section 4 w.r.t. alternatives) and stakeholders subsequently decided on the Remainder of Generaalsdraai 429 JS, Wonderfontein. The site is located west of the Afgri Silos and north of the N4 national road and Transnet railway line near Wonderfontein. The location of the site is indicated in Figure 5.1.

The entire property is 485.7559 ha in extent. Umsimbithi Mining (Pty) Ltd. will purchase 19.8607 ha of the property from the current landowner, of which 4.8777 ha will be utilized for the school.

The farm will thus be subdivided into three portions, namely Portion A, Portion B and Portion C (Figure 3.1).

- Portion A (4.8777 ha; Figure 3.1) will be used for the school and will be rezoned from 'Agricultural' to 'Institutional'.
- Portion B (465.8952 ha; Figure 3.1) will remain the property of the current landowner (Mr. WJ Prinsloo) and will continue to be utilized for agricultural purposes.
- Portion C (14.983 ha - located east of the school site; Figure 3.1) will be consolidated with the Remainder of Portion 3 of Generaalsdraai 423 JS, which belongs to Umsimbithi Mining (Pty) Ltd.

The property will thus be subdivided as follows (see Figure 3.1):

Portion	Size (ha)	Use
Portion A	4.8777	Institutional (school)
Portion B	465.8952	Agriculture
Portion C	14.983	Agriculture

For further information please consult the rezoning and subdivision applications compiled by Urban Dynamics Town and Regional Planners (hereafter referred to as Urban Dynamics, 2016a and Urban Dynamics, 2016b respectively) provided in Appendix 3.

The Nkangala District Municipality approved the rezoning application (letter dated: 19 June 2017; Appendix 3), based on the following conditions:

- *"That all necessary services e.g. water, electricity, roads, sewage, and refuse removal, be installed by the applicant and be to the satisfaction of the Emakhazeni Local Municipality.*
- *That the comments from the National Department of Agriculture, Forestry and Fisheries be submitted to the Nkangala District Municipality.*
- *That the site development plans for all new structures and all future buildings be submitted in terms of the National Building Regulation and Standard Act, 1997 (Act 103 of 1977) and Emakhazeni Land Use Scheme, 2010 to the local municipality for approval prior to any buildings commencement.*

- *That the access of the proposed development be to the satisfaction of the relevant road authority and Emakhazeni Local Municipality.*
- *That the application be subjected to the approval of Environmental Impact Assessment in terms of the National Environmental Management Act (Act No. 107 of 1998).*
- *That in terms of section 43(2) of SPLUMA must be adhered to within a five year period after the date of approval, failure to comply will lead to the lapsing of the approved land use right.*
- *That the applicant must provide the Nkangala District Municipality with written proof from Eskom that the services agreement has been complied with to the satisfaction of Eskom.*
- *That the Bulk Development contribution fee in terms of the Chapter 7 Part A of the Emakhazeni Spatial Planning and Land Use Management By-law, 2015, be payable prior to the commencement of any development of the erf.*
- *That the comments from Department of Water Affairs and Forestry be submitted to the Nkangala District Municipality."*

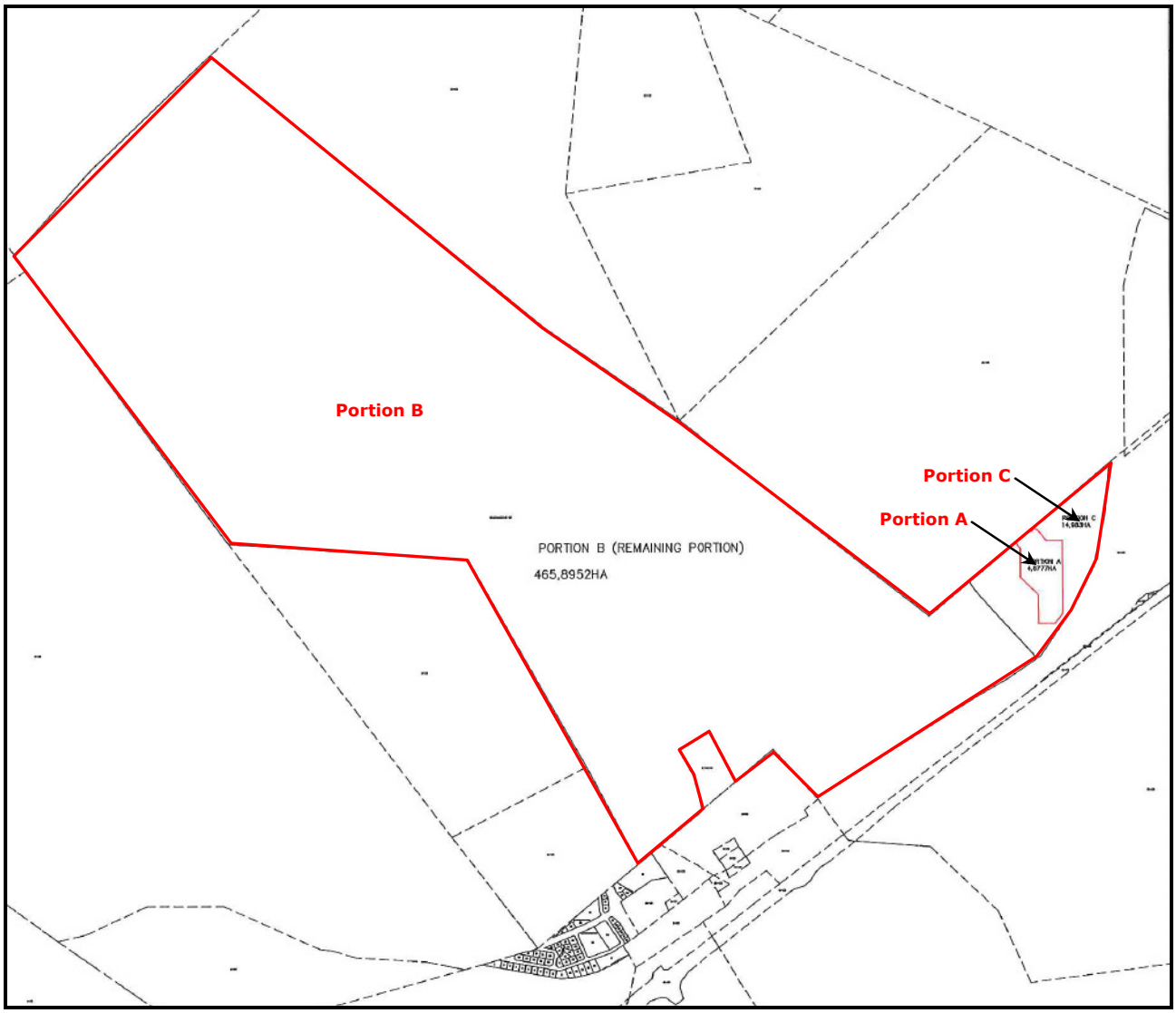


Figure 3.1: Proposed subdivision plan (taken from Urban Dynamics, 2016b)

3.1.2 Layout plan

Figure 3.2 provides an indication of the proposed site development plan for the new school.

The school will be able to cater for 1000 students (from Grade R to Grade 12) and will consist of the following:

- 29 classrooms,
- 3 ablution blocks,
- library,
- laboratory,
- kitchen,
- computer center,
- administration block,
- hall,
- guardhouse,
- 3 accommodation blocks,
- sports field,
- 3 combi courts,
- parking and drop off zone for busses,
- 30 covered and 30 open parking bays.

As indicated in Figure 3.2, the access road, guardhouse, classrooms, parking areas, accommodation, etc. will be located in the northern portion of the site whilst the sports fields will be located in the central and southern portions of the site.

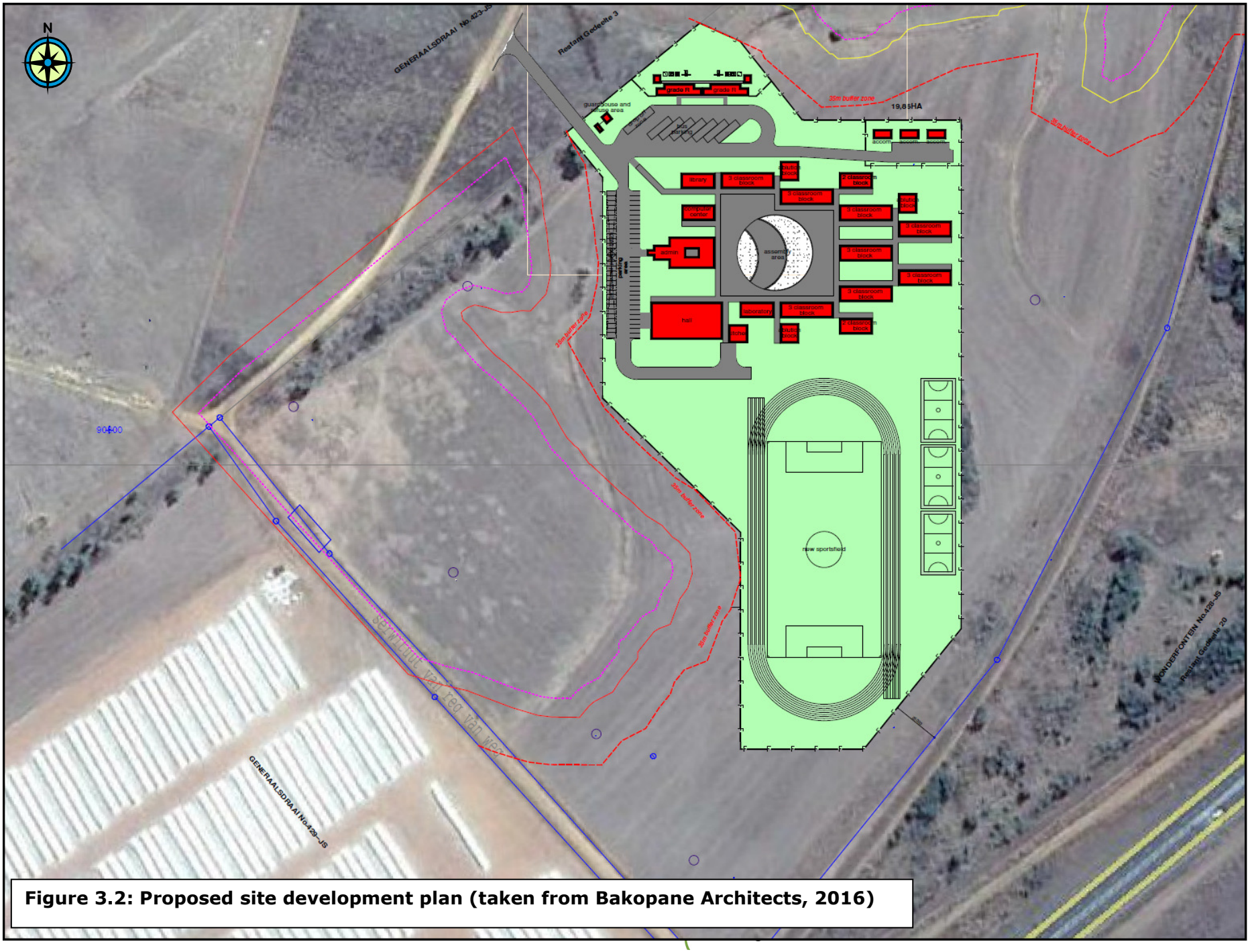


Figure 3.2: Proposed site development plan (taken from Bakopane Architects, 2016)

3.2 Services required

The said site is located within a rural agricultural area that is not serviced by the Emakhazeni Local Municipality. Water, electricity, waste removal, etc. would therefore have to be provided by the applicant.

Strydom & Malan Consulting Engineers (referred to as Stydom & Malan, 2016) was appointed to investigate existing and proposed bulk and link services for the proposed project. A copy of the engineering report is provided in Appendix 4.

3.2.1 Water

Water supply
No boreholes are currently present on site.

Existing boreholes are present near the site at the Afgri Silos and the adjacent Generaalsdraai Village.

During the construction phase, the contractor will be responsible for providing site workers with potable water. Water for the construction activities would have to be sourced from nearby boreholes or brought to site by the contractor.

During the operational phase, potable water needs to be provided to the employees and school children for drinking, cooking, cleaning and ablution purposes. Water will also be required for irrigation purposes and fire control.

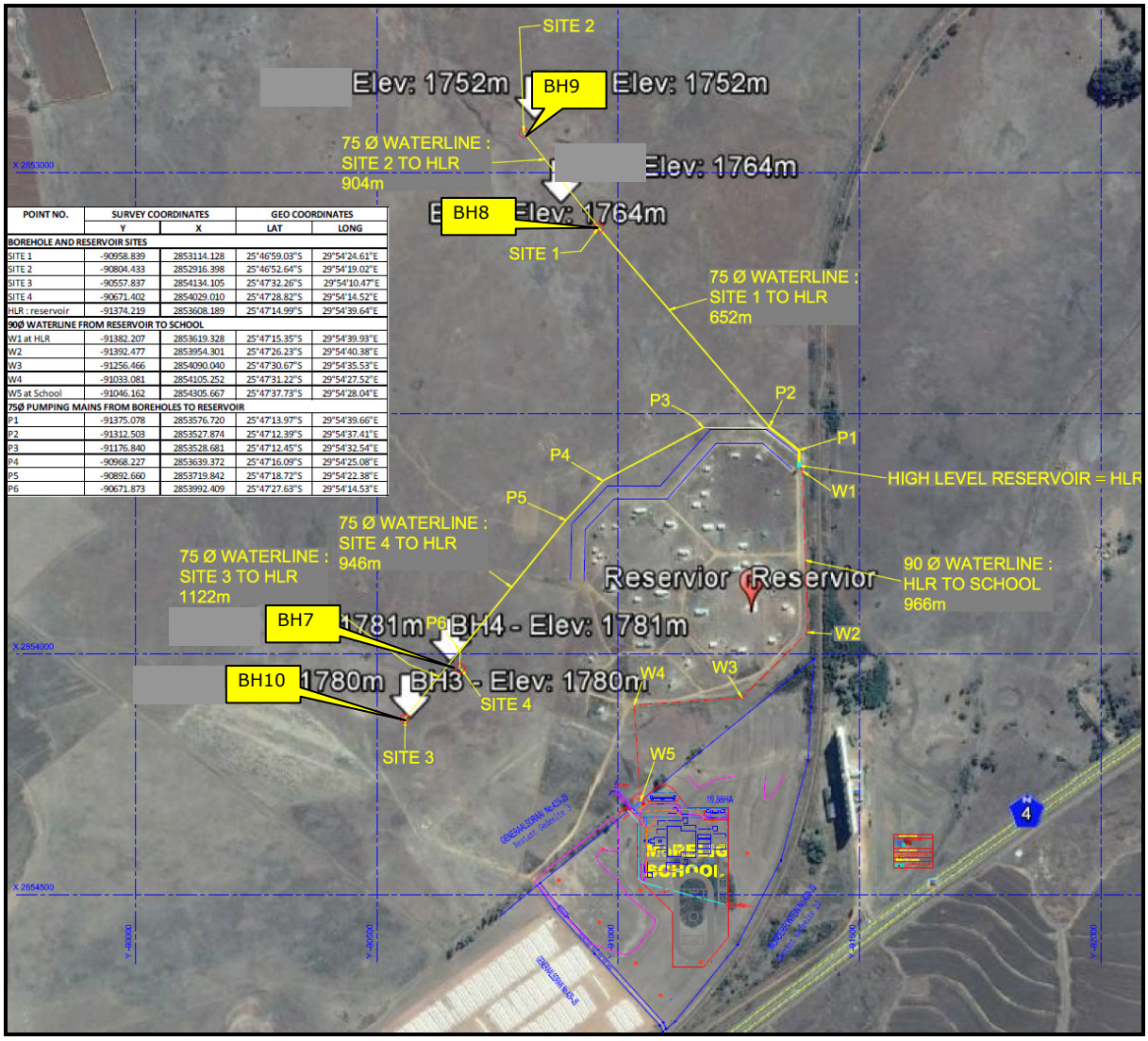
According to Strydom & Malan (2017), 20 liters per day is required per learner, which translates to 20 000 liters/day based on 1000 learners.

Strydom & Malan (2016) indicated that between 1 and 4 new boreholes would have to be drilled to supply the school with sufficient water during the operational phase. Cilliers (2017) identified 4 potential drilling sites in the area from which to source potable water for the school. These sites are located north west of the proposed school as indicated in Figure 3.3 (BH7 to BH10).

The proposed water pipelines would extend from the boreholes (Figure 3.3) across the adjacent property (Remainder of Portion 16 of Generaalsdraai 423 JS), which belongs to the applicant, Umsimbithi Mining (Pty) Ltd.

Strydom & Malan (2016) indicated that groundwater will be abstracted and pumped to an existing 50 000 liter high level reservoir within Generaalsdraai Village (Figure 3.3). From here, the water will be gravitated to four (4) 10,000 liter storage tanks (Figure 3.3). The storage tanks will be located in the north eastern corner of the site (Figure 3.4). The water tanks will allow for 48 hours of storage capacity in the event of a water interruption to the school.

The pump lines (yellow lines; Figure 3.3) from the boreholes to the high level reservoir will comprise of 75 mm diameter uPVC Class 12 pipes. The gravitation pipe (red line; Figure 3.3) from this reservoir to the storage tanks within the school premises will be 90 mm diameter uPVC pipes.



POINT NO.	SURVEY COORDINATES		GEO COORDINATES	
	Y	X	LAT	LONG
BOREHOLE AND RESERVOIR SITES				
SITE 1	-90958.839	2853114.128	25°46'59.03"S	29°54'24.61"E
SITE 2	-90804.433	2852916.398	25°46'52.64"S	29°54'19.02"E
SITE 3	-90557.837	2854134.105	25°47'32.26"S	29°54'10.47"E
SITE 4	-90671.402	2854029.010	25°47'28.82"S	29°54'14.52"E
HLR : reservoir	-91374.219	2853608.189	25°47'14.99"S	29°54'39.64"E
90Ø WATERLINE FROM RESERVOIR TO SCHOOL				
W1 at HLR	-91382.207	2853619.328	25°47'15.35"S	29°54'39.93"E
W2	-91392.477	2853954.301	25°47'26.23"S	29°54'40.38"E
W3	-91256.466	2854090.040	25°47'30.67"S	29°54'35.53"E
W4	-91033.081	2854105.252	25°47'31.22"S	29°54'27.52"E
W5 at School	-91046.162	2854305.667	25°47'37.73"S	29°54'28.04"E
75Ø PUMPING MAINS FROM BOREHOLES TO RESERVOIR				
P1	-91375.078	2853576.720	25°47'13.97"S	29°54'39.66"E
P2	-91312.503	2853527.874	25°47'12.39"S	29°54'37.41"E
P3	-91176.840	2853528.681	25°47'12.45"S	29°54'32.54"E
P4	-90968.227	2853639.372	25°47'16.09"S	29°54'25.08"E
P5	-90892.660	2853719.842	25°47'18.72"S	29°54'22.38"E
P6	-90671.873	2853992.409	25°47'27.63"S	29°54'14.53"E

Figure 3.3: Location of proposed boreholes and water pipelines.

The internal water reticulation and fire network will comprise of 90mm diameter uPVC Class 9 pipes, appurtenant fittings, valves, air valves, a bulk water meter and fire hydrants as indicated in Figure 3.4 (blue lines).

3.2.2 Electricity

During the construction and operational phases, electricity will be provided by Eskom.

LTZ Consulting (hereafter referred to as Stoltz, 2016) was appointed as electrical engineers and will be responsible for the bulk electrical supply line as well as the electrical reticulation design for the new school. A copy of the electrical report is provided in Appendix 4.

According to Stoltz (2016), the total load requirement for the school (i.e. buildings, classrooms, accommodation, water pumps, etc.) is 120 kVA. An application was made to Eskom (Ref. No: 189930928; Appendix 4) to confirm availability of supply and to obtain a costing for a new connection. Feedback from Eskom is still outstanding.

It is proposed that a single phase, low voltage (LV) network will be installed at the school. The cables will be installed underground and will connect to the distribution board at each building. Each classroom will be provided with 2 double plug sockets, whereas the laboratory, library, etc. will be fitted with more sockets in order to provide for the various activities.

Lighting (mostly open tube fluorescent lights) will be provided in all buildings. LED downlights will be installed in the ablution facilities and standard bulkhead fittings will be provided along outdoor walkways and in smaller areas.

3.2.3 Sewage

During the construction phase, the contractors will have to provide chemical toilets based on the number of construction personnel. The toilets must be provided as soon as construction commences. The contractor will be responsible to ensure that the toilets are emptied and cleaned on a regular basis.

For the operational phase, a complete waterborne sewage system with sewer connection points at the lower ends of the buildings will be provided. Figure 3.4 provides a layout of the proposed internal sewer infrastructure (orange lines).

According to Strydom & Malan (2016), the design of this sewer system will be as follows:

SEWER RETICULATION	
Average daily flow	16 l/day per learner
Minimum pipe size for internal connections	110 mm
Minimum pipe size in network	160 mm
Pipe material	Structured wall uPVC
Maximum manhole spacing	90 m
Peak factor	2.25
Minimum flow speed	0.7 m/s
Minimum slope	1:120 for 110mm diameter 1:200 for 160 mm diameter
Minimum cover to pipes in servitudes	800 mm
Minimum cover to pipes in sidewalks	1000 mm
Manholes	1000 mm inside diameter with step irons if deeper than 1.2 m.

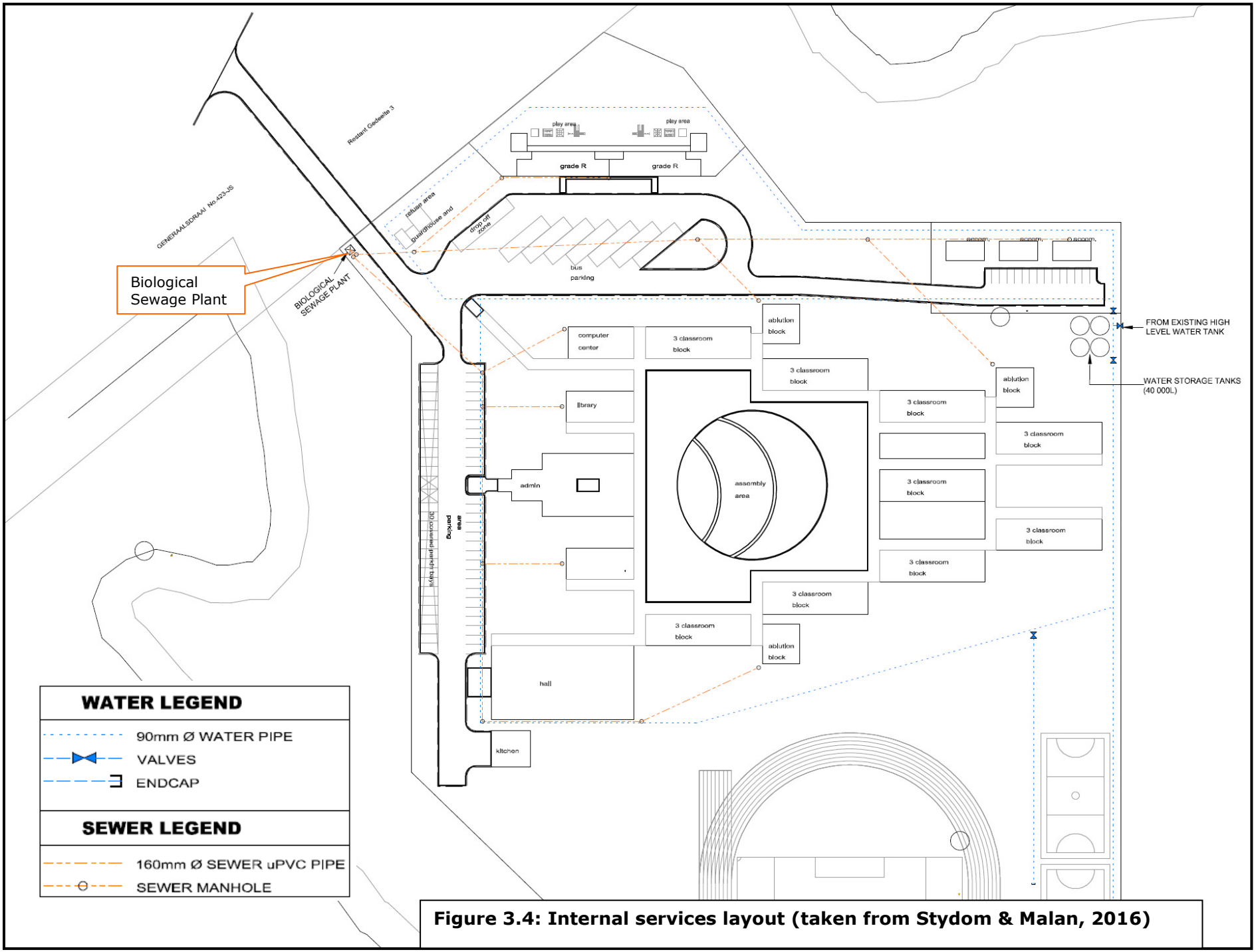


Figure 3.4: Internal services layout (taken from Stydom & Malan, 2016)

A Biological Sewage Treatment Plant will be provided in the north western corner of the site adjacent to the access road as indicated in Figure 3.4. According to Strydom and Malan (2016), the said plant will be able to treat 25 000 litres of sewage effluent per day (i.e. 25 kl per day). It is estimated that the average daily sewage flow would be 16 l/day per learner or 16 000 litres per day in total.

According to Strydom & Malan (2016), a fibre glass modular sewage package plant will be installed by Uthingo Environmental Services. The sewage package plant will be constructed in modules which has the advantage that a module can be isolated for maintenance without disrupting the flow. Once the maintenance is completed, the plant can be returned to full production.

Figure 3.5 provides a three dimensional layout of the proposed sewage package plant. According to Uthingo Environmental Services (2017), the package plant will be 20 m in length, 8 m wide and 1.8 m deep.

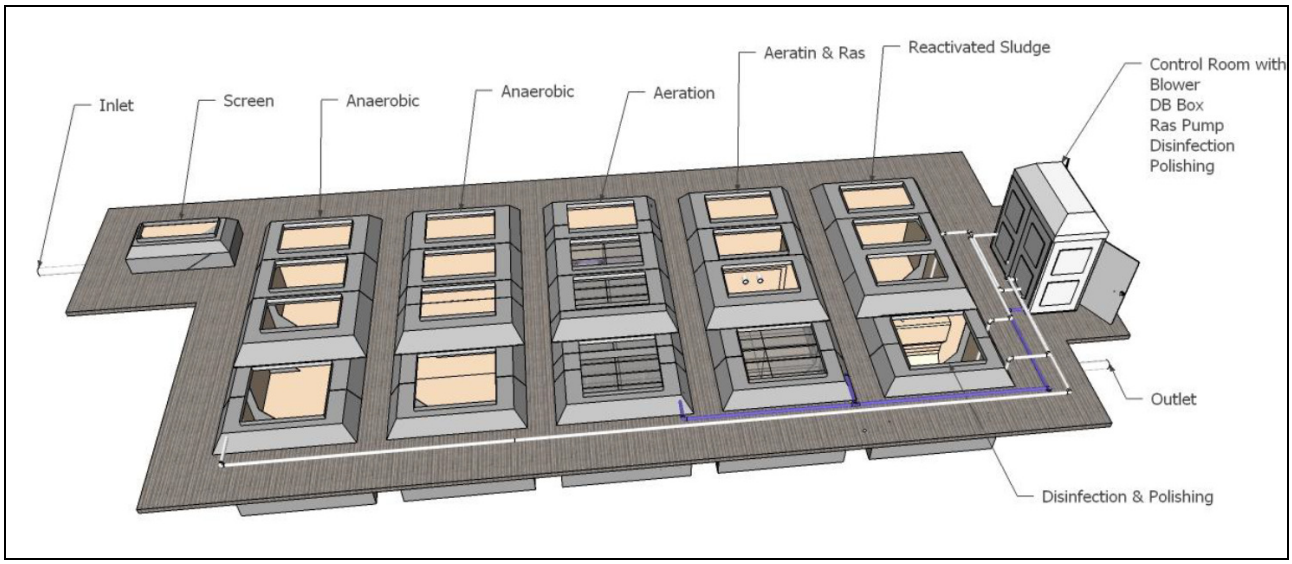


Figure 3.5: Three dimensional layout of the proposed modular sewage package plant (taken from Uthingo Environmental Services, 2017)

Figure 3.6 provides a schematic flow diagram of the treatment process which will basically comprise of the following steps:

- Initial removal of solids (settling and floating);
- Anaerobic digestion;
- Aerobic digestion;
- Final settling;
- Sterilization (disinfecting using chlorine, etc.).

According to Uthingo Environmental Services (2017), there will be no sludge build up in the system and no off-odours will be generated due to the biological digestion process. More detailed information with regards to the sewage treatment process is provided in Appendix 4.

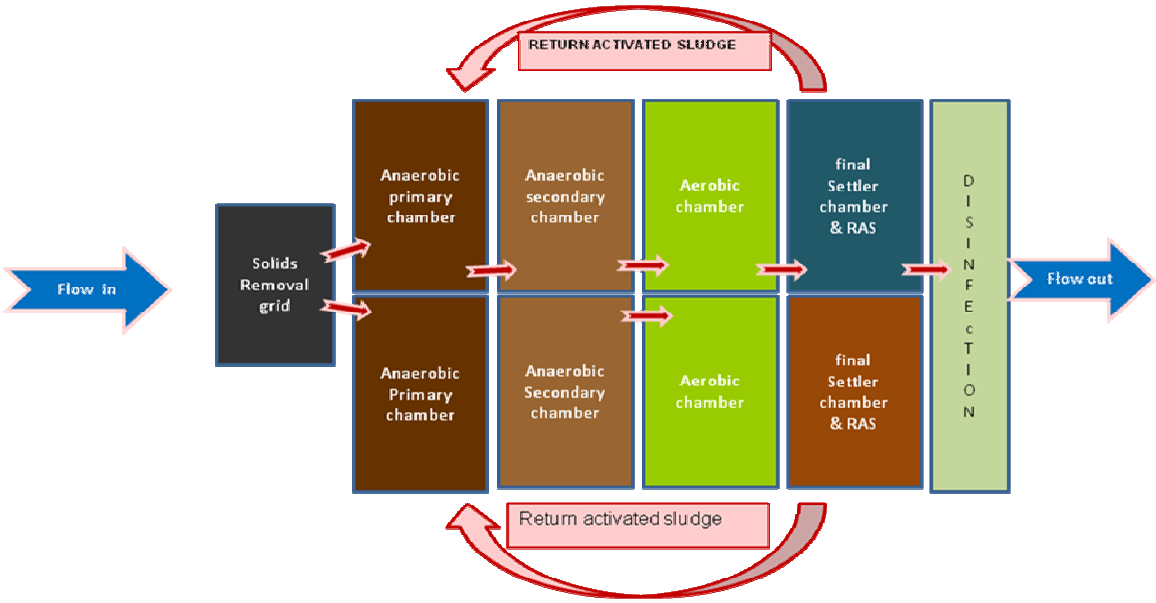


Figure 3.6: Flow diagram of proposed modular sewage package plant (taken from Uthingo Environmental Services, 2017)

According to Uthingo Environmental Services (2017), treated effluent will comply with the Department of Water and Sanitation standards. The intention is to use the final effluent to irrigate the sports fields, gardens, etc. A water use licence application in this regard will be compiled and submitted for approval to the Department of Water and Sanitation.

The advantages of installing the proposed sewage treatment plant (Uthingo Environmental Services, 2017) include the following:

- Based on the SAM-RAS principle (i.e. submerged aeration media - return activated sludge);
- Self-controlled gravity flow;
- Small footprint (forced aeration);
- Located underground;
- Low service required (few moving parts);
- Low management required (simple process);
- Almost odourless;
- Modular;
- Adaptability.

3.2.4 Waste management

During the construction phase, building rubble and a small amount of domestic waste will be generated. The contractor will have to provide adequate containers for the collection of waste. The applicant will have to ensure that the contractors remove the said building rubble and domestic waste to the licensed Belfast Waste Disposal Site or another licensed waste disposal site. Any hazardous waste (e.g. soil contaminated with fuel/oil, paint tins, etc.) will have to be disposed at a Hazardous Waste Disposal Facility by a company dealing with such waste.

During the operational phase, domestic waste produced by the staff and learners will be disposed in bins, which will be emptied on a regular basis into waste skips located in a waste collection area. The waste skips will be collected on a regular basis and the waste disposed of at the licensed Belfast Waste Disposal Site or another licensed waste disposal site. Arrangements for

the collection and disposal of waste at the waste disposal site will have to be made by the school.

It is recommended that recycling forms part of waste management at the school in order to reduce the amount of waste to be disposed of at the waste disposal site. Items such as paper, cans and bottles to be separated at source and either reused or collected by a recycling company. An income for the school could also be generated in this way.

3.2.5 Storm water control measures

No formal storm water infrastructure (e.g. pipes, culverts, drains, etc.) is present on site. Storm water control measures would have to be implemented as part of the development of the proposed school.

According to Stydom & Malan (2016), all internal roads and parking areas will be constructed with two compacted gravel layers, pre-cast kerbing (mountable) and 60 mm thick pre-cast paving bricks. Open concrete channels and energy breaking measures will be provided in terms of surface storm water management in order to prevent soil erosion.

Drains (30 m in length) will be excavated along the access road at 200 m intervals to allow storm water to drain from the gravel road into the adjacent veld (Strydom & Malan, 2016).

3.2.6 Access road

The site is located on a farm just north of the N4 national road between Middelburg and Belfast.

According to Strydom & Malan (2016), the school will be accessed via an existing 2.2 km gravel road (Photo 3.1) with a right-of-way servitude that extends from Wonderfontein to the proposed site (Figure 4.7). The gravel road connects to the D685 district road, which connects to the N4 national road.

Strydom & Malan (2016) indicated that the existing gravel road will be upgraded as follows to accommodate the increased traffic:

- The entire road will be graded to a width of 6 m - currently the road is between 4.5m and 8m wide;
- The road will be ripped and re-compacted to 93% MOD AASHTO;
- A gravel sub-base course of 150 mm thick will be imported and compacted to 95% MOD AASHTO;
- Drains (30m in length) will be excavated along the road at 200 m intervals to allow storm water to drain from the gravel road into the adjacent veld.

Photo 3.1: View of the existing access road adjacent to railway line

3.2.7 Fire fighting

All fire-fighting controls will have to be in accordance with the National Building Regulations, the SANS Code of Practice (related to Community Protection against Fire) and with "Red Book" standards.

3.3 Applicable legislation, policies and/or guidelines

Table 3.1 provides an indication of legislation, policies and/or guidelines applicable to the said project. The list below merely serves to highlight key legislation and obligations and is thus not definitive or exhaustive.

Table 3.1: Applicable legislation, policies and/or guidelines

Title of legislation, policy or guideline:	Administering authority:	Aim of legislation, policy or guideline
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)	Department of Justice and Constitutional Development	To establish a Constitution with a Bill of Rights for the RSA. It sets out of a number of fundamental environmental rights (Section 24).
Spatial Planning and Land Use Management Act, 16 of 2013	Department of Rural Development and Land Reform	To provide a framework for spatial planning and land use management
Environment Conservation Act, 1989 (Act 73 of 1989) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To control environmental conservation.
National Environmental Management Act, 1998 (Act 107 0f 1998) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To provide for the integrated management of the environment.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) and amendments	Department of Environmental Affairs	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable

Title of legislation, policy or guideline:	Administering authority:	Aim of legislation, policy or guideline
		use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African Biodiversity Institute; and for matters connected therewith.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): National List of Ecosystems that are threatened and in need of protection (9 December 2011).	Department of Environmental Affairs	The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004): Alien and Invasive Species List, 1 August 2014	Department of Environmental Affairs	Regulations regarding alien and invasive species.
List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998), 23 December 2016	Department of Agriculture, Forestry and Fisheries	Provides a list of protected tree species.
National Environmental Management: Waste Act, 2008 (Act 59 of 2008) and amendments	Department of Environmental Affairs and Department of Agriculture, Rural Development, Land and Environmental Affairs	To reform the law regulating waste management in order to protect health and the environment by providing for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.
Environmental Impact Assessment Regulations, 2014 (Government Gazette No. 33306 of 18 June 2010) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	Regulations pertaining to environmental impact assessments.
National Water Act, 1998 (Act 36 of 1998) and amendments	Department of Water and Sanitation	To control water management aspects.
National Veld and Forest Fire Act, 1998 (Act 101 of 1998) and amendments	Department of Agriculture, Forestry and Fisheries	To prevent and combat veld, forest and mountain fires throughout South Africa.
National Heritage Resources Act, 1999 (Act 25 of 1999) and amendments	South African Heritage Resources Agency	This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.
Protection of Personal Information Act, 2013 (Act 4 of 2013)	Department of Justice and Constitutional Development	The purpose of this act is to give effect to the constitutional right to privacy by safeguarding personal information and to regulate the manner in which personal information may be processed.
Promotion of Access to Information Act, 2000 (Act 2 of 2000) and amendments	Department of Justice and Constitutional Development	To give effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights; and to provide for matters connected therewith.
Promotion of Administrative Justice Act, 2000 (Act 3 of 2000) and amendments	Department of Justice and Constitutional Development	The Act aims to make the administration (e.g. Government and Parastatals) effective and accountable to people for its actions.
Conservation of the Agricultural Resources Act, 1983 (Act 43 of 1989) and amendments	Department of Agriculture, Forestry and Fisheries	To provide control over the utilization of the natural resources of the Republic in order to promote the conservation of soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.
Occupational Health and Safety Act, 1993 (Act 85 of 1993) and amendments	Department of Labour	To provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work and to establish an advisory

Title of legislation, policy or guideline:	Administering authority:	Aim of legislation, policy or guideline
		council for occupational health and safety.
Health Act, 1977 (Act 63 of 1977) and amendments	Department of Health	To promote public health.
Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) and amendments	Mpumalanga Tourism and Parks Agency	To control nature conservation.
National Building Regulations and Standards Act, 1977 (Act 103 of 1977) and amendments	Department of Trade and Industry	To provide for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities; for the prescribing of building standards; and for matters connected therewith.
South African Bureau of Standards` SANS 10400 X and 10400 XA	Department of Trade and Industry	The application of the National Building Regulations in terms of environmental sustainability and energy usage in buildings.
Various by-laws of the Emakhazeni Local Municipality, e.g.: ○ Waste management; ○ Noise.	Emakhazeni Local Municipality	To regulate land use with the Emakhazeni Local Municipal area.
The Emakhazeni Land Use Scheme, 2010	Emakhazeni Local Municipality	To regulate land use planning within the Emakhazeni Local Municipality
Integrated Development Plan for the Emakhazeni Local Municipality (2015/2016)	Emakhazeni Local Municipality	Broad spatial framework guidelines for the Emakhazeni Local Municipality.
Spatial Development Framework for the Emakhazeni Local Municipality (January 2015)	Emakhazeni Local Municipality	Spatially based policy guidelines whereby changes, needs and growth in the region can be managed to benefit the whole community.
Nkangala District Municipality Climate Change Response Strategy	Nkangala District Municipality	A strategy in response to climate change.
Nkangala District Municipality Integrated Waste Management Strategy	Nkangala District Municipality	A strategy dealing with waste.
Integrated Environmental Management Guideline Series (Guideline 5 – 10 October 2012) – Companion to the Environmental Impact Assessment Regulations, 2010	Department of Agriculture, Rural Development, Land and Environmental Affairs	To provide clarity on the processes to be followed when applying for an environmental authorisation in terms of the EIA Regulations and gives a comprehensive interpretation of the listed activities.

4. DESCRIPTION OF ALTERNATIVES

This section provides an indication of the alternatives investigated in terms of the site, layout plan and service provision.

4.1 Alternative sites

Morelig Combined School located near Wonderfontein needs to be relocated due to mining activities of Umsimbithi Mining (Pty) Ltd. Four (4) alternative sites were investigated for the establishment of the new school namely:

- Option 1: Site located east of the Afgri Silos.
- Option 2: Site located west of the Afgri Silos (preferred site).
- Option 3: Site located south of the existing Morelig Combined School.
- Option 4: Site located within Wonderfontein.

The alternative site locations are indicated in Figure 4.1.

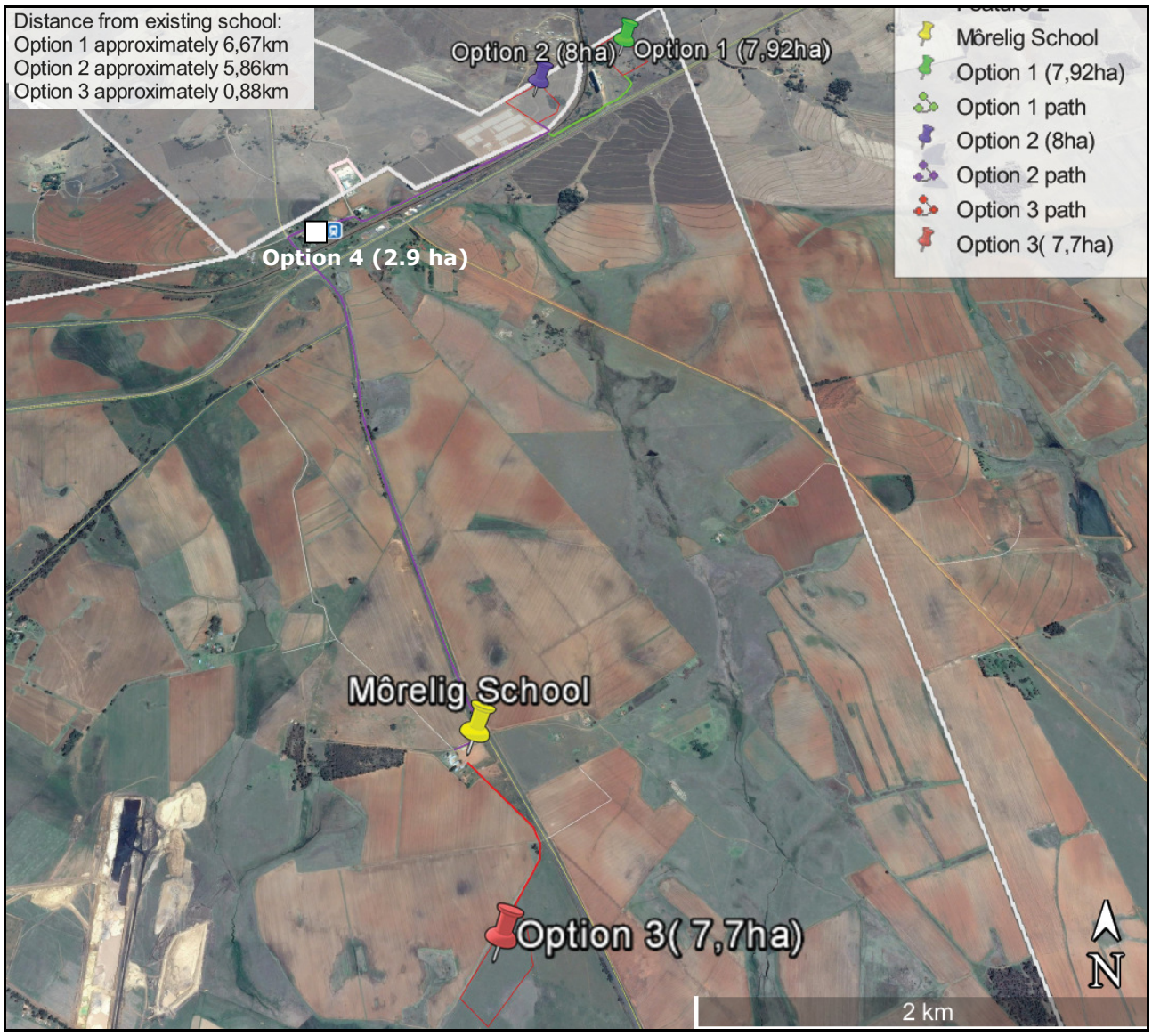


Figure 4.1: Location of alternative sites

4.1.1 Option 1: Site located east of the Afgri Silos (Figure 4.1)

A 7.92 ha area was initially identified to the east of the Afgri Silos for the relocation of the Morelig Combined School (Figure 4.1).

Initially, Option 1 was considered favourable for the following reasons:

- The majority of students are transported to school by bus from Belfast and farms in the area. The proposed site is therefore desirable due to the close proximity to major traffic routes (e.g. N4 national road; Figure 4.1).
- The existing Morelig Combined School is located only 6.7 km south west of the site (Figure 4.1). The proposed site is therefore located in the same general vicinity as the existing school.
- The property owner (Corlouis Boerdery (Pty) Ltd.) agreed to sell the proposed site to the applicant.
- The said site is not used for agricultural purposes (e.g. cultivation or grazing).
- The site is large enough for the establishment of a school and associated infrastructure.
- The topography of the site is suitable for a school.

Upon further investigation, the following issues came to light:

- The South African National Roads Agency (SANRAL) indicated that they would not give permission for direct access to the site from the N4 national road (see Section 4.3.7).
- The alternative access route would cross the Transnet railway line, which would necessitate the upgrading of the existing level crossing and lead to increased costs.
- A Transnet railway line is located between the said site and the Generaalsdraai Village. It was anticipated that school children from the Generaalsdraai Village would cross the railway line on foot, which would pose a serious safety risk.
- Numerous Wattle Trees are present on site (Photo 4.1). The tree stumps would be costly to remove during earthworks.

Option 1 was thus discarded due to the number of issues identified above.

Photo 4.1: A view of the Option 1 site east of Wonderfontein Silos

4.1.2 Option 2: Site located west of the Afgri Silos (preferred site; Figure 4.1)

A 8 ha area was identified west of the Afgri Silos (Figure 4.1) for the relocation of the Morelig Combined School.

The site was decided upon in view of the following:

- The existing Morelig Combined School is located only 5.8 km south west of the site (Figure 4.1). The proposed site is therefore located in the same general vicinity as the existing school.
- The majority of students are transported to school by bus from Belfast and farms in the area. The proposed site is therefore desirable due to the close proximity to major traffic routes (e.g. N4 national road) within the rural area.
- Access to the site can be obtained from an existing gravel road that connects to Wonderfontein and the D685 provincial road (Figure 4.9). This access road does not cross the Transnet railway line.
- Direct access from the N4 national road would not be required since an existing access road is available (Figure 4.9).
- The site is located adjacent to Generaalsdraai Village providing easy access to school facilities for the residents.
- Students from the Generaalsdraai Village would not have to cross the Transnet railway line to get to school.
- The site is large enough for the establishment of a school and associated infrastructure.
- The property owner (W.J. Prinsloo) has agreed to sell the proposed site to the applicant.
- The topography of the site is suitable for a school. It is relatively flat, which will minimize the need for earthworks.
- The site is not affected by the 1:100 year floodline. There is thus no flood risk to the proposed school.
- No impact on natural vegetation since the said site comprises planted pastures.
- Only a few Wattle Tree stumps are present in the centre of the site, which should not have serious cost implications in terms of construction.
- Easy access to electricity as existing Eskom powerlines are located near the site and supplies Generaalsdraai Village.
- Sufficient capacity of nearby boreholes to cater for the required water demand.

Option 2 is therefore the preferred alternative

4.1.3 Option 3: Site located south of the existing Morelig Combined School (Figure 4.1)

Option 3 comprises a 7.7 ha area located only 0.8 km south of the existing Morelig Combined School (Figure 4.1), making it ideal in terms of close proximity to the existing school. The site is currently vacant and comprises natural vegetation. No buildings or infrastructure would therefore be impacted. In addition, the site can easily be accessed from the P15/1 provincial road to Carolina.

However, the following issues with regards to Option 3 were identified:

- The site is located close to an opencast coal mine (Figure 4.1). The school children and buildings could thus be impacted by blasting

activities. The close proximity of the existing Morelig Combined School to the opencast coal mine is the reason for the relocation of the school. Option 3 would therefore not solve this issue.
- From the aerial view, it is evident that a wetland could be present on site.
- The landowner (Corlouis Boerdery (Pty) Ltd.) would have to be approached regarding the sale of the property.
- No electrical infrastructure is present near the site. A new powerline would thus have to be installed.

Option 3 was thus discarded.

4.1.4 Option 4: Site located within Wonderfontein (Figure 4.1)

E. Kock of Aledlox Prop (Pty) Ltd. indicated that they would be willing to sell their property (Portion 18 of Wonderfontein 428 JS; Figure 4.1) for the proposed school.

The said site is located in Wonderfontein where the old mill was situated and is already serviced. Access to the site could be easily obtained from the N4 national road/ D685 provincial road.

Option 4 was however, discarded since the site is too small (2.995 ha) for the proposed school and associated infrastructure. According to Urban Dynamics (2016a), at least 4.8 ha is required.

4.1.5 No project option

More information with regards to the implication of the 'no project option' is provided in Section 4.9.

4.2 Alternative layout plans

4.2.1 Layout Plan No 1 (original layout plan; Figure 4.2)

Figure 4.2 provides an indication of the original layout plan (Layout Plan No 1) with regards to the proposed school drafted by Bakopane Architects (2016).

The proposed layout plan made provision for the following:
- bus and staff parking in the northern portion of the site.
- main complex located in the centre of the site comprising of 22 classrooms, 2 Grade R rooms, 2 ablution blocks, library, laboratory, kitchen, computer center, administration block, hall and guardhouse,
- 1 large and 3 smaller sports fields in the southern portion of the site.

Layout Plan No 1 covered an area of 5.58 ha with a building coverage of 0.49ha (Figure 4.2).

The layout plan was forwarded to the Morelig Combined School Board for input and approval. Subsequently, Mr. Maseko (the principal) requested that teacher accommodation be provided as part of the school since teachers at rural schools often struggle with accommodation and/or travel expenses.

The wetland specialist reviewed the layout plan and indicated that the large sports field encroaches on the 35m buffer zone recommended around the

adjacent wetland. The buildings are located 50 m outside the wetland, but the sports field is present to within 10 m of the wetland boundary.

Layout Plan No 1 was thus discarded and a new layout plan drafted.

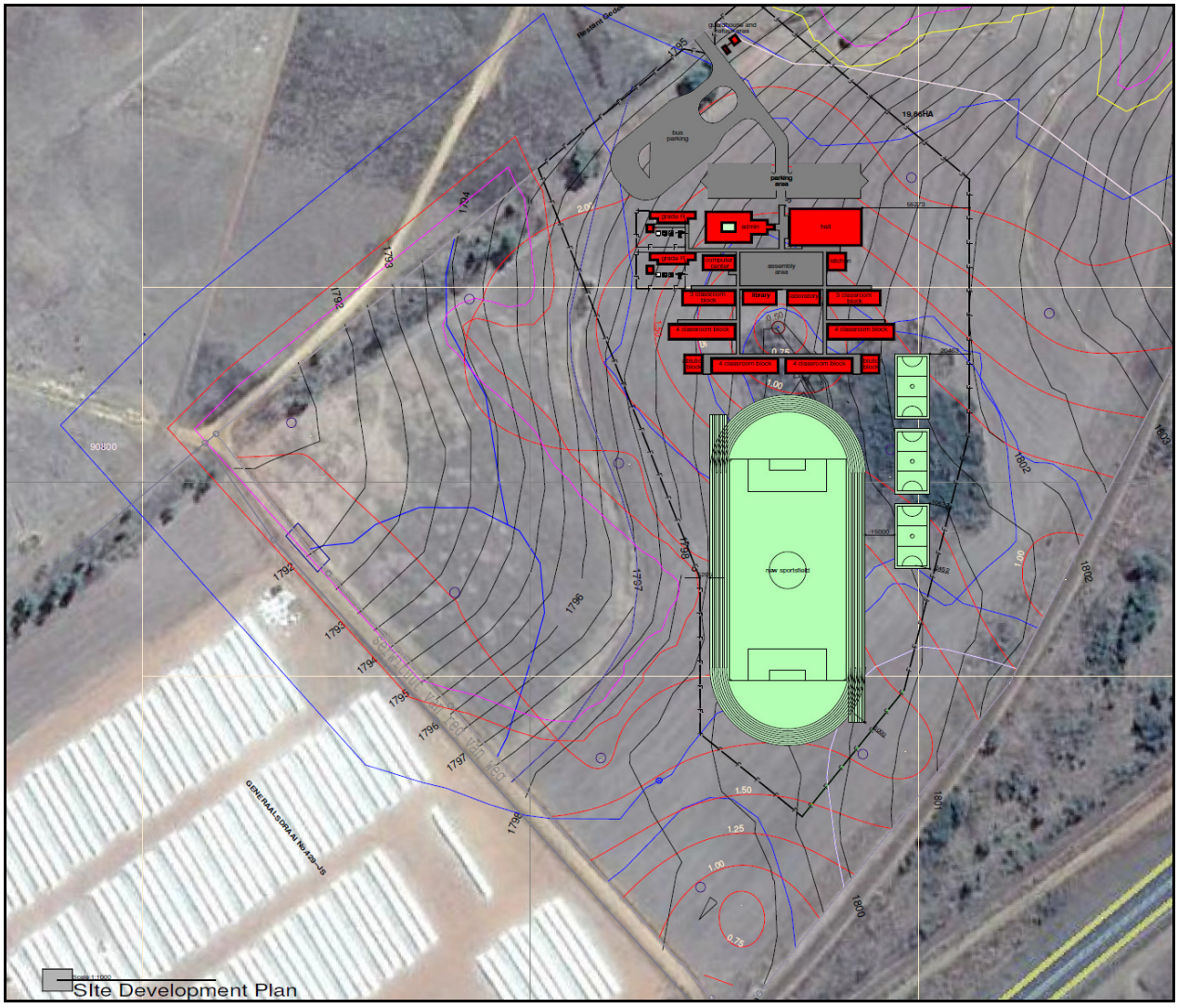


Figure 4.2: Layout Plan No 1 (original layout plan) (taken from Bakopane Architects, 2016)

4.2.2 Layout Plan No 2 (Figure 4.3)

Layout Plan No 1 was revised to include the recommendations from the Morelig Combined School Board as well as the wetland specialist. Figure 4.3 provides an indication of the revised layout plan (Layout Plan No 2).

Bakopane Architects (2016) added 3 accommodation blocks in the north eastern portion of the site for teachers.

The large sports field was moved towards the right i.e. outside of the 35m wetland buffer zone as recommended by the wetland specialist (Figure 4.3). The 3 smaller sports fields were moved towards the north west (Figure 4.3). The buildings remain 50 m outside the wetland, while the parking areas, sports fields and access route are located outside the 35 m buffer.

Layout Plan No 2 covered an area of 4.87 ha with a building coverage of 0.49ha (Figure 4.3).

The Department of Education and the applicant were however, not satisfied with the general layout of the proposed school and also requested that more classrooms and ablution facilities be provided.

The Morelig Combined School Board requested that the two Grade R classes located near the administration block be kept separate from the main school buildings.

Layout Plan No 2 was thus discarded and a new layout plan drafted.

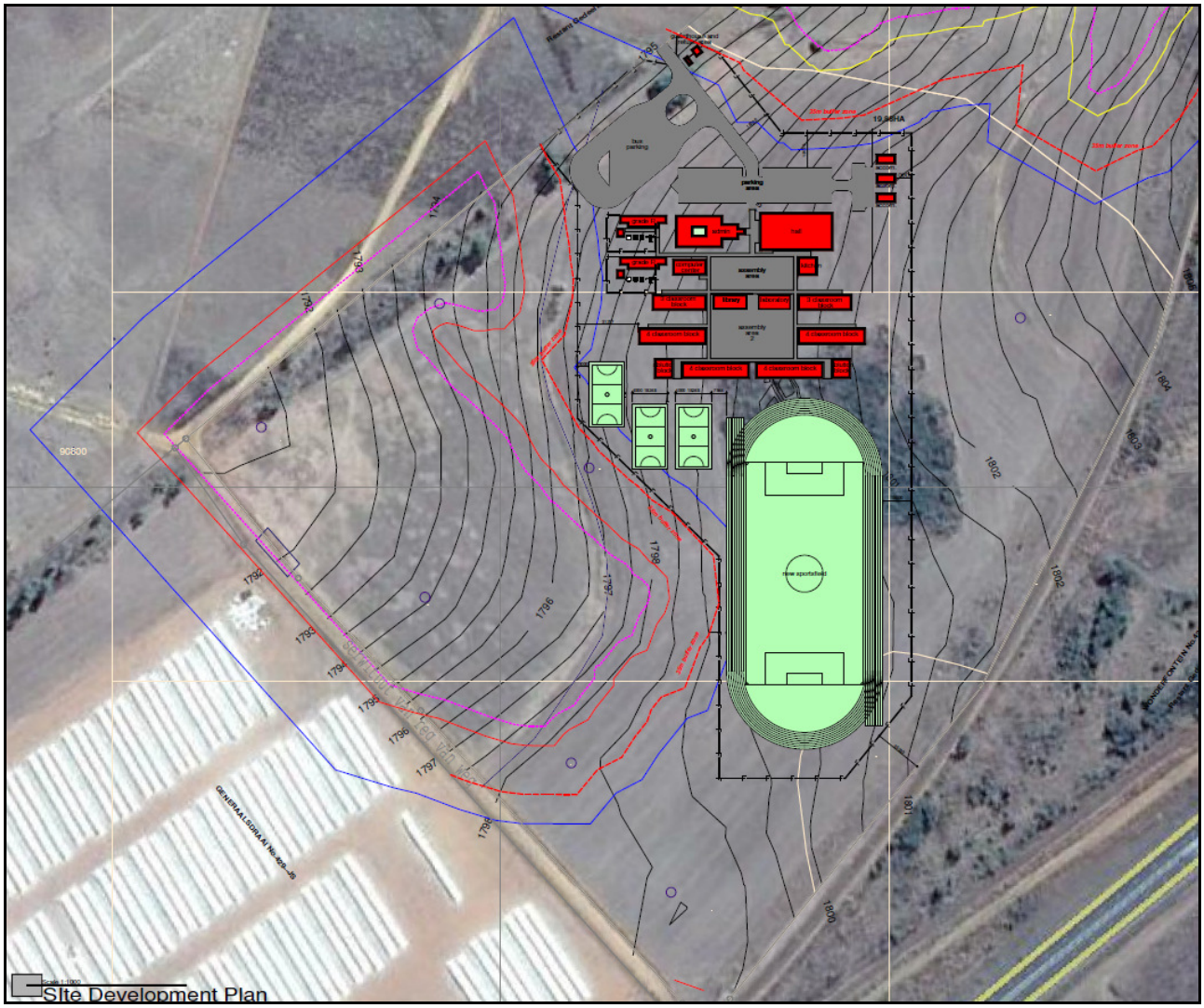


Figure 4.3: Layout Plan No 2 (taken from Bakopane Architects, 2016)

4.2.3 Layout Plan No 3 (Figure 4.4)

As indicated in Figure 4.4, the general layout of the school facilities (e.g. classrooms, ablutions, parking areas, etc.) was changed to allow easier access to all the facilities. The kitchen was moved to the south of the assembly area and provided with vehicular access. The hall, administration block and staff parking area were moved to the western portion of the site.

Additional classrooms and an additional ablution facility were also catered for in the layout plan (Figure 4.4).

The buildings remain 50 m outside the wetland, while the sports fields, parking areas and access route are located outside the 35 m buffer as recommended by the wetland specialist (Figure 4.4).

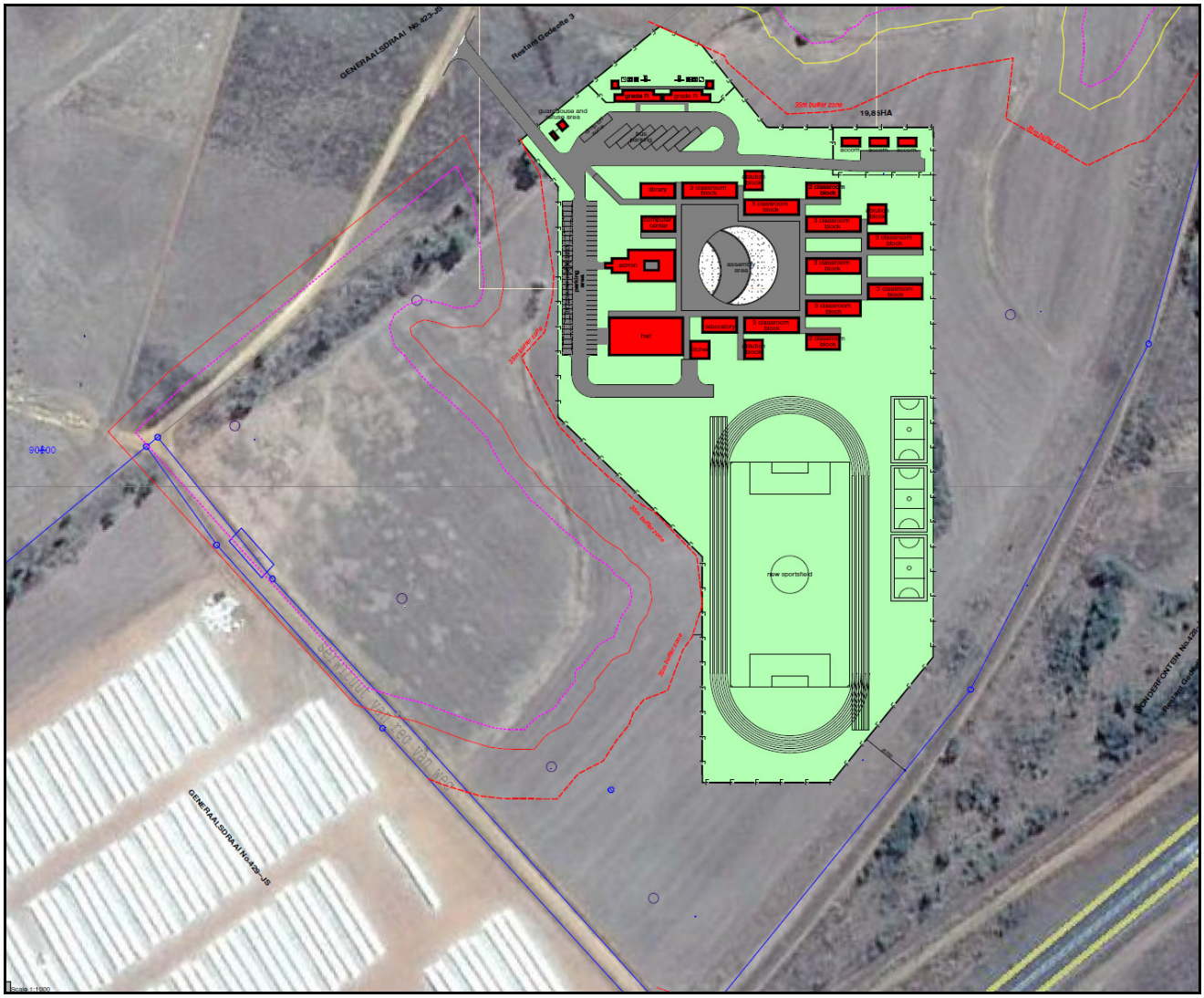


Figure 4.4: Layout Plan No 3 (taken from Bakopane Architects, 2016)

Upon review of Layout Plan No 3, the various stakeholders decided to once again alter the layout plan in terms of the location of the classrooms, kitchen, laboratory and sport fields.

Layout Plan No 3 was thus discarded and a new layout plan drafted.

4.2.4 Layout Plan No 4 (preferred layout plan; Figure 4.5)

Layout Plan No 3 was revised to ensure optimal usage of the site. Figure 4.5 provides an indication of the revised layout plan, which is also the preferred option.

As indicated in Figure 4.5, the laboratory was moved from south of the assembly area to the administration block. The kitchen was moved adjacent

to the hall (for logistical purposes), which meant that the access road to the kitchen was no longer required (Figure 4.5).

The 2 two-room classroom blocks were removed and replaced with a three-room classroom block south of the assembly area. Due to the additional space available south of the buildings, the smaller sports fields could be moved from the eastern boundary of the site closer to the hall.

The buildings remain 50 m outside the wetland, while the sports fields, parking areas and access route are located outside the 35 m buffer as recommended by the wetland specialist (Figure 4.4).

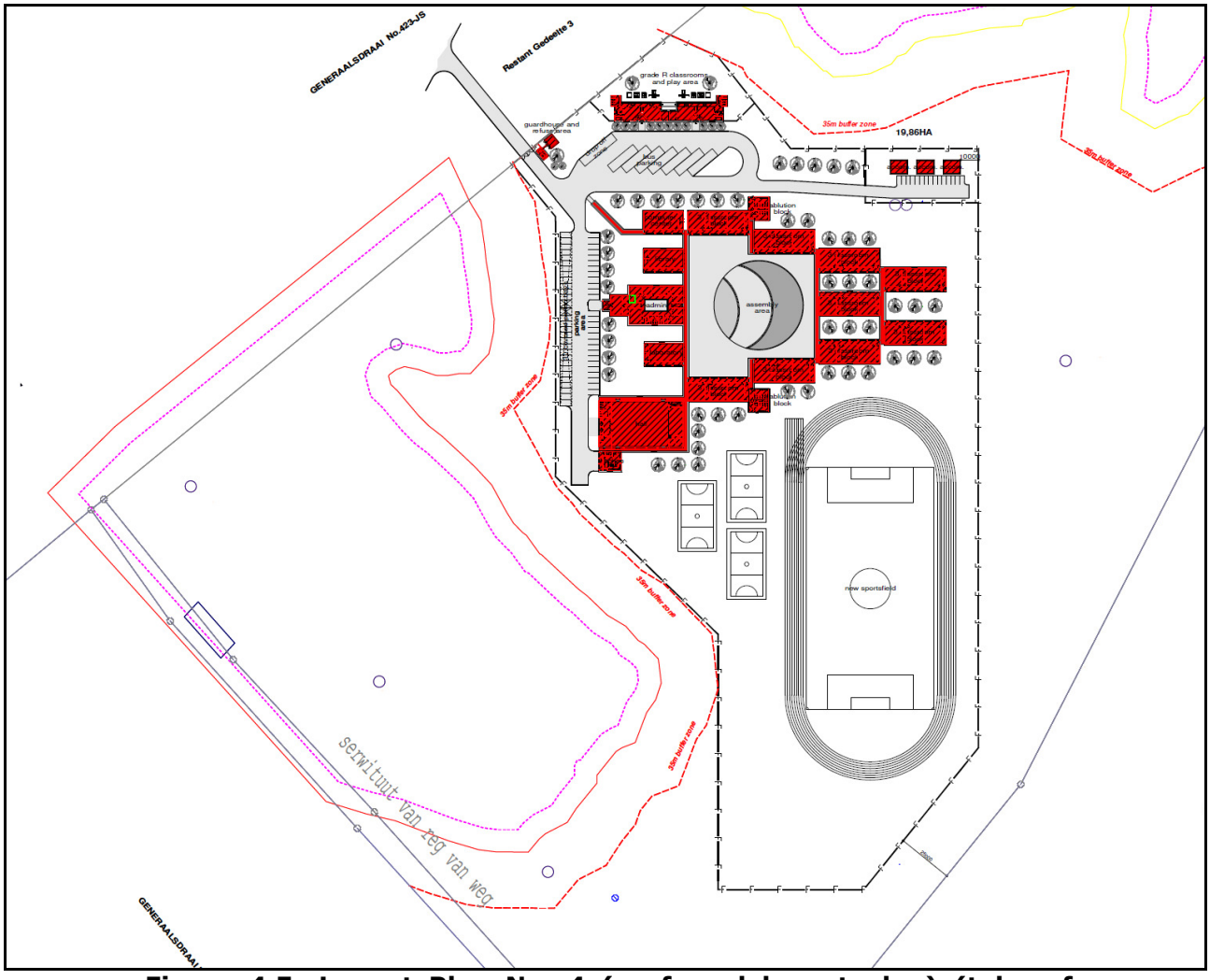


Figure 4.5: Layout Plan No. 4 (preferred layout plan) (taken from Bakopane Architects, 2017)

Layout Plan No 4 (Figure 4.5) is the preferred layout plan. It should however, be noted that some minor changes may still be made to the proposed layout plan during the detailed design phase.

4.2.5 No project option

More information with regards to the implication of the 'no project option' is provided in Section 4.9.

4.3 Water

During the operational phase, potable water needs to be provided to the employees and school children for drinking, cooking, cleaning and ablution purposes. Water will also be required for irrigation purposes and fire control.

4.3.1 Alternative water sources

Alternative 1 - municipal water
The proposed site is located within a rural agricultural area that is not serviced by the Emakhazeni Local Municipality (Figure 4.1). No bulk water pipelines are present on or near the proposed site to which the development can connect.

Alternative 1 (municipal water) was thus discarded and other sources of water investigated.

Alternative 2 - surface water
Water could be abstracted from a surface water resource such as a dam, river or stream and treated for potable use. However, no sustainable surface water resources (dams/rivers/streams) are located near the site.

The closest farms dams are located approximately 1.5 km south east and north west of the site. Obtaining water from these dams would entail the following:

- Obtaining permission from the landowner;
- Construction of a weir and pump station;
- Installation of a 1.5 km long bulk water pipeline;
- Registration of a right-of-way servitude across private property;
- Construction of a water treatment plant.

Alternative 2 (surface water) was thus discarded since this alternative would be very costly and impractical. The said dams may also not be a sustainable source.

Alternative 3 - groundwater (existing boreholes)
The abstraction of groundwater was investigated since no sustainable surface water resources are located on or near the site.

Engeolab cc (referred to as Du Preez, 2016) was appointed to conduct a feasibility geohydrological investigation to determine where groundwater can be sourced for the proposed school. A hydrocensus was conducted as part of the feasibility study to identify existing boreholes on site and in the area that could potentially be used for the development.

Cilliers (2017) confirmed that there are no boreholes present on site. Six (6) boreholes were however, identified in the vicinity of the proposed school site as indicated in Figure 5.18 and Table 5.13. Three (3) of the boreholes are not operational. The other three (3) boreholes are utilized by Generaalsdraai Village and Afgri Silos.

Alternative 3 (groundwater - existing boreholes) was however, discarded due to the following:

- Permission would have to be obtained from Afgri Silos to utilize their borehole.
- Additional abstraction from the Afgri Silos borehole could impact on the Afgri Silos water supply.
- Additional abstraction from the Generaalsdraai Village boreholes could impact on the residents.
- Ideally, the school's water supply should be independent from other users.
- The sharing of a water resource with Generaalsdraai Village and Afgri Silos could lead to issues in terms of water use licenses, fees payable to the Department of Water and Sanitation, maintenance costs of pumps, etc.

Alternative 4 - groundwater (new boreholes)
Since no boreholes are located on site and the existing boreholes in the surrounding area are being utilized, it was decided to investigate the possibility of drilling new boreholes.

Cilliers (2017) identified four (4) potential borehole sites (BH7 - BH10) as indicated in Figure 4.6.

Subsequently, the four (4) identified boreholes were drilled and a full geohydrological investigation conducted to determine what the sustainability of the water source would be in terms of quality and quantity. More information in this regard is provided in Section 5.10 of this report.

According to Cilliers (2017), the two new boreholes located north west of the said site (BH8 and BH9; Figure 4.6) would provide sufficient water to the proposed school. The other two sites identified and drilled (BH7 and BH10; Figures 4.6) were deemed inadequate and will not be utilized.

Alternative 4 (groundwater - new boreholes) is thus the preferred alternative.

4.3.2 Alternative water pipeline routes

As previously indicated, groundwater will be utilized for the proposed school. This necessitates the installation of bulk water pipelines from the boreholes to the proposed site.

Alternative 1 - two bulk water pipelines (Figure 4.6)
Initially, four (4) potential borehole sites (BH7 - BH10; Figure 4.6) were identified for groundwater abstraction. Strydom & Malan (2016) was appointed to plot a route for the water pipeline from the 4 boreholes to the school site.

As indicated in Figure 4.6, the proposed water pipeline would comprise of two 'legs' extending in a north easterly and south easterly direction from the boreholes to a high level water reservoir in Generaalsdraai Village. From here, the water pipeline extends in a southerly direction along a gravel road to the school site (Figure 4.6).

However, after the boreholes were drilled and pump tested, it was determined that only two (2) boreholes are required. According to Cilliers

(2017), the two new boreholes located north west of the said site (BH8 and BH9; Figure 4.6) would provide sufficient water to the proposed school. The other two sites identified and drilled (BH 7 and BH10; Figure 4.6) were deemed inadequate and will not be utilized. A water pipeline will thus no longer be required from these boreholes.

Alternative 1 was thus discarded and a new plan indicating a new pipeline route from BH8 and BH9 drafted.

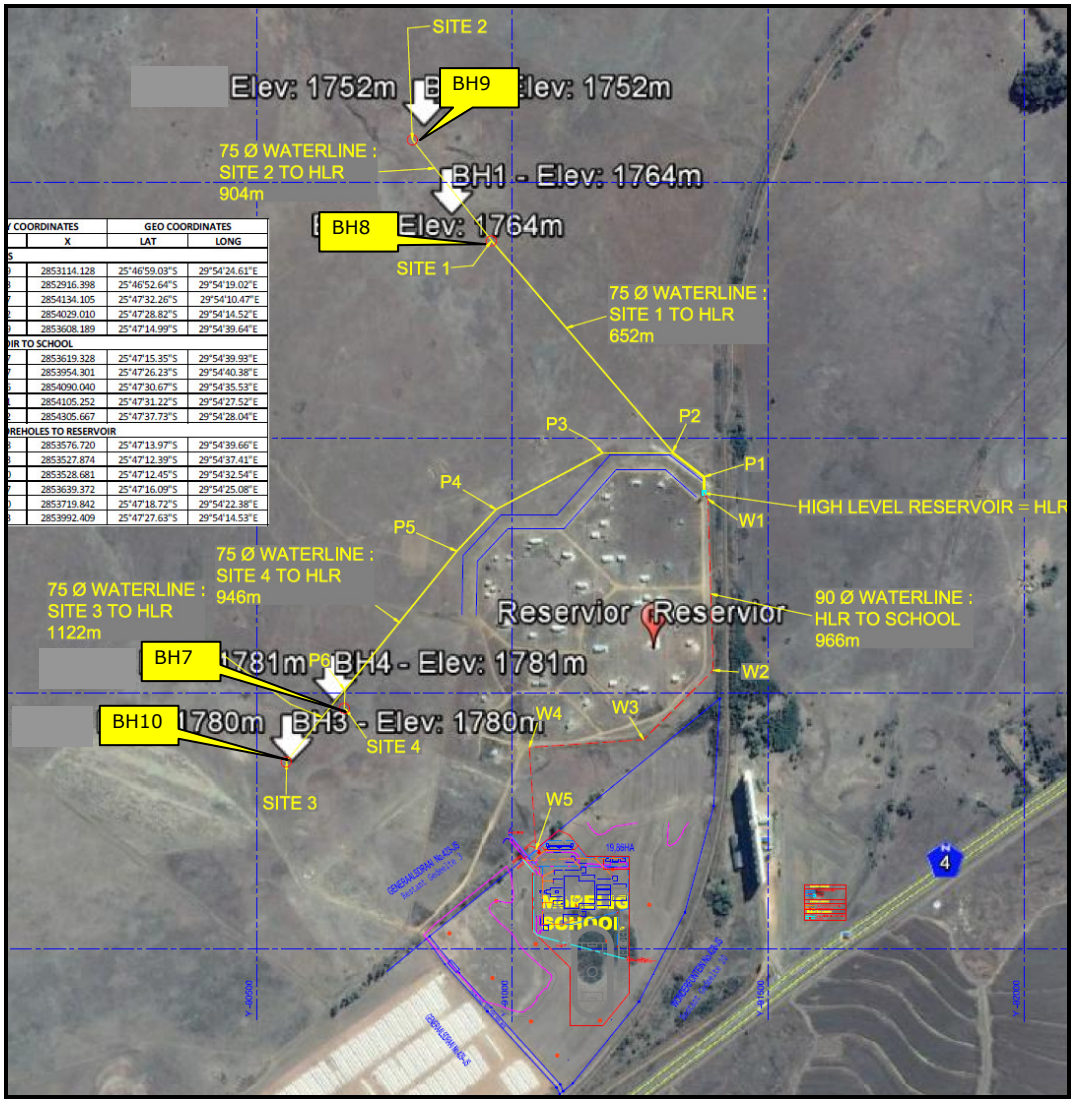


Figure 4.6: Alternative 1 - Location of proposed boreholes and water pipelines.

Alternative 2 - gravity pipeline directly to school site (Figure 4.7)
According to Du Preez (2017), the two new boreholes located north west of the said site (BH8 and BH9; Figure 4.7) would be able to provide sufficient water to the proposed school. The installation of a water pipeline from BH7 and BH10 (Figure 4.7) will thus not be required.

In order to save costs, Du Preez (2017) recommended that the water be pumped directly to the school (Figure 4.7) and not via the existing reservoir located within the Generaalsdraai Village as indicated in the previous plan

(Alternative 1; Figure 4.6). Overflow water from the tanks will then be discharged back into the borehole or into cattle troughs via a second gravity pipeline (Figure 4.7).

However, a large section of the proposed water pipeline would extend across a wetland area (Figure 4.7). **Alternative 2 was thus discarded** and a new pipeline route investigated.

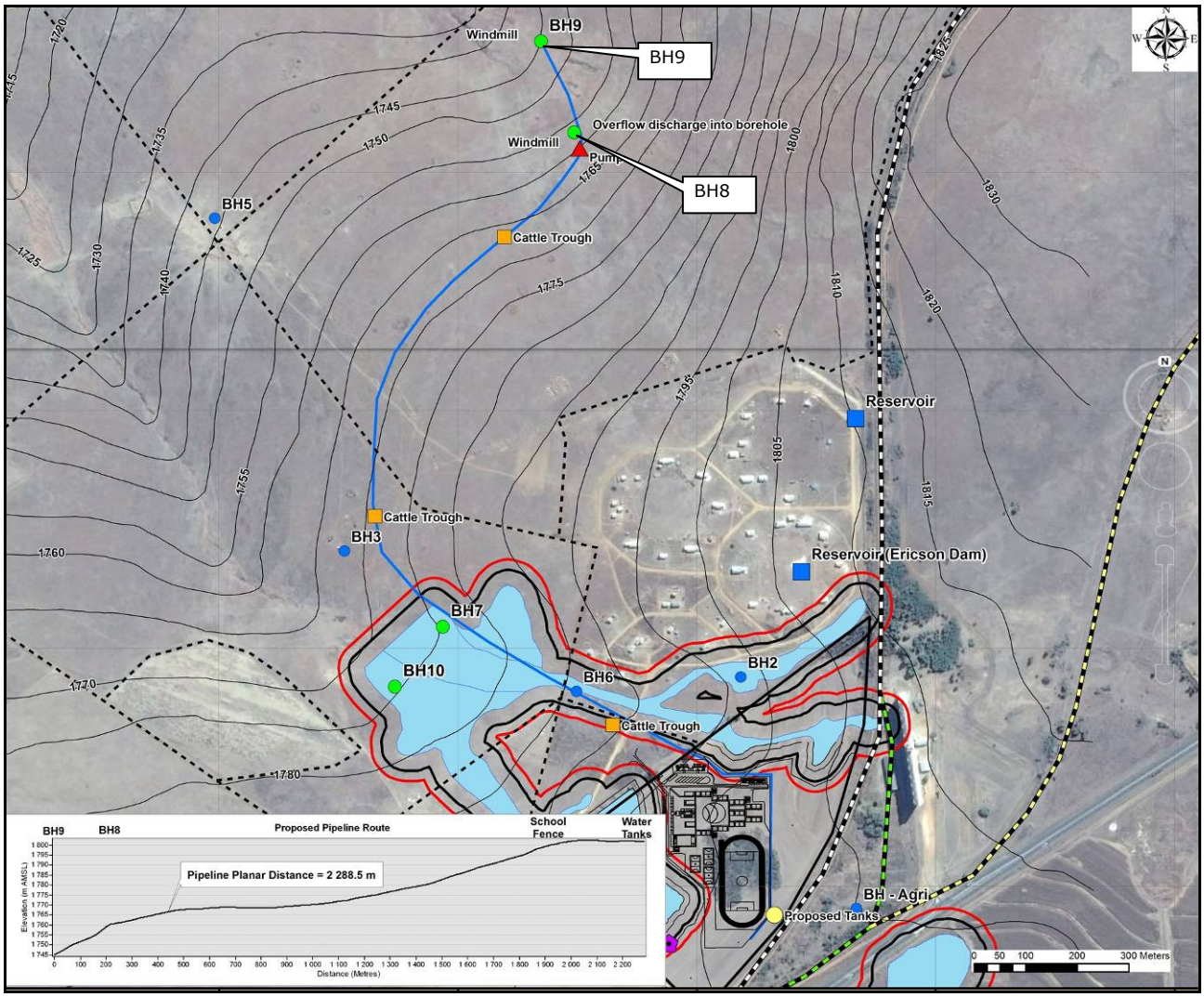


Figure 4.7: Alternative 2 - Location of BH8 and BH9 and the proposed water pipeline (taken from Engeolab, 2017).

<u>Alternative 3 - preferred bulk water pipeline route (Figure 4.8)</u>
The Alternative 2 bulk pipeline route had to be revised since a large section of the route extended across a wetland area (Figure 4.7). In order to minimize the impact of the proposed water pipeline on the identified wetland, the route was once again realigned as indicated in Figure 4.8.

Groundwater will be abstracted from BH8 and BH9 and pumped to an existing 50 000 liter high level reservoir within Generaalsdraai Village (Figure 4.8). From here, the water will be gravitated to storage tanks located within the proposed school site.

The proposed route will extend along a gravel road located on the eastern and southern boundaries of Generaalsdraai Village before it deviates in a southerly direction towards the school site. The gravel road crosses a wetland (located between the school site and Generaalsdraai Village) by means of a culvert. The water pipeline will also cross the wetland at this culvert.

Alternative 3 (Figure 4.8) will have the least impact on the identified wetland and is therefore the preferred alternative.

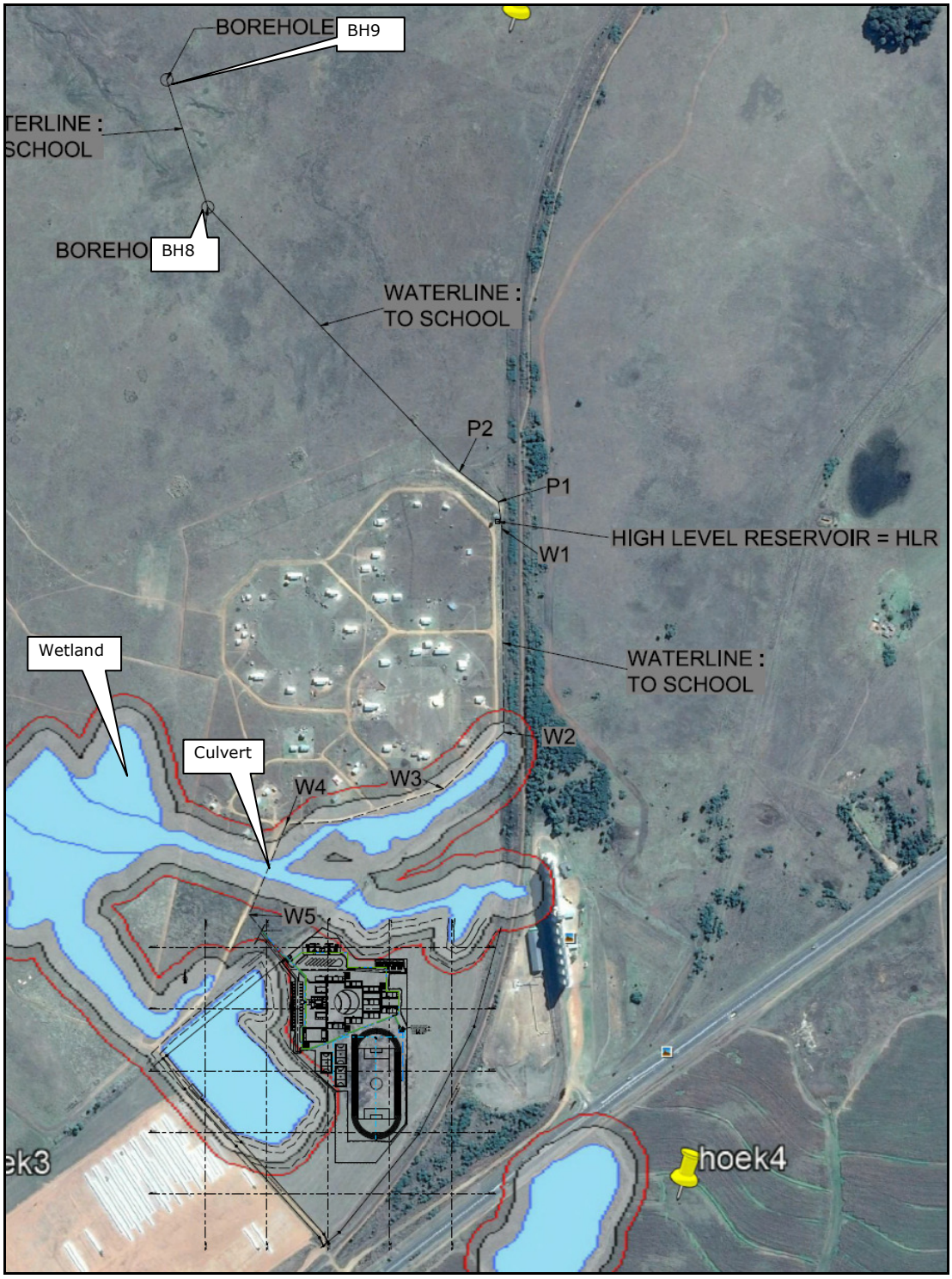


Figure 4.8: Alternative 3 - preferred water pipeline route

4.3.3 Alternative water abstraction methods

Groundwater can be abstracted by means of electrical pumps, solar pumps or windmills.

Alternative 1 - Electrical pumps

Electrical pumps (aboveground or submersible) can be installed at the boreholes to pump water to the school. However, no electricity is located near BH8 and BH9 (Figure 4.8), making the installation of electrical pumps problematic. In addition, lengthy power outages could lead to water interruptions. There is also a risk that the electrical pumps and cables could be stolen or vandalized.

Alternative 1 (electrical pumps) was therefore discarded.

Alternative 2 - Solar pumps

Solar pumps could be installed at the boreholes instead of electrical pumps, meaning that no electrical cables would be required. Although the initial installation costs of solar pumps are high, long term operating costs are low and the system is environmentally friendly. However, the efficiency of the solar pumps could be compromised by extended periods of bad weather (overcast or raining). Solar pumps are also not ideal due to potential vandalism or theft.

Alternative 2 (solar pumps) was therefore discarded.

Alternative 3 (preferred alternative) - Windmills

Windmills have the advantage that no electricity or fuel is required for operation. They can thus be installed in remote areas. Although the initial installation costs are high, windmills are very durable and little maintenance is required. It is also unlikely that theft would be a problem due to the size of the windmill.

The installation of Turbex windmills (one at each borehole) was thus identified as the preferred option for water abstraction.

4.3.4 Alternative internal water reticulation layouts

Alternative 1 - Original layout (Figure 4.9)

As indicated in Section 3.2.1, groundwater will be abstracted and pumped to an existing 50 000 liter high level reservoir within Generaalsdraai Village (Figure 3.3). From here, the water will be gravitated to high level storage tanks on site and distributed to the various buildings.

The potable water reticulation network will comprise of the following (Figure 4.9):

- 90 mm diameter Class 9 uPVC water pipe;
- 4 x 10 000 liter high level water storage tanks;
- fittings, valves, bulk water meter;

A separate reticulation network will be installed for irrigation of the sport fields. The irrigation network will comprise of the following (Figure 4.9):

- 50 mm diameter irrigation mPVC pipe;
- 2 x 10 000 liter Jo-Jo tanks for irrigation storage;
- Pressure pump to irrigation storage.

Subsequent to designing the internal reticulation network, the layout plan was changed. This necessitated changes to the reticulation network and ***Alternative 1 was therefore discarded***.

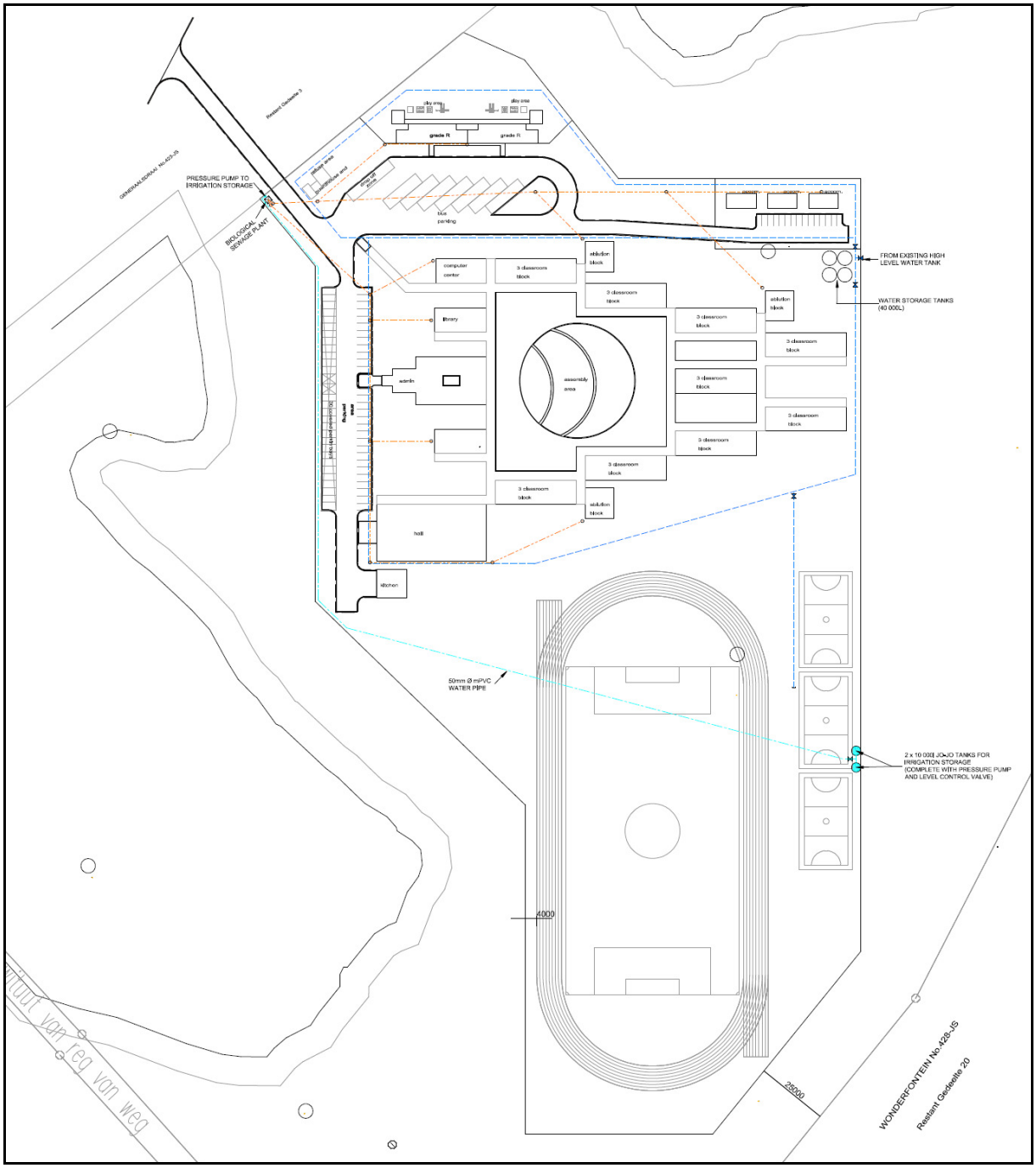


Figure 4.9: Internal water reticulation - Alternative 1 (taken from Strydom & Malan, 2017)

<u>Alternative 2 - preferred layout (Figure 4.10)</u>
The internal reticulation network layout for Alternative 1 and Alternative 2 remains mostly the same. Minor changes were made to pipe diameters, location of the storage tanks, number of storage tanks and the irrigation system.

As indicated in Figure 4.10, only 3 (and not 4) high level storage tanks will be installed on the eastern boundary of the site near the sports field.

The following storage tanks will be provided:

- 27 000 liters - potable water for daily consumption;
- 27 000 liters - Fire control
- 15 000 liters - Irrigation

The new location of the storage tanks allows for the gravitation of potable water and irrigation water across the site. The two irrigation storage tanks and pressure pump as per Alternative 1 (Figure 4.9) are thus no longer required, saving costs. In addition to these cost savings, the engineering calculations showed that smaller potable water pipes (75mm diameter instead of 90mm diameter) will suffice, further reducing installation costs.

In Alternative 2, provision was made for a 75mm diameter water pipe (orange line; Figure 4.10) to return overflow water from the tanks to the boreholes (Figure 4.8). The overflow pipeline is required to ensure that no water is wasted should the windmills pump continuously during lengthy windy conditions.

Alternative 2 will be the most cost effective and water efficient. It therefore the preferred alternative.

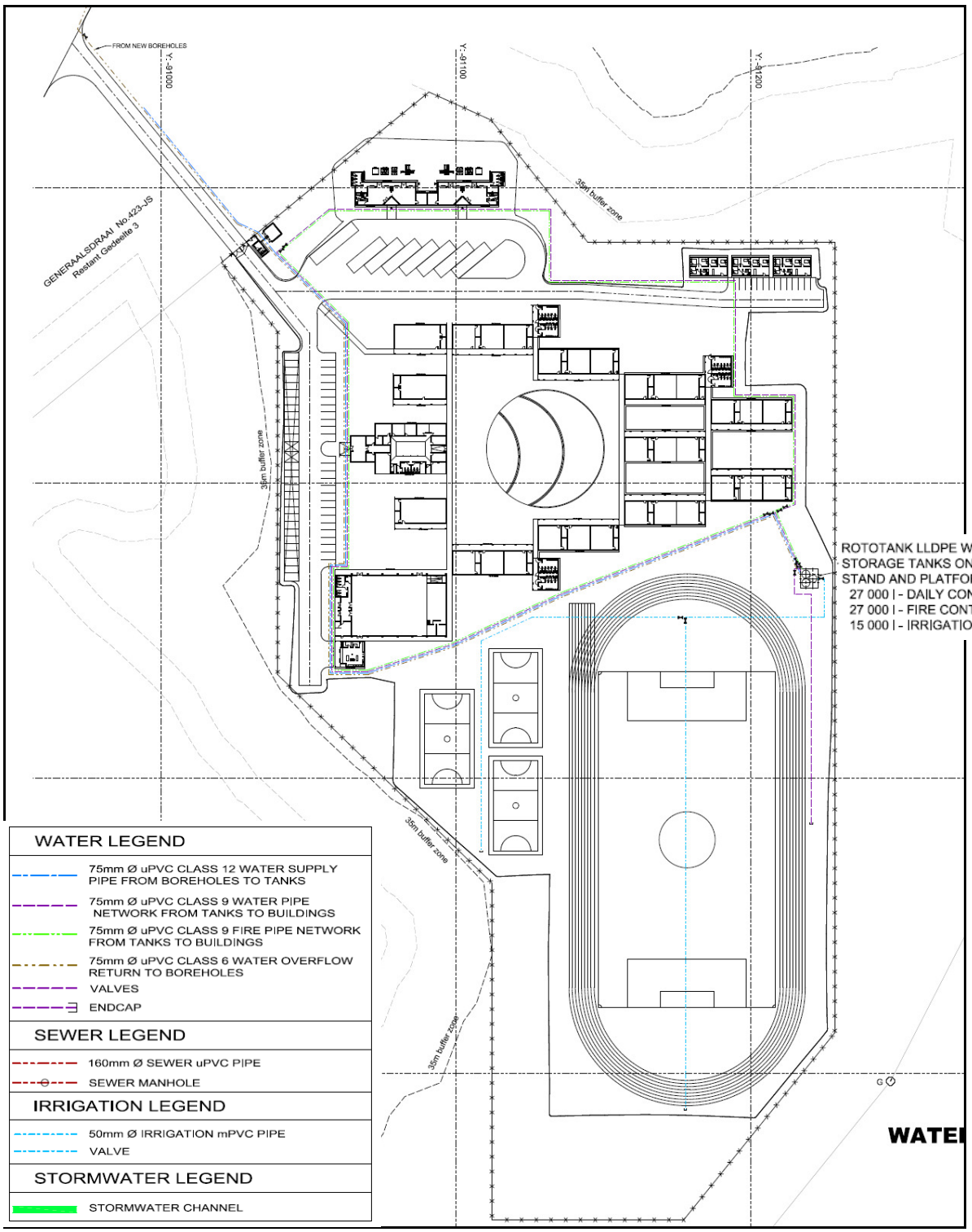


Figure 4.10: Internal water reticulation - Alternative 2 (taken from Strydom & Malan, 2017)

4.3.5 No project option

More information with regards to the implication of the 'no project option' is provided in Section 4.9.

4.4 Electricity

Electricity will be obtained from Eskom from existing Eskom powerlines present on the western boundary of the site that already supplies Generaalsdraai Village (see Section 3.3.2). No other sources of electricity are available.

Cilliers (2017) recommended that the boreholes be fitted with windmills capable of delivering up to 0.11 l/s from a depth of 100 m. The installation of Turbex windmills was decided upon as the preferred option. No electricity will thus be required for the pumping of water.

The kitchen will be supplied with gas stoves. Solar geysers will be provided at the school and staff accommodation in order to minimize electricity usage.

4.5 Sewage

A Biological Sewage Treatment Plant will be provided in the north western corner of the site adjacent to the access road as indicated in Section 3.2.3 and Figure 3.4.

Alternatively, a conservancy tank can be installed. This is however, not very practical for this development due to the remoteness of the site and the number of students at the school. The regular emptying of the conservancy tank could be problematic in terms of finding a service provider and the costs involved.

4.6 Domestic waste

Domestic waste skips will be provided on site and emptied at the licensed Belfast Waste Disposal Site or another licensed waste disposal site as indicated in Section 3.2.4. Arrangements for the collection and disposal of waste at the waste disposal site will have to be made by the school.

4.7 Access road

The site is located on a farm just north of the N4 national road between Middelburg and Belfast and is currently accessed via an existing gravel road.

Two routes can be used to access the site.

- Access road 1 extends from the N4 national road, along the D685 provincial road, through Wonderfontein town and along the railway line service road to the site (Figure 4.11).
- Access road 2 extends from the N4 national road, past the Afgri Silos and across the railway line to the site (Figure 4.11).

According to a letter from SANRAL (dated: 22 December 2014; Appendix 3) regarding access to the Generaalsdraai Village, the direct access route (i.e. Access road 2) from the N4 across the railway line (near the Afgri Silos; Photo 4.2) may not be used to provide access to the village. It therefore stands to reason that SANRAL would not allow access to the school via Access

road 2. In addition, Transnet will require that the level crossing be upgraded if it is to be used by the school. ***Access road 2 was therefore discarded.***

According to the project engineers (Strydom & Malan, 2016), ***Access road 1*** (Figure 4.11) will not cross the level crossing or connect directly to the N4 national road and ***is thus the preferred option.*** Access road 1 will be upgraded to accommodate the additional traffic and school busses (see Section 3.2.6).

Photo 4.2: Existing level crossing across the railway line near the Afgri Silos

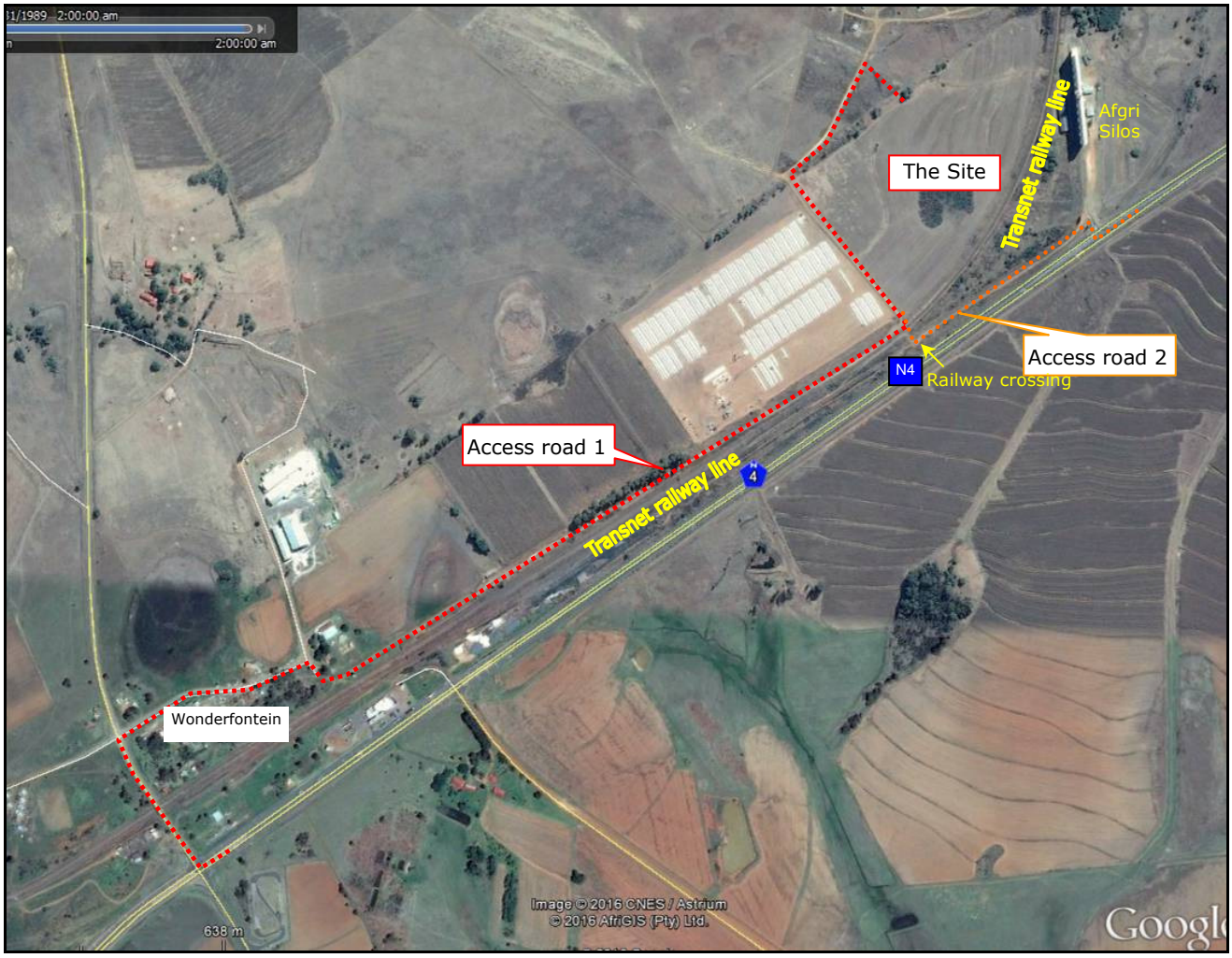


Figure 4.11: Alternative access roads to the proposed site

4.8 The 'No Project Option'

The 'no project option' is the alternative of not going ahead with the proposed development. The 'no project option' is only considered if it is found that the development will have significant negative impacts on the environment, which cannot be mitigated or managed.

If the 'no project option' in terms of the proposed project was exercised, it would mean that:

- The applicant would have to investigate alternative sites for the proposed school, which would lead to substantial delays in the project.
- The applicant would have to discard the mining expansion plans. This could impact on the mine workers in terms of job losses.
- The students would be impacted in terms of hygiene and safety should the mining expansion plans be discarded and the school remain as is in its dilapidated state (see Section 4.10).
- According to the Urban Dynamics (2016a), the Department of Education has a new policy in place of replacing small farm schools with Boarding Schools. If the no project option is implemented, the existing Morelig Combined School could be decommissioned and the students sent to Boarding Schools. Sending the students to Boarding

Schools could have a significant socio-economic impact on the 778 students and their families.
- The existing staff members (32 people) would lose their jobs if the school is closed down and the students sent to Boarding School.
- Job opportunities created by the project applicant (construction phase: 100 employees) would be lost.

4.9 Need and desirability of the activity

The existing Morelig Combined School is located about 5.8 km south west of the proposed site (Figure 4.1).

Morelig Combined School currently caters for 778 students (ranging from Grade R to Grade 12) and 26 teachers. The majority of students are transported to school by bus from Belfast and farms in the area.

The existing school consists of the following buildings (Urban Dynamics, 2016a):
- 19 classrooms of which 2 are mobile units and 17 permanent structures (giving an average of 40 students per classroom);
- Multipurpose room (mobile unit);
- Staff room (mobile unit);
- Administrative office;
- Open plan office for the HOD's;
- Kitchen (old house converted into a kitchen);
- Mobile kitchen unit which is not in use;
- 15 free standing toilets;
- Shack for wood and garden equipment;
- Soccer field;
- Mobile basketball posts.

Figure 4.12 provides a photographic view of the existing school.

According to Urban Dynamics (2016a), the buildings are in a poor state with broken ceilings, crumbling cement floors, rusted roofs, no insulation, no fire-fighting equipment, inadequate storm water drainage, etc. No hand basins are provided so hygiene is a major concern. The toilets are some distance from the classrooms and boys/girls ablutions are not separate.

The students at the school are on a feeding scheme. However, the make-shift kitchen is poorly equipped with insufficient ventilation (wood fire used for cooking) and work surfaces leading to unhygienic conditions as food is placed on the floor.

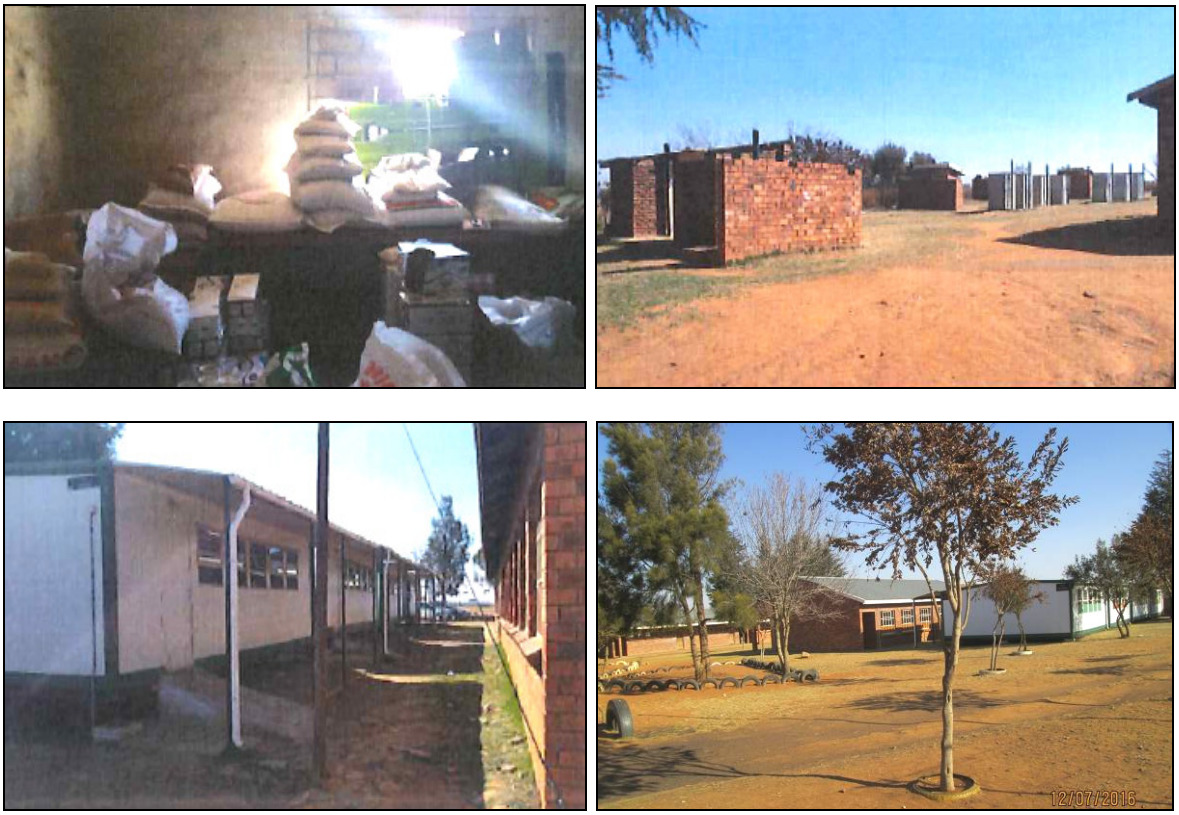


Figure 4.12: Photographic view of the existing Morelig Combined School

Morelig Combined School needs to be relocated due to mining activities of Umsimbithi Mining (Pty) Ltd. A new school is thus required and would improve the current situation.

The National Development Plan (2012) places a lot of emphasis on improving the quality of education to aid in the eradication of poverty and unemployment. The improvement of rural educational facilities is even more important since these facilities are normally neglected.

The mining company indicated that they will construct the new school and upon completion, donate the land and school to the Department of Public Works, Roads and Transport or the Department of Education.

According to Urban Dynamics (2016a), the need for a new school as well as the proposed location and design of the school have already been discussed with the Department of Public Works, Roads and Transport and the Department of Education. The concept drawings were signed off/approved.

5. BIOPHYSICAL DESCRIPTION OF THE SITE

5.1 Location of the site

The proposed Morelig Combined School will be located on a portion of the Remainder of Generaalsdraai 429 JS, Wonderfontein. The site is located west of the Afgri Silos in Wonderfontein, which is located approximately 25 km south west of Belfast (Figure 5.1).

The co-ordinates for the centre of the site are:

Latitude (S):			**Longitude (E):**		
25°	47‘	42.14“S	29°	54‘	31.93“E

The Surveyor-General 21 digit site reference number for the proposed school site is:

T	O	J	S	0	0	0	0	0	0	0	0	0	4	2	9	0	0	0	0	0

The water pipelines and boreholes will be located on the Remainder of Portion 16 of Generaalsdraai 423 JS (i.e. the property adjacent to the school site) as well as on the Remainder of Generaalsdraai 429 JS (Figure 3.2).

The co-ordinates for the various water pipelines and boreholes are:

	Latitude (S):			**Longitude (E):**		
75 Ø pipeline from boreholes to reservoir						
• Starting point of the activity	25°	47’	27.63“	29°	54‘	14.53“
• Middle point of the activity	25°	47‘	12.45“	29°	54‘	32.54“
• End point of the activity	25°	47‘	13.97“	29°	54‘	39.66“
90Ø pipeline from reservoir to school						
• Starting point of the activity	25°	47’	15.35“	29°	54‘	39.93“
• Middle point of the activity	25°	47‘	30.67“	29°	54‘	35.53“
• End point of the activity	25°	47‘	37.73“	29°	54‘	28.04“
Borehole sites						
• **BH 8**	25°	46’	59.03“	29°	54‘	24.61“
• **BH 9**	25°	46‘	52.64“	29°	54‘	19.02“
• **BH 10**	25°	47‘	32.26“	29°	54‘	10.47“
• **BH 7**	25°	47‘	28.82“	29°	54‘	14.52“

The Surveyor-General 21 digit site reference numbers for the water pipelines and borehole site are:

T	O	J	S	0	0	0	0	0	0	0	0	0	4	2	9	0	0	0	0	0
T	O	J	S	0	0	0	0	0	0	0	0	0	4	2	3	0	0	0	1	6

The said properties fall under the jurisdiction of the Emakhazeni Local Municipality (MP314) and the Nkangala District Municipality.

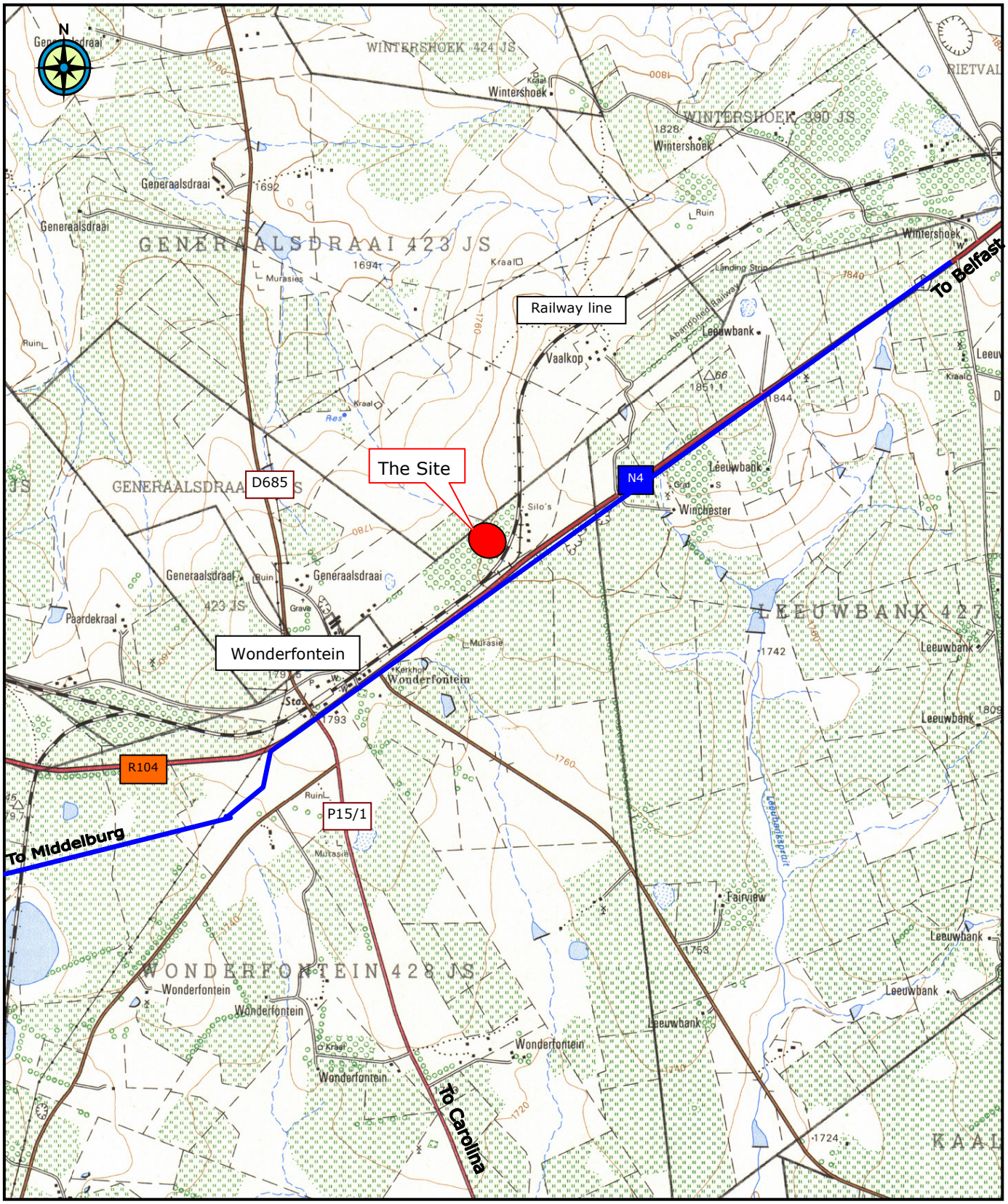


Figure 5.1: Location of site *(taken from 1: 50 000 2529 DD-not to scale)*

5.2 Climate

5.2.1 Regional climate

The South African Weather Bureau partitioned the country into 15 climatic regions. This division is based on:

- geographic considerations, more specifically the prominent mountain ranges (great escarpment) which constitute the main climatic divides, besides also other features such as rivers and political boundaries;
- the interior plateau - use has been made of the change from BW to BS and from BS to C climates according to the Köppen classification.

The site falls within Climatic Region H – The Highveld characterised by warm summers and cold winters with occasional severe frosts. Rainfall typically occurs as high-intensity short duration thunderstorms. The average frost period is 111 days per annum. The mean annual temperature is 22.5°C, with recorded extremes of -11°C and 34°C.

The site falls in the summer rainfall region, which is characterised by thunderstorm activity and relatively low average rainfall. The mean annual rainfall is 735mm compared to the mean annual potential evaporation of 1500mm. Pertinent climate data was obtained from the Middelburg (No.0515/826) and Belfast (No. 0517/0109) weather stations.

5.2.2 Mean monthly rainfall

The average number of days per month having rainfall depths in excess of 0.1mm, together with the average monthly depth of rainfall, are given in Table 5.1.

Table 5.1: Average monthly rainfall depths (mm) and days with rainfall of > 0.1mm.

Month	Average Depth	Average Days
January	132	13.8
February	103	11.2
March	88	9.5
April	42	6.5
May	19	2.9
June	7	1.5
July	9	1.7
August	8	0.9
September	22	3.7
October	63	8.3
November	124	13.0
December	118	13.1
Total	**735**	**86.1**

5.2.3 Mean annual rainfall

The maximum rainfall intensities recorded at the relevant weather stations are shown in Table 5.2.

Table 5.2: Maximum rainfall intensities.

24 Hour Rainfall Depths (mm)			
Maximum recorded	**1:50 Yr. Storm**	**1:100 Yr. Storm**	**1:200 Yr. Storm**
117	104	118	134

5.2.4 Mean annual evaporation

The mean monthly evaporation figures recorded at the relevant weather stations are given in Table 5.3. The data in the table was obtained using an 'A' Pan.

Table 5.3: Mean monthly evaporation figures

Month	Evaporation (mm)	Rainfall (mm)	Monthly deficit (mm)
January	160	132	28
February	140	103	37
March	110	88	22
April	110	42	68
May	85	19	66
June	70	7	63
July	75	9	66
August	110	8	102
September	140	22	118
October	160	63	97
November	160	124	36
December	180	118	62
Total Average	1500	735	765

5.2.5 Mean monthly maximum and minimum temperatures

The average and actual maximum and minimum temperatures between the weather stations are given in Table 5.4.

Table 5.4: Mean monthly maximum and minimum temperatures (ºC)

Month	Daily Maximum	Daily Minimum	Highest Temperature	Lowest Temperature
January	27.2	13.7	32.0	9.1
February	26.8	13.4	30.8	9.0
March	26.8	11.4	30.2	6.4
April	23.9	7.4	27.9	1.4
May	21.3	2.2	26.1	-2.9
June	18.5	-1.8	22.4	-6.0
July	18.4	-1.7	23.0	-5.8
August	21.4	0.8	26.0	-4.1
September	24.0	5.3	29.2	-1.3
October	26.0	10.1	31.2	4.4
November	26.2	11.8	31.8	5.9
December	27.1	13.2	31.2	7.8
Yearly Average	**23.9**	**7.2**	**28.4**	**2.0**

5.2.6 Prevailing wind direction

No wind data is available for Belfast according to the South African Weather Bureau. The wind pattern data for the Middelburg station is shown in Table 5.5.

Table 5.5: Mean monthly wind speed and direction

Month	N		NE		E		SE		S		SW		W		NW	
	N	v	n	v	N	v	N	v	N	v	n	v	n	V	n	v
January	161	3.0	287	3.2	44	3.1	92	3.3	122	3.6	96	3.3	109	3.7	48	4.5
February	142	2.9	295	3.2	44	3.1	74	3.4	112	3.4	101	2.9	141	3.9	60	4.2
March	152	2.8	304	3.3	36	3.1	54	3.1	100	3.4	104	2.9	139	3.4	63	3.5
April	170	2.7	211	3.3	47	3.2	95	3.4	149	3.6	146	2.8	87	3.4	39	3.0
May	172	2.6	166	2.9	59	3.4	89	3.7	162	3.9	167	2.9	67	3.0	51	3.3
June	146	2.5	149	3.0	54	3.6	117	3.0	157	3.8	166	2.7	86	3.2	43	3.2
July	162	2.5	184	2.9	51	3.9	99	3.9	142	3.6	143	2.8	79	3.4	53	4.2
August	174	5.4	180	3.4	40	3.5	86	4.1	141	4.1	182	3.0	83	3.2	40	4.4
September	197	3.2	223	3.8	27	3.5	70	3.9	131	4.3	171	3.3	84	4.0	41	3.9
October	190	3.4	243	3.7	33	3.6	71	3.6	142	4.0	160	3.8	83	4.3	42	3.6
November	174	3.2	225	3.6	28	3.1	68	3.1	185	3.8	154	3.5	92	4.1	40	3.9
December	180	3.1	254	3.4	34	3.0	69	3.3	154	3.5	135	3.3	95	4.0	40	4.0
Average	**188**	**2.0**	**227**	**3.3**	**41**	**3.3**	**82**	**3.8**	**141**	**3.8**	**146**	**3.1**	**95**	**3.7**	**47**	**3.8**

n = average direction frequency per 1000 readings v = velocity (m/s)

5.2.7 The incidence of extreme weather conditions

Being located on the Highveld, the area is prone to extreme weather on a regular basis. These weather conditions include droughts, floods and strong gusty winds prior to and during thunderstorms. Frost also occurs on an average of 120 to 150 days between April and September.

5.2.8 Climate change

According to the Mpumalanga Biodiversity Sector Plan Handbook (Lotter *et. al.*, 2014), there has already been notable shifts in climate in terms of increased average temperatures in Mpumalanga. Heat waves are becoming more frequent while cold days/nights and frost are becoming less frequent.

In addition, spring events such as flowering, bird migration and egg-laying are happening earlier in the year. Altitudinal range shifts for species such as the black mamba, red toad, black-bellied starling, yellow weaver, etc. have already been recorded.

Assuming moderate to high increases in greenhouse gas concentrations (e.g. carbon dioxide), regional modelling scenarios indicate that the north eastern interior of South Africa will experience higher minimum, average and maximum temperatures over the next few decades (Lotter *et. al.*, 2014). Higher temperatures will be accompanied by increased incidents of drought, rainfall increases along the escarpment and a shift in rainfall pattern.

5.3 Land use

5.3.1 Land ownership

The proposed school and associated infrastructure will be located on a portion of the Remainder of Generaalsdraai 429 JS (Figure 5.1) which is currently registered in the name of WJ Prinsloo (Title Deed No T21725/2002). A copy of the Deeds Office Property Report and a letter from the property owner giving permission for the proposed activity are provided in Appendix 1.

As indicated in Section 3.1, the farm will be subdivided into three portions, namely Portion A, Portion B and Portion C.

Umsimbithi Mining (Pty) Ltd. intends to purchase the portion of the property on which the school will be located (Portion A; Figure 3.1) and to transfer ownership of the constructed school and property to the Department of Public

Works, Roads and Transport or the Department of Education upon completion thereof.

The proposed boreholes and water pipelines will extend onto the Remainder of Portion 16 of Generaalsdraai 423 JS, which is registered to Umsimbithi Mining (Pty) Ltd (the applicant). A copy of the Deeds Office Property Report is provided in Appendix 1.

5.3.2 Zoning of the site

Currently, both properties are zoned as 'Agricultural'. Portion A of the Remainder of Generaalsdraai 429 JS (Figure 3.1), will be rezoned for institutional purposes (i.e. for the school). The Nkangala District Municipality approved the rezoning application (letter dated: 19 June 2017; Appendix 3) subject to certain conditions as indicated in Section 3.1.1.

Portion 16 of Generaalsdraai 423 JS will remain agricultural since only water pipelines and boreholes are proposed for this property.

5.3.3 Size of the site

The Remainder of Generaalsdraai 429 JS is 485.7559 ha in extent, of which **4.8777 ha** (Portion A; Figure 3.1) will be subdivided, rezoned and utilized for the school and associated infrastructure. Only 4.8777 ha will thus be used for the proposed Morelig Combined School.

It is estimated that **±8 000 m^2** of the Remainder of Portion 16 of Generaalsdraai 423 JS will be utilized for the water pipelines and boreholes.

5.3.4 Servitudes

No servitudes are known to be present on site.

However, a Transnet railway line and service road are located on the southern and eastern boundaries of the property (Figure 5.3). The proposed school would be located outside of this Transnet servitude.

Eskom powerlines and associated servitudes are located to the west of the site, on the opposite side of the gravel road. The proposed school would not be affected by the servitude.

5.3.5 Land use and existing infrastructure

Figure 5.2 provides an aerial view of the site indicating the existing land uses and infrastructure.

The proposed school site is fenced and comprises mostly planted pastures (Photo 5.1). The said site is thus used for agricultural purposes. No infrastructure (e.g. buildings, boreholes, powerlines, access roads, etc.) is present on the school site (Figure 5.2 and Photo 5.1).

A large stand of alien trees used to be present in approximately the centre of the site as can be seen from the aerial view (Figure 5.2). Remains of these alien trees are still present in this area as well as excavations (Photo 5.2).

Photo 5.1: A view of the site looking towards the Afgri Silos

Photo 5.2: Remains of the alien trees located in approximately the centre of the site.

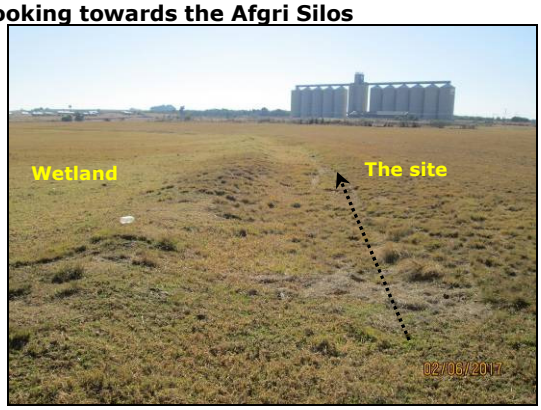


Photo 5.3: Storm water trench west of the site.

5.3.6 Surrounding land uses

The site is located in an agricultural area between Middelburg and Belfast (Figure 5.1). The surrounding properties are mainly used for maize cultivation and grazing.

Generaalsdraai Village is located north of the proposed school site (Figure 5.3). The community was relocated due to nearby mining activities. The Generaalsdraai Village was designed as an agricultural village, allowing for subsistence farming and the keeping of livestock. The village comprises approximately 50 houses that are provided with electricity and borehole water.

A gravel road extending from the N4 national road and Wonderfontein provides access to the site and Generaalsdraai Village (Figure 5.2 and Photo 5.4). This gravel road crosses the Transnet railway line and extends along the railway line to Wonderfontein.

West of the site, a storm water trench is present which diverts storm water away from the lower lying areas towards a drainage area located north of the site (Figure 5.2 and Photo 5.3). A small earthen dam is located within this drainage area (Figure 5.2) as well as a cement culvert and trench that extend underneath the gravel access road (Photo 5.8).

A railway line and service road are located near the southern and eastern boundaries of the site (Figure 5.2 and Photo 5.5). The N4 national road is present south of the site adjacent to the railway line (Figure 5.2).

Eskom powerlines extend along the gravel road (Figure 5.2) located west of the site and provide electricity to Generaalsdraai Village (Photo 5.4).

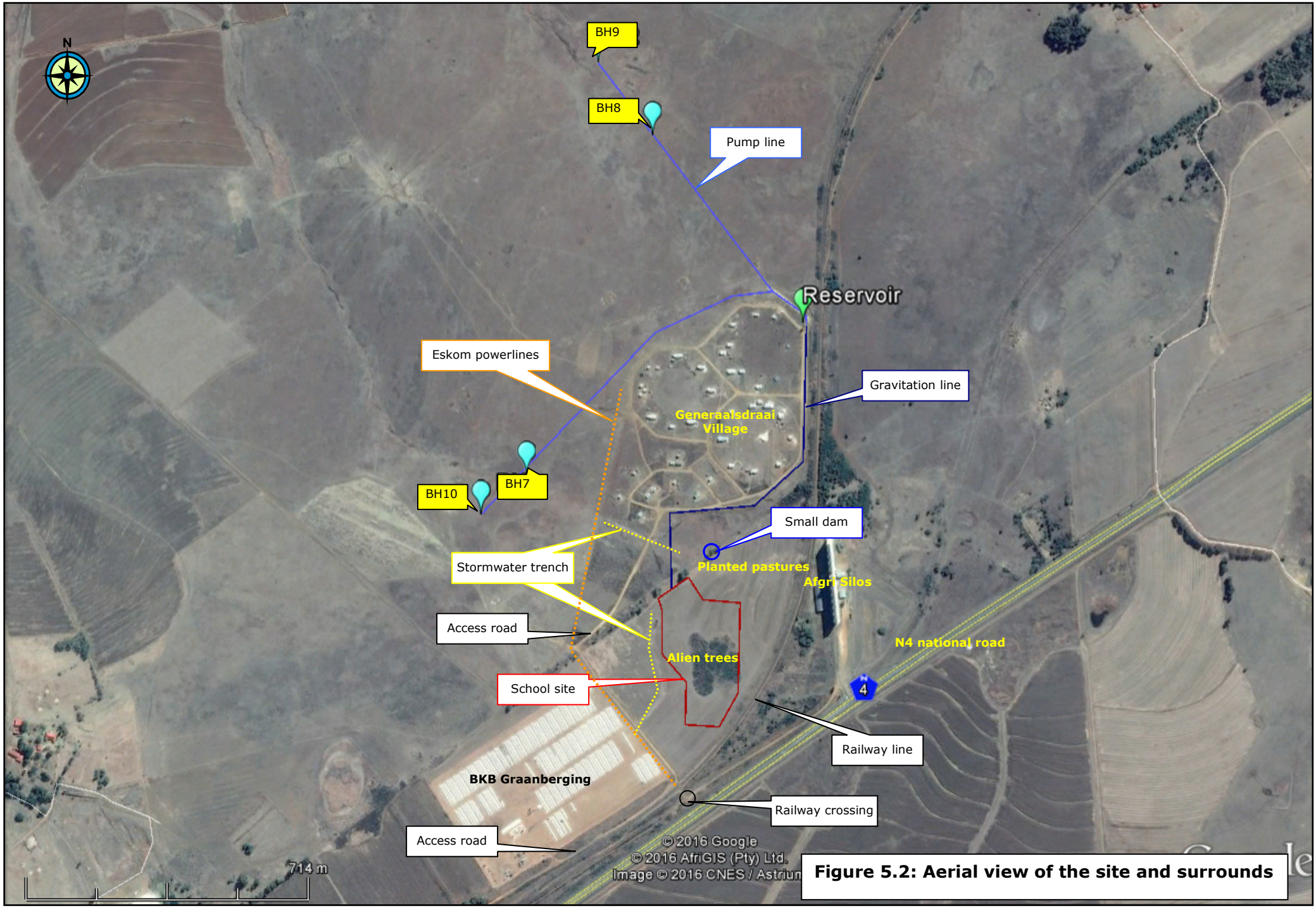


Figure 5.2: Aerial view of the site and surrounds

Photo 5.4: A view of the existing gravel access road and Eskom powerlines to Generaalsdraai Village.

Photo 5.5: A view of the Transnet railway line and service road.

Photo 5.6: A view of the existing gravel road and high level water tank in Generaalsdraai Village.

Photo 5.7: Generaalsdraai Village located in close proximity to the school site.

Photo 5.8: A view of the culvert located north of the site

Photo 5.9: Silo bags west of the site (BLB Graanberging)

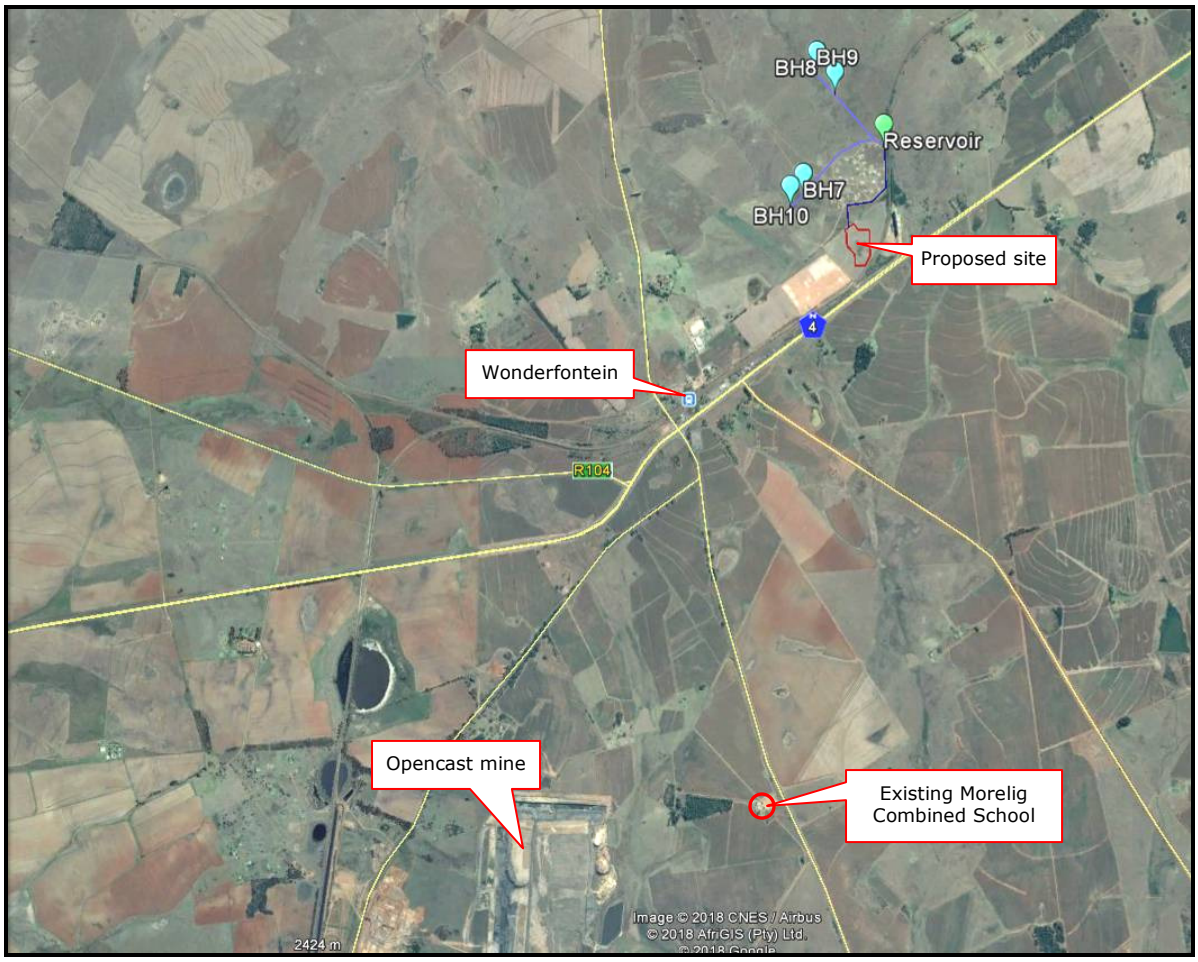


Figure 5.3: Surrounding land uses

The Afgri Wonderfontein Silo's are located to the north east of the site (Figure 5.2 and Photo 5.1). Maize is stored in silo bags south west of the site by BKB Graanberging (Figure 5.2 and Photo 5.9).

Wonderfontein is located approximately 1.6 km south west of the site (Figure 5.2). The town comprises of a clinic, Tshusong Service Centre, Wonderfontein Station, TWK Agriculture, Biominerale Fosfate en Lekke factory, Puma Filling Station and George's shop, a few houses and vacant industries/businesses (e.g. Wonderfontein Mill).

The existing Morelig Combined School is located about 5.8 km south west of the site as indicated in Figure 5.3.

Mining activities (Umsimbithi Mining) take place approximately 6.5 km south east and 5.5 km south west of the site (Figure 5.3).

5.4 Geology

A geotechnical study was undertaken by Engeolab (hereafter referred to as Cilliers & Meyer, 2016) to determine the suitability of the site for development purposes. A copy of the report is provided in Appendix 5.

According to Cilliers & Meyer (2016), the proposed school site is underlain by sedimentary bedrock (such as shale, sandstone, gritstone and coal seams (in places)) of the Vryheid Formation, Ecca Group, Karoo Sequence (Figure 5.4). Basalt and andesite of the Dullstroom Formation and gabbro, norite and anorthosite of the Rustenburg Layered Suite is present to the north of the site (Figure 5.4).

The site is blanketed by transported soils of various origins and thickness and sequentially underlain by pedogenic and highly weathered sedimentary rock. The pedogenic materials are partially to well-cemented with a medium dense, to dense and sometimes very dense consistency. The depths range from 0.30m to 1.20m below surface (Cilliers & Meyer, 2016).

The very soft sedimentary rock (gritstone and sandstone) is predominantly highly weathered with a medium dense to dense consistency. These rock horizons are located on average between 0.70 m and 1.1. m below surface (Cilliers & Meyer, 2016).

According to Cilliers & Meyer (2016), excavations with a TLB should not be difficult to an average depth of 2.0m below surface. However, deep service trenches within shallow hardpan ferricrete and sedimentary rock (Photo 5.10) will require hard ripping and powerful excavators. No boulder excavation will be required.

The said site is not subject to undermining or dolomite related instabilities. In addition, no potentially unstable natural slopes are present on or in close proximity to the site.

Photo 5.10: Sandstone outcrop noted in the area (taken from Fourie, 2017)

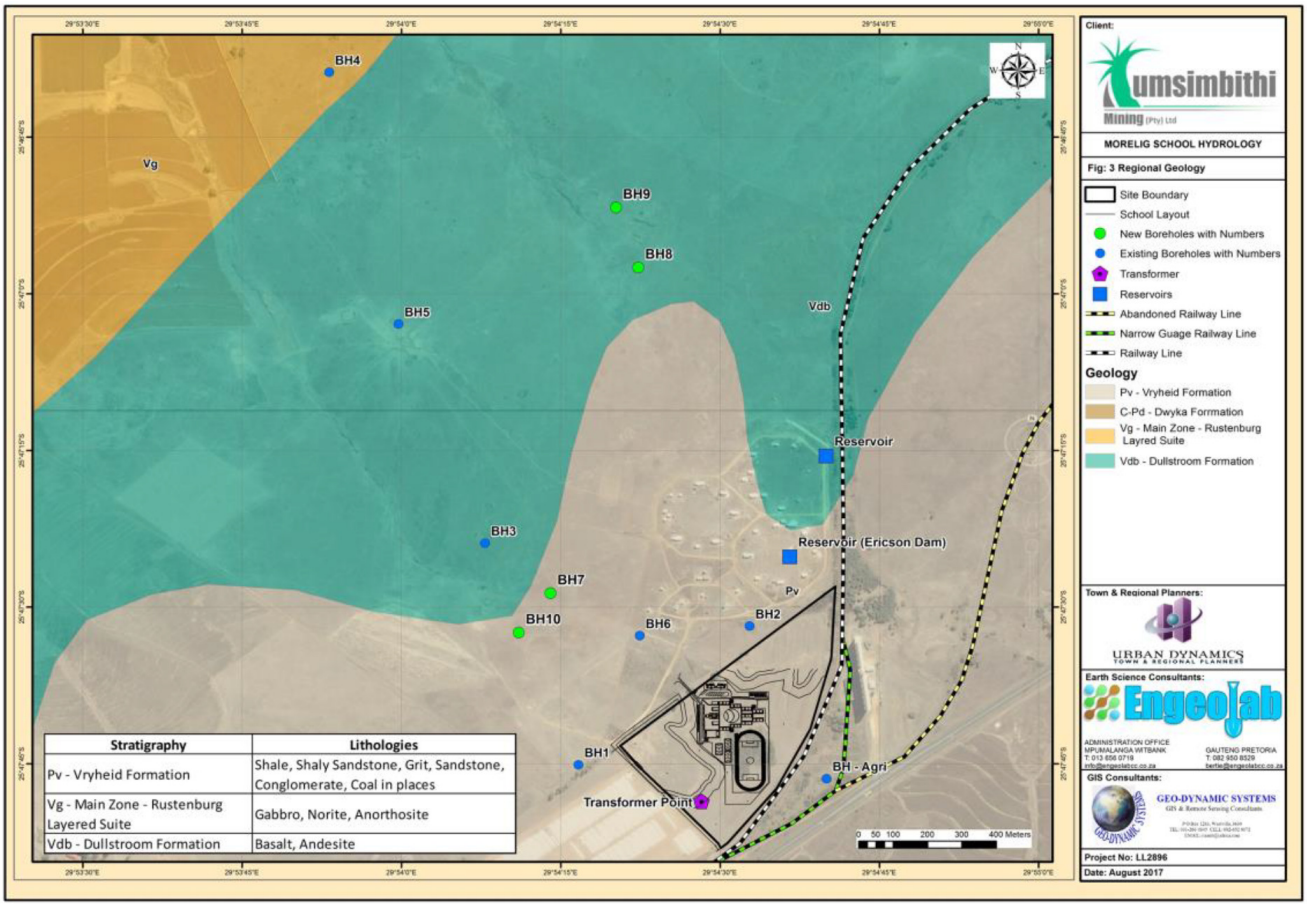


Figure 5.4: Geology of the site (taken from Du Preez, 2017)

5.5 Topography

The proposed school site lies at approximately 1800 meters above mean sea level (mamsl). The site is fairly flat with a gentle slope from east to northwest as indicated in Figure 5.5.

According to the AGIS Comprehensive Atlas of the Department of Agriculture, Forestry and Fisheries, the terrain type is level plains with some relief.

The topography of the site and immediate surrounding area has been impacted in terms of agricultural activities (i.e. cultivated lands), residential activities (Generaalsdraai Village), gravel roads, powerlines, railway lines, excavations, storm water trenches, etc.

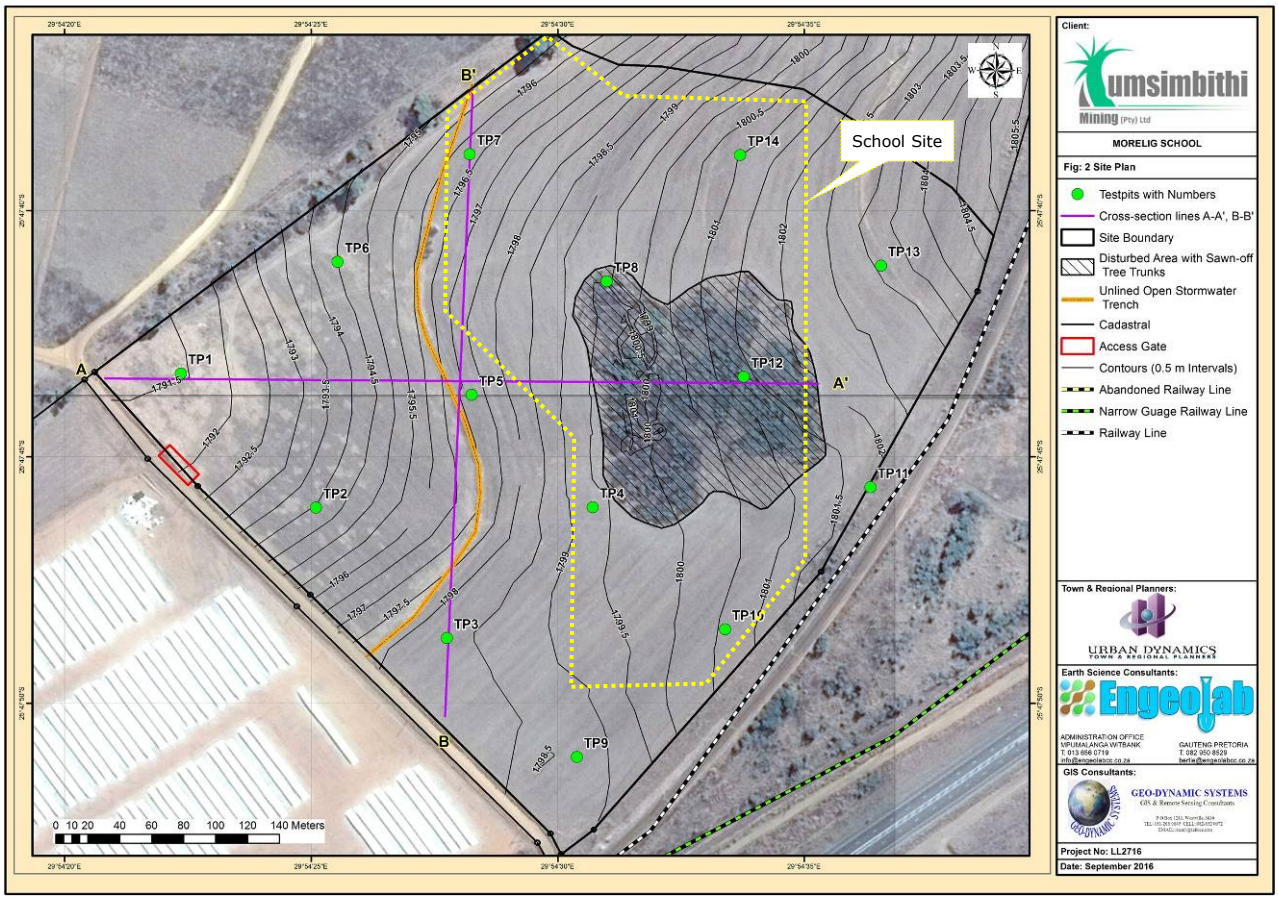


Figure 5.5: Topography of the site indicating the 5m contours (taken from Cilliers & Meyer, 2016)

5.6 Soil

5.6.1 General

According to the AGIS Comprehensive Atlas of the Department of Agriculture, Forestry and Fisheries, the soil is characterised by red and yellow soils with a low to medium base status (Figure 5.6).

According to Venter (2016), the soil on site is brown, sandy soil over ferricrete. The soil becomes more yellow in colour with depth. The wetland soils consist of a brown sand becoming greyish with depths, with orange and/or yellow mottling present.

The soil of the site and immediate surrounding area has been impacted upon by agricultural activities (i.e. cultivation and grazing) and residential activities (Generaalsdraai Village). Other impacts include the excavation of storm water trenches (west and north of the school site), excavations (at the alien tree stand on site), roads, railway lines, Eskom powerlines, etc.

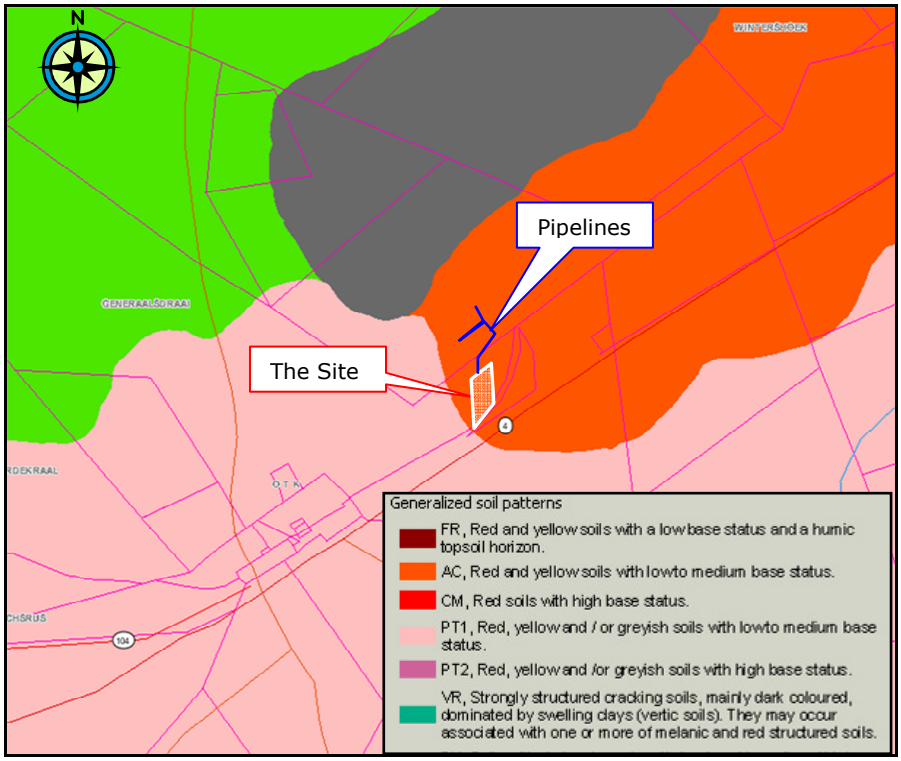


Figure 5.6: Generalized soil patterns of the school site and pipeline routes (taken from Department of Agriculture, Forestry and Fisheries)

5.6.2 Soil properties

A geotechnical study was undertaken by Engeolab (hereafter referred to as Cilliers & Meyer, 2016) to determine the suitability of the proposed school site for development purposes. Appendix 5 should be consulted for methodology used.

Fourteen (14) test pits were excavated with a TLB to determine the properties of the soil. The test pit locations are indicated in Figure 5.7.

According to Cilliers & Meyer (2016), the site is blanketed by transported soils (of various origins and thicknesses) sequentially underlain by pedogenic and highly weathered sedimentary rock.

Five soil profiles were encountered on site as described in Table 5.6.

Table 5.6: Soil profiles encountered on site (taken from Cilliers & Meyer, 2016)

Soil/bedrock profile	Description	Average thickness (m)	Average depth (m)	Consistency
Colluvium	The site is blanketed by a transported silty clayey sand mix with grass roots in the upper 0.10 - 0.30m of the profile.	0.45	Surface to 0.45	Loose; Loose to medium dense
Pebble marker	The pebble marker comprises sub-rounded ferricrete and quartz gravels	0.4	0.7	Medium dense

Soil/bedrock profile	Description	Average thickness (m)	Average depth (m)	Consistency
	mixed with fine to medium grained silty clayey sand in a predominantly medium dense matrix.			
Pedogenic materials	Low active, soft powdery ferricrete concretions and nodules within scattered soft and partially cemented ferruginised zones in a matrix of clayey silty sand.	0.4	0.3-1.2	Medium dense to dense
Highly weathered gritstone	This horizon comprises orange brown mottled greyish, coarse grained, very soft rock.	0.5	0.5-1.2	Medium dense to dense very soft rock
Highly weathered sandstone	Orange and olive brown, mottled greyish and stained relict, medium grained, very soft to soft rock.	>1.1	>0.7-1.1	Medium dense to dense very soft rock

Permeabilities are expected to be high in the overburden materials due to the high sand fraction and fine gravel content (Cilliers & Meyer, 2016). The partially cemented pedogenic zones and clayey sedimentary residuum will be less permeable.

In terms of excavation characteristics, Cilliers & Meyer (2016) anticipates no excavation problems up to an average depth of 2m. However, deep service trenches within shallow hardpan ferricrete and sedimentary rock will require hard ripping and powerful excavators. No boulder excavation will be required. Figure 5.7 provides an indication of the excavation characteristics of the proposed site. Shallow excavation is expected in the central and eastern parts of the proposed school site (Figure 5.7)

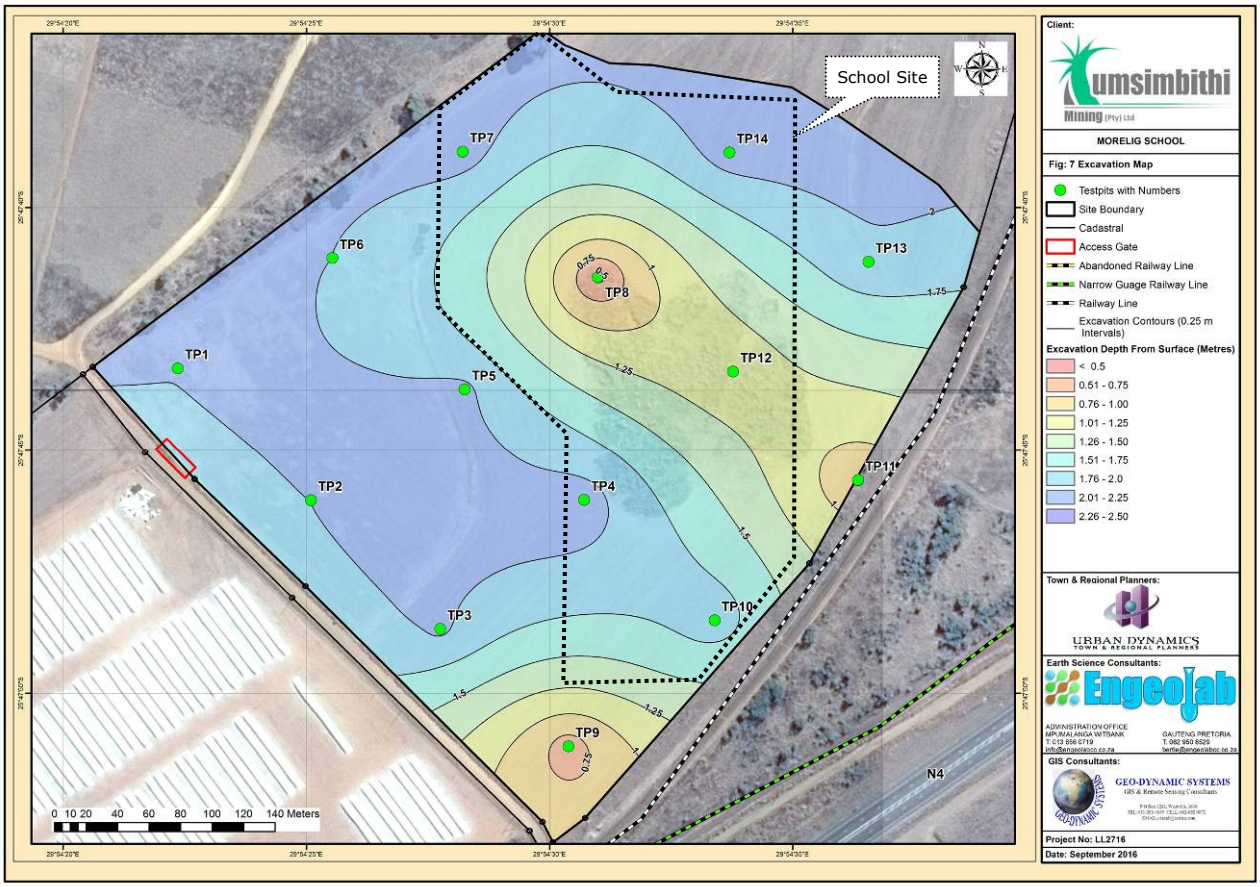


Figure 5.7: Excavation map (taken from Cilliers & Meyer, 2016)

According to Cilliers & Meyer (2016), portions of the site contain problematic material. The cover soils and weathered rock might be slightly aggressive to concrete or steel piping, medium active clays are present in some areas as well as compressible soils. Special precautions with regard to services and structures will be required.

5.6.3 Geotechnical zones

Based on the geology and soils of the site, Cilliers and Meyer (2016) divided the development site into seven (7) Site Class Designation Zones (or geotechnical zones) based on the identified geotechnical characteristics (Figure 5.8).

Table 5.7 provides a summary of the geotechnical zones identified for the proposed school site and adjacent areas.

Table 5.7: Summary of geotechnical zones identified (taken from Cilliers & Meyer, 2016)

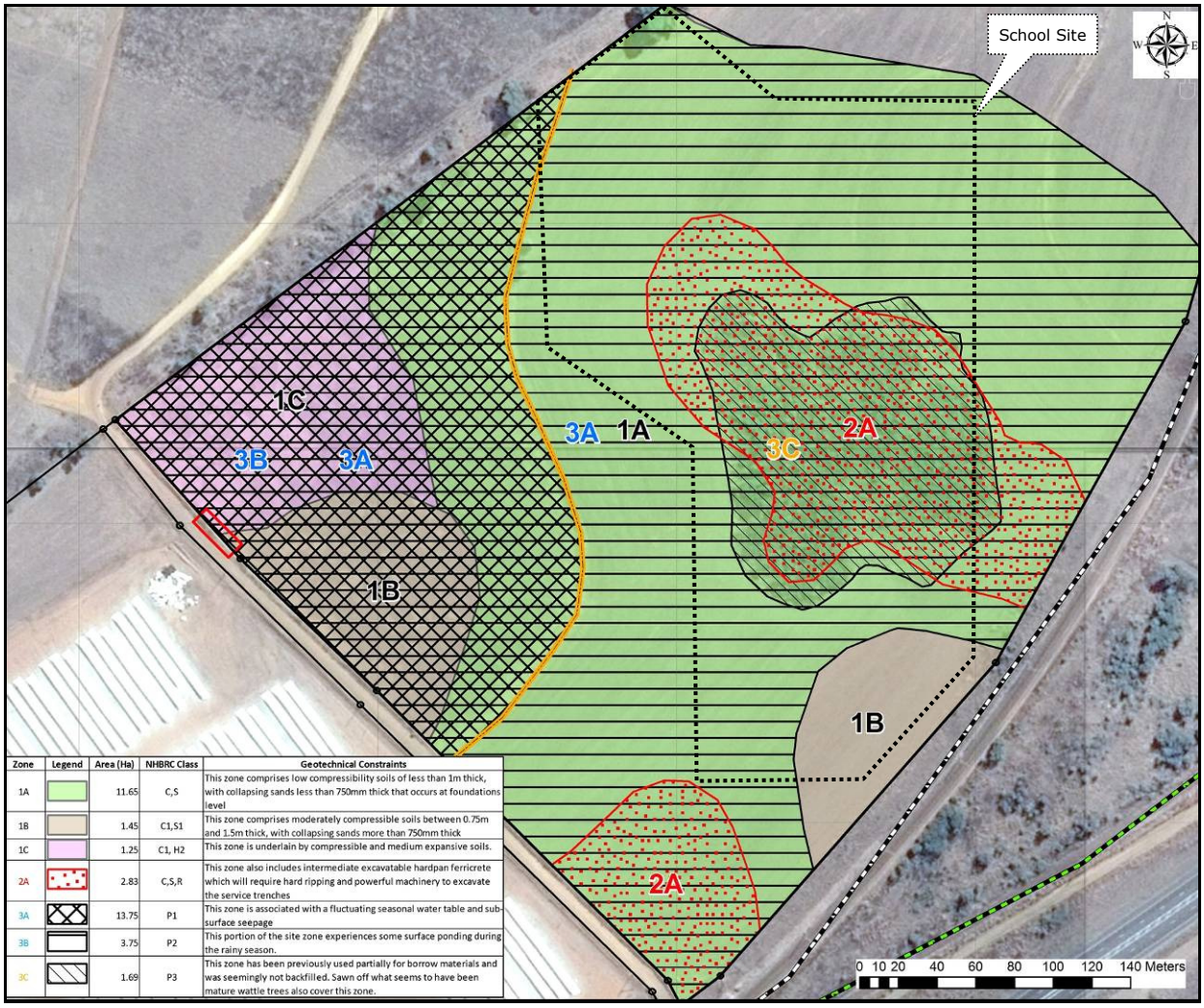
Zone	Area (ha)	NHBRC Class	Constraints
1A	11.65	C, S	Normal Founding - Comprises low compressibility soils of less than 1m thick, with collapsing sands <750mm thick that occur at foundation level. Little or no modifications to normal building construction techniques required. Foundation settlement is not expected to exceed 5 - 10mm. Normal construction precautions will apply.
1B	1.45	C1, S1	Modified Normal Construction - Comprises moderately compressible soils between 0.75m and 1.5m thick, with collapsing sands >750mm thick. Settlements of between 10 and 20mm is expected beneath foundations if construction is not modified to accommodate these differential movements.
1C	1.25	C1, H2	Comprehensive Modified Constructions - Underlain by compressible and medium expansive soils. Modified construction would be required to accommodate expected soil movements.
2A	2.83	C, S, R	Shallow Hardpan Ferricrete - Intermediate excavatable hardpan ferricrete which will require hard ripping and powerful machinery to excavate the service trenches.
3A	13.75	P1	Susceptible to Sub-surface Seepage - Fluctuating seasonal water table and sub-surface seepage. Mitigation measures in terms of sub-surface and surface drainage will be required.
3B	3.75	P2	Susceptible to Surface Ponding - Some surface ponding takes place during the rainy season. Mitigation measures in terms of surface drainage will be required.
3C	1.69	P3	Remediation - Was previously excavated and not backfilled. Roots and tree stumps of wattle trees that were cut down still present. Mitigation measures in terms of the removal of the tree stumps and backfilling of the excavations will be required.

It should be noted that only geotechnical zones 1A, 1B, 2A and 3C are present within the proposed school site as can be seen in Figure 5.8.

The geotechnical zones susceptible to a seasonal water table and sub-surface and surface seepage (i.e. 3A and 3B) are located on the western boundary of the site. Zone 1C, which is underlain by compressible and medium expansive soils, is also located outside of the site boundary (Figure 5.8).

As indicated in Table 5.7 and Figure 5.8, the entire site is developable if mitigation measures as recommended by Cilliers and Meyer (2016) are implemented. Recommendations to be implemented are provided in Section 8 of this report.

The geotechnical study did not include the proposed water pipeline routes.



Zone	Legend	Area (Ha)	NHBRC Class	Geotechnical Constraints
1A		11.65	C,S	This zone comprises low compressibility soils of less than 1m thick, with collapsing sands less than 750mm thick that occurs at foundations level
1B		1.45	C1,S1	This zone comprises moderately compressible soils between 0.75m and 1.5m thick, with collapsing sands more than 750mm thick
1C		1.25	C1, H2	This zone is underlain by compressible and medium expansive soils.
2A		2.83	C,S,R	This zone also includes intermediate excavatable hardpan ferricrete which will require hard ripping and powerful machinery to excavate the service trenches
3A		13.75	P1	This zone is associated with a fluctuating seasonal water table and sub-surface seepage
3B		3.75	P2	This portion of the site zone experiences some surface ponding during the rainy season.
3C		1.69	P3	This zone has been previously used partially for borrow materials and was seemingly not backfilled. Sawn off what seems to have been mature wattle trees also cover this zone.

Figure 5.8: Geotechnical zones (taken from Cilliers & Meyer, 2016)

5.6.4 Agricultural potential/land capability

In terms of land capability, the proposed school site and pipeline routes are indicated according to the Department of Agriculture, Fisheries and Forestry as high potential arable land (Figure 5.9).

As previously indicated, the said school site was used for planted pastures.

A section of the proposed water pipeline route will extend across a grassland area currently used for grazing purposes by the Generaalsdraai Village residents. The majority of the pipeline will however, be located adjacent to an existing gravel road.

The land capability/agricultural potential of the grassland surrounding Generaalsdraai Village has been impacted by overgrazing and residential activities associated with the village. No cultivation is taking place.

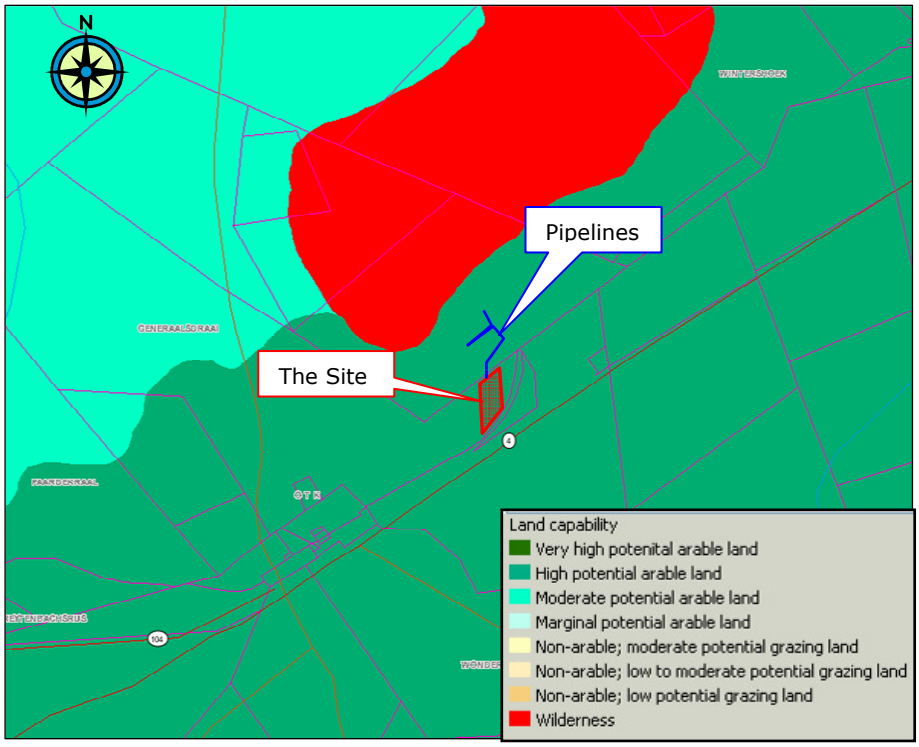


Figure 5.9: Land capability of the proposed school site and pipeline routes (taken from Department of Agriculture, Forestry and Fisheries)

Looking at grazing capacity, Figure 5.10 indicates that the proposed school site and pipeline routes have a grazing capacity of less than 4 ha required per livestock unit.

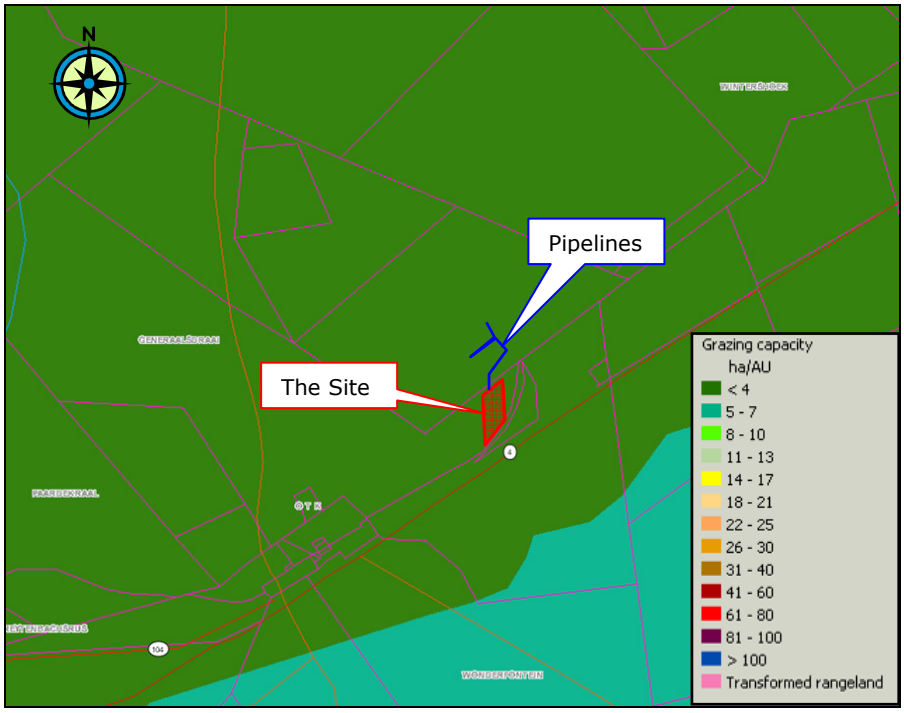


Figure 5.10: Grazing capacity of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

5.7 Natural vegetation

5.7.1 Regional vegetation and conservation status

According to 'The vegetation of South Africa, Lesotho and Swaziland', the study area falls within the Mesic Highveld Grassland bioregion, specifically the **Eastern Highveld Grassland** (veld type Gm12; Figure 5.11) (Mucina & Rutherford, 2006). The vegetation type was previously referred to by Low and Rebelo (1998) as Moist Sandy Highveld Grassland (38) and by Acocks (1953) as Bankenveld (61) and North-Eastern Sandy Highveld (57).

This grassland extends from the eastern side of Johannesburg towards Belfast and then southwards to Bethal, Ermelo and Piet Retief.

This vegetation type is characterized by short dense grassland, dominated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda,* etc.*)* with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Parinari capensis*, etc.).

Approximately 44% of the Eastern Highveld Grassland has already been transformed by cultivation, urban sprawl, mining, plantations and dams. This vegetation type has been afforded the status of **endangered** with a conservation target of 24%.

The National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as **Vulnerable**.

Vulnerable (VU) ecosystems - being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems.

The stated purpose of listing 'threatened ecosystems' is primarily to reduce the rate of ecosystem degradation and species extinction.

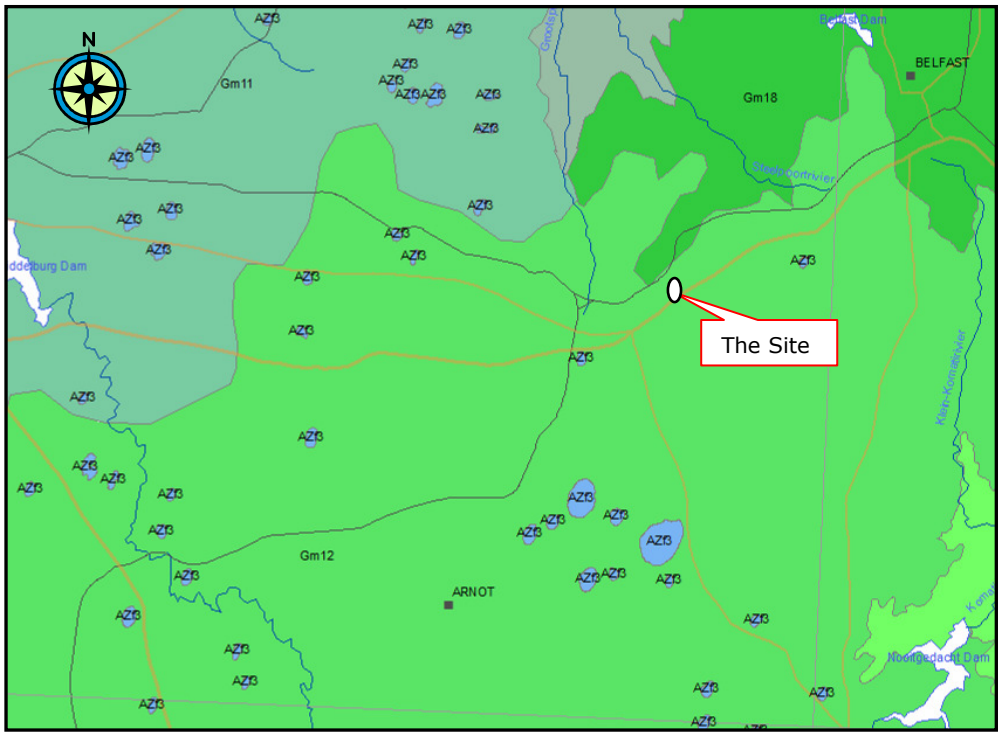


Figure 5.11: Vegetation type (taken from Mucina and Rutherford, 2006)

The entire school site is indicated as **'No Natural Habitat Remaining'/'Heavily Modified'** (Figure 5.12) in terms of the terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan (2006), due to the site being cultivated. The property towards the north of the site (i.e. area where the water pipelines and boreholes are proposed) is indicated as **'Ecological Support Area Aquatic'** (Figure 5.12). Towards the south of the site (i.e. between the railway line and the N4 national road), the area is indicated as **'Critical Biodiversity Area'** (Figure 5.12).

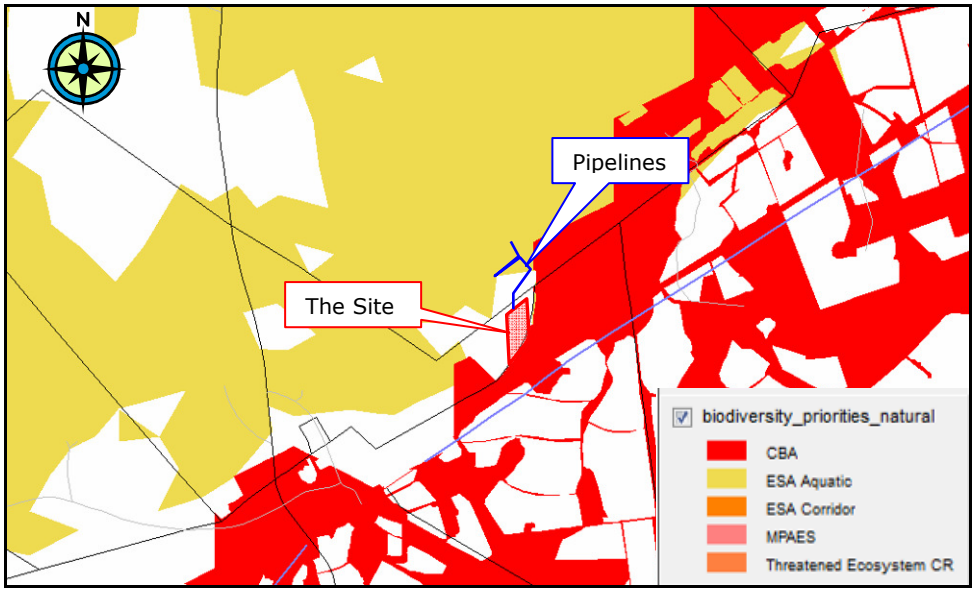


Figure 5.12: Terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan, 2006

The proposed school site does not fall within a Critical Biodiversity Area (CBA) as identified in the Mpumalanga Conservation Plan (2006). The proposed water pipelines and boreholes could however, impact on identified Critical Biodiversity/Ecological Support Areas (Figure 5.12). Listed activities in terms of Listing Notice 3 (GN R324) of the Environmental Impact Assessment Regulation (2014, as amended) could therefore be applicable.

Over the last few years (2007 – 2013), the Mpumalanga Tourism and Parks Agency reviewed and updated the Mpumalanga Biodiversity Conservation Plan (2006) in order to align the spatial data with the bioregional plan requirements of the South African National Biodiversity Institute (SANBI) and surrounding provinces.

The Mpumalanga Biodiversity Sector Plan (MBSP, 2013) is a biodiversity planning tool that provides the most recent spatial biodiversity information to inform land-use and development planning (Lotter *et al*., 2014). The main mapping categories used in the MBSP (in descending order of importance in terms of meeting conservation targets), are:

- Protected Areas;
- Critical Biodiversity Areas (Irreplaceable and Optimal);
- Ecological Support Areas;
- Other Natural Areas;
- Modified (Heavily Modified and Moderately Modified-old lands).

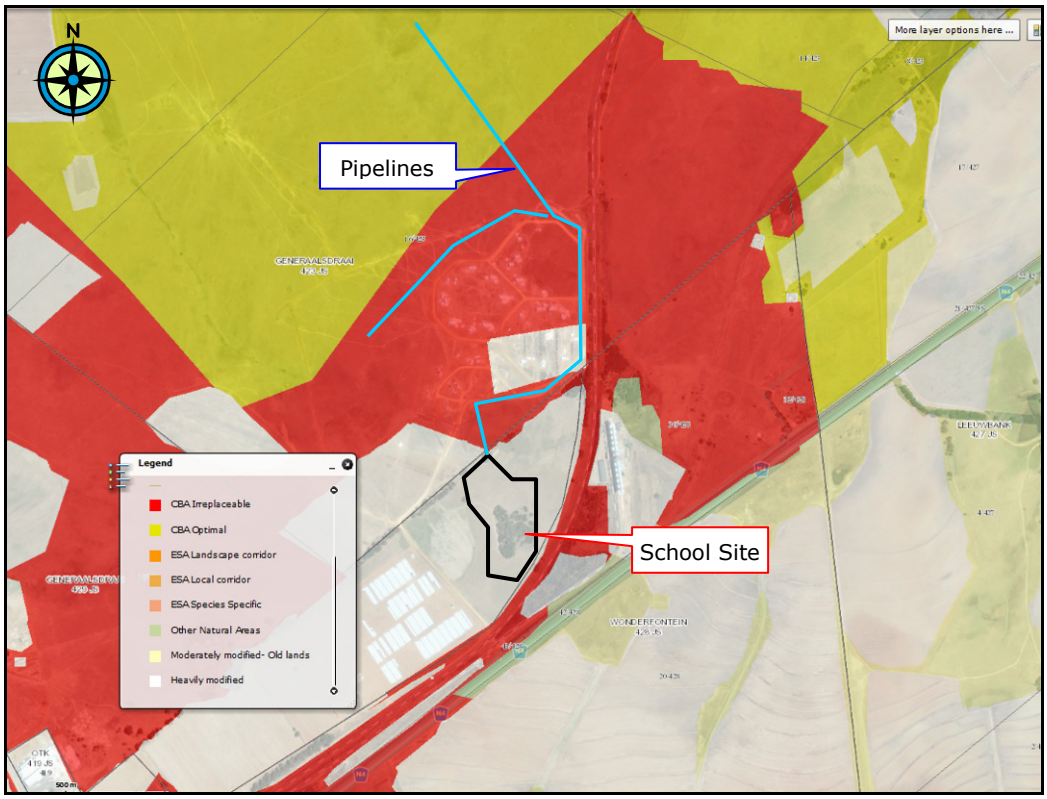


Figure 5.13: Terrestrial biodiversity assessment of the Mpumalanga Biodiversity Sector Plan, 2013

According to the Mpumalanga Biodiversity Sector Plan (MBSP, 2013), the proposed school site is classified as **Heavily Modified** (Figure 5.13).

The proposed water pipeline routes and boreholes will extend through areas classified as **Critical Biodiversity Areas (CBA)**, **Ecological Support Areas (ESA)** and **Heavily Modified** (Figure 5.13).

However, the entire area located north of the school site (which is indicated as a CBA; Figure 5.13), has been impacted by the Generaalsdraai Village. This area is therefore no longer pristine and should not be indicated as a CBA but rather as Heavily Modified in terms of the MBSP (2013).

5.7.2 Vegetation found on site and surrounds

As previously indicated, the majority of the site comprises planted pastures (*Eragrostis* sp.), which is cut and baled at the end of the summer season (Photo 5.11). During the winter months, the vegetation is burnt.

A large stand of alien trees used to be present in approximately the centre of the site as can be seen from the aerial view (Figure 5.2). Remains of the exotic vegetation (possibly Wattle) are still present in this area (Photo 5.12).

The vegetation on the school site has thus been significantly altered by various impacts.

Photo 5.11: A view of the planted pastures.

Photo 5.12: Remains of alien trees present on site

A seasonal seep wetland identified by Venter (2016) is present on the western boundary of the proposed school site (Figure 5.16 and Photo 5.13). This seep is dominated by planted pastures and kikuyu grass. The vegetation

has been impacted as a result of agriculture, the excavation of a trench and the construction of a road.

Photo 5.13: A view of the kikuyu grass dominating the seasonal seep

According to Venter (2016), a drainage line/seep wetland is also present north of the proposed school site (Figure 5.16 and Photo 5.14). Here the vegetation has been impacted by the construction of a small earthen dam, gravel road, trenching, alien vegetation and agriculture. Venter (2016) noted *Chenopodium album, Paspalum dilatatum, Ricardia braziliense* and *Stoebe vulgaris* within the drainage line/seep wetland, which are all indicative of disturbance. Green Wattle (*Acacia decurrens*), an invasive species, is also present adjacent to the small dam.

The majority of the proposed water pipeline routes will extend along an existing gravel road providing access to Generaalsdraai Village (Photo 5.14). Approximately 800 m of the proposed pipeline will however, extend across natural grassland vegetation. As can be seen in Photo 5.14, the natural grassland vegetation located near Generaalsdraai Village is heavily impacted by residential activities, powerlines, roads and grazing. The vegetation is short, with a small basal cover and plant species indicative of disturbance (e.g. Bankrupt Bush, Cosmos, Wild Verbena, Blackjack, Scottish Thistle, Khakibush, etc.).

The natural vegetation located further north and west of the Generaalsdraai Village has had fewer impacts and is therefore in a better condition in terms of diversity and basal cover as can be seen in Photo 5.15.

Photo 5.14: A view of the vegetation present along the pipeline route located near Generaalsdraai Village

Photo 5.15: A view of the natural vegetation located north of the site (near BH2) (taken from Van Vollenhoven, 2017)

The plant species observed on and adjacent to the site by Venter (2016) and AdiEnvironmental are indicated in Table 5.8.

Table 5.8: Plant species observed on and adjacent to the school site (taken from Venter, 2016 and AdiEnvironmental)

Species	Note	Location		
		Drainage line	Seep wetland	Terrestrial
Acacia decurrens	Invasive Category 2			X
Bidens sp	Indicates disturbance			X
Chenopodium album	Indicates disturbance	X		
Cirsium vulgare	Invasive Category 1b			
Cosmos bipinnatus	Indicates disturbance			X
Cynodon sp				X
Cyperus esculentus	Indicates disturbance			X
Datura stramonium	Invasive Category 1b			X
Eragrostis cf rigidior				X
Eragrostis tef	Planted grazing			X
Paspalum dilatatum	Alien grass common in wetland areas	X	X	X
Pennisetum clandestinum	Alien species	X	X	X
Ricardia braziliense	Indicates disturbance, alien species	X		
Sonchus sp	Indicates disturbance	X	X	X
Stoebe vulgaris	Indicates disturbance	X		X
Tagetes minuta	Indicates disturbance	X		X
Verbena bonariensis	Invasive Category 1b	X	X	

5.7.3 Plant Species of Conservation Concern

The term 'Species of Conservation Concern' refers to the IUCN Threatened and Near Threatened categories as well as the South African Red List categories (i.e. Critically Rare, Rare and Declining).

A list of Species of Conservation Concern, which historically occurred in the area (quarter degree square 2529DD), was obtained from the PRECIS Database (South African National Biodiversity Institute) and PlantDat database (Mpumalanga Tourism & Parks Agency). Only 2 plant Species of

Conservation Concern were recorded for this quarter degree square as indicated in Table 5.9.

Table 5.9: Plant Species of Conservation Concern recorded for quarter degree square: 2529DD

Latin Name	Common Name and Description	Habitat	Status
Khadia carolinensis	Perennial, succulent	Well-drained, sandy loam soils among rocky outcrops, or at the edges of sandstone sheets, Highveld Grassland	Vulnerable
Miraglossum davyi	Perennial herb, succulent	The plants grow in open, gentle sloping grassland of high altitudes on sand or heavy black loam soils in areas that are prone to very low temperatures, frost and even snow in winter.	Vulnerable

However, habitat for *Khadia carolinensis* and *Miraglossum davyi* (Table 5.9) does not occur within the proposed school site, and these species were not observed on site. It is extremely unlikely that they will occur on site, since the vegetation has been heavily impacted by agriculture and other human activities.

5.7.4 Protected plant species

In addition to the IUCN categories, the following legislation affords protected status to selected indigenous plant species:

- National Forests Act (Act 84 of 1998),
- NEMA Biodiversity Act (Act 10 of 2004, as amended in 2007), and
- Mpumalanga Nature Conservation Act (No.10 of 1998).

National Forests Act (Act 84 of 1998)

The National Forests Act lists 47 tree species that may not be removed or damaged without a license from the National Department of Agriculture.

None of the 47 tree species listed in Schedule A of this Act occurs within the study area or its immediate surroundings.

NEMA Biodiversity Act (Act 10 of 2004, as amended in 2007)

The intention of the Biodiversity Act is to protect plant species (e.g. cycads, yellow arum lily, protea, etc.) that are directly threatened in terms of their utilisation. The destruction, collection or trading of any species listed in this Act requires a permit.

As indicated in Section 5.7.3, no habitat for plant Species of Conservation Concern is present on site.

Mpumalanga Nature Conservation Act (No.10 of 1998)

A number of plant species are protected in the Mpumalanga Province under the Mpumalanga Nature Conservation Act, whether they are considered to be threatened or not. This includes, but is not limited to, the following common names: ferns, flame lilies, christmas bells, pineapple flowers, clivia, nerine,

crinum, ground lily, fire lily, irises, all orchids. A permit has to be obtained prior to their removal.

No protected plant species or trees were noted on site as the majority of the site is cultivated (i.e. planted pastures).

5.7.5 Invader or exotic species

Declared Weeds and Invaders are subject to the Conservation of Agricultural Resources Act (Act 43 of 1983) as amended in 2001. In terms of this Act, landowners are legally responsible for the control of alien plant species on their properties.

In addition, a number of plant species are listed as alien invasive species in terms of the Alien Invasive Species (AIS) Regulations, as defined in the National Environmental Management Biodiversity Act (Act no. 10 of 2014). The AIS regulations place each declared alien invasive plant species into one of four categories and stipulates measures for the eradication of plants in each of the four categories.

Invasive species (as indicated in Table 5.10) were noted on site as a result of the disturbances.

Table 5.10: Declared alien invasive plant species

Latin name	Category
Acacia decurrens	Invasive Category 2
Cirsium vulgare	Invasive Category 1b
Datura stramonium	Invasive Category 1b
Verbena bonariensis	Invasive Category 1b

*Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act (NEM: Biodiversity Act) as species which must be controlled.
Category 2 Listed Invasive Species are species listed as such by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.

5.8 Animal life

5.8.1 Regional conservation status

According to the MBSP (2013) the proposed school site is classified as **Heavily Modified** (Figure 5.13). The proposed water pipeline routes and boreholes will extend across areas classified as **Critical Biodiversity Areas (CBA)**, **Ecological Support Areas (ESA)** and **Heavily Modified** (Figure 5.13).

However, the entire area located north of the school site (which is indicated as a CBA; Figure 5.13), has been impacted by Generaalsdraai Village. This area is therefore no longer pristine and should not be indicated as a CBA but rather as Heavily Modified in terms of the MBSP (2013).

The proposed school site is also classified as **'Heavily Modified'** in terms of the Freshwater Biodiversity Assessment (Figure 5.14) with the area towards the north (i.e. where the pipeline routes and boreholes will be located) indicated as **'Other Natural Areas'**.

'Other Natural Areas' (ONAs) are defined as:

> *Natural areas that are potentially available to changes in land-use, subject to environmental authorisation processes. Although they are not identified to support freshwater CBAs or ESAs, they still provide important ecosystem services. Freshwater ONAs are particularly important in buffers around rivers and wetlands to reduce siltation and improve water quality. Old lands were included under Freshwater ONAs because of their functional importance in supporting and maintaining freshwater CBAs.*

It should be noted that the MBSP freshwater assessment includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment 2011).

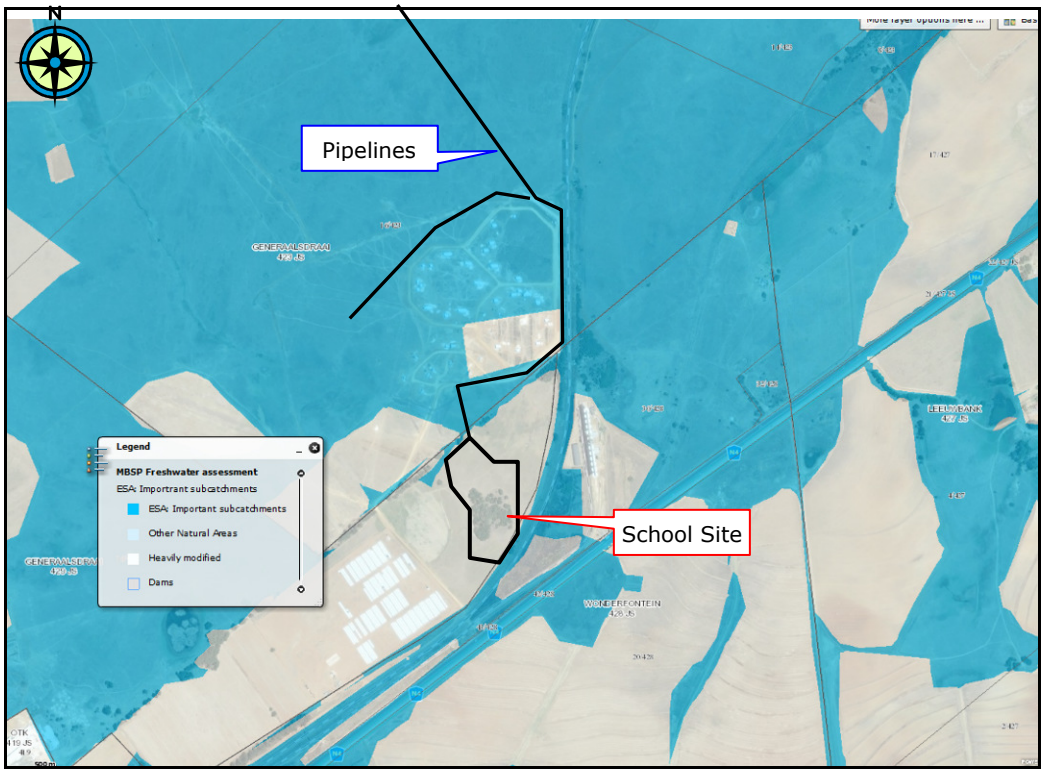


Figure 5.14: Freshwater biodiversity assessment of the Mpumalanga Biodiversity Sector Plan, 2013

No Critical Biodiversity Areas (CBA's) for aquatic species or Ecological Support Areas (ESA's) for fish or wetland clusters are present on or near the site as indicated in Figure 5.14.

5.8.2 Animal life found on site and surrounds

No animal species were noted on site during the site visits. It is highly unlikely that large animal species would permanently inhabit the area due to agricultural and residential activities taking place in the area. The said school site currently comprises planted pastures. The Afgri Silos are present east of the site and BKB Graanberging is present west of the site (Figure 5.2). In addition, Generaalsdraai Village is present on the northern boundary of the

school site. The school site is also bordered on the south and east by a railway line (Figure 5.2), which would impact on larger animal movement.

Smaller species such as rodents, insects, scrub hare, birds, etc. may frequent/pass through the planted pastures and surrounding cultivated lands. As indicated in Section 5.7, some natural vegetation is present towards the north (i.e. along the pipeline routes and where the boreholes are proposed), which could provide habitat for small mammals (e.g. duiker), reptiles, frogs, birds, etc.

5.8.3 Species of conservation concern

No species of conservation concern (e.g. Giant Bullfrog, Hedgehog, Serval, etc.) were noted on site during the site visits. It is unlikely that species of conservation concern will be present on the school site since the site has been transformed (planted pastures) and no natural habitat remains.

No species of conservation concern are expected along the pipeline routes due to heavy grazing, the presence of Generaalsdraai Village and the fragmented nature of the remaining grassland vegetation.

The possibility that Red Data species may occur in the area is however, not excluded.

5.9 Surface water

5.9.1 Catchment

The proposed site is located within the Steelpoort River Catchment (more specifically the B41A quaternary catchment), which forms part of the Olifants River Catchment. The site drains in a northwesterly direction towards tributaries of the Grootspruit and eventually the Steelpoort River, located approximately 20 km north of the site. The B41A catchment comprises 769.7km^2 with an estimated mean annual precipitation of 714 mm/annum and a recharge of 54.95 million m^3/annum (Du Preez, 2016).

The X11C quaternary catchment is located immediately south of the site.

The Minister has, in terms of section 12 of the National Water Act, Act No. 36 of 1998, prescribed a system for classifying water resources by promulgating Regulation 810 (Government Gazette 33541, dated: 17 September 2010).

The Water Resource Classification System is intended to ensure the ecological sustainability of all the significant water resources taking into consideration the social and economic needs of competing interests by all who rely on the water resource.

The proposed water resource classes for the Olifants catchment were published in Notice 619 of 2015 (Government Gazette 39004, dated: 20 July 2015). In terms of this notice, the water resource class of the B41A quaternary catchment is a Class III (indicating sustainable minimum protection and high utilization). The Ecological Category to be maintained is C (moderately modified). The natural MAR (Mean Annual Run-off) is indicated as 41.9 million m^3/a.

According to the MBSP Freshwater Biodiversity Assessment (2013), the proposed school site and pipeline routes do NOT fall within an Ecological Support Area (ESA): Important subcatchment (Figure 5.14).

It should be noted that the MBSP Freshwater Biodiversity Assessment (2013) includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment, 2011).

5.9.2 Surface water runoff

The school site is fairly flat with a gentle slope in a westerly and north westerly direction. The northern portion of the site drains towards a drainage line/seep wetland located north of the site (Figure 5.16). A small earthen dam is located within this drainage area (Figure 5.2 and Photo 5.16) as well as a cement culvert and trench which extends underneath the existing gravel road (Photos 5.8 and 5.19).

The southern and western portions of the site drain towards a temporary to seasonal seep located west of the school site (Figure 5.16). A trench was excavated around the western seep to divert seepage water/storm water from the school site towards the northern drainage line (Photos 5.3 and 5.17).

Photo 5.16: A view of the small dam located within the northern drainage area

5.9.3 Wetlands

The Mpumalanga Biodiversity Sector Plan (MBSP, 2013) indicates only one wetland approximately 1.7 km south east of the site (Figure 5.15).

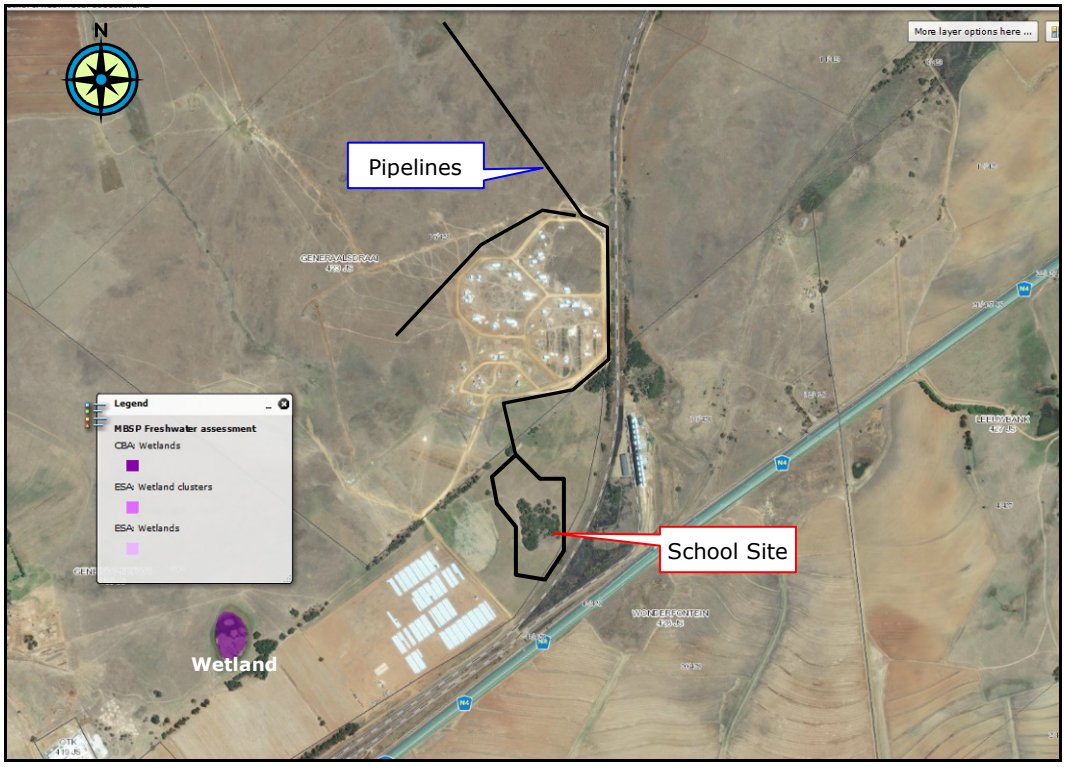


Figure 5.15: The proposed site in relation to nearby wetlands (taken from Mpumalanga Biodiversity Sector Plan, 2013)

A wetland assessment and delineation study was undertaken by I Venter of Kyllinga Consulting (referred to as Venter, 2016). A copy of the report is provided in Appendix 6 and should be consulted with regards to the methodology used.

5.9.3.1 Wetlands identified within and near the study area

Venter (2016) identified the following wetland units within and near the study area:

- Temporary to Seasonal Seep;
- Drainage line/seep wetland;
- Off-site seep.

Figure 5.16 provides an indication of the various wetland units identified within the study area.