Licensing of the Belfast Resettlement Project

Integrated Water Use Licence Application: Summary Report

Exxaro Coal Mpumalanga

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Approval			
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Abbreviations used in this document

BAR	Basic Assessment Report
BID	Background Information Document
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
FEPA	Freshwater Ecosystem Priority Area
GN	Government Notice
HAS	Hazardous Substances Act, 1973 (Act No.15 of 1973)
HDSA	Historically Disadvantaged South Africans
HGM	Hydrogeomorphic unit
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IWULA	Integrated Water Use Licence Application
MBSP	Mpumalanga Biodiversity Sector Plan
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NEMA	National Environmental Management Act, 1998 (Act No.107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
No.	Number
NWA	National Water Act, 1998 (Act No. 36 of 1998)
RU	Resource Units
OHSA	Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
PES	Present Ecological State
RWQO	Resource Water Quality Objective
SP	Significance Points
SST	Secondary Settling Tank
TSE	Treated Sewage Effluent
TDS	Total Dissolved Solids
WMA	Water Management Area
WSA	Water Service Authority
WSP	Water Service Provider
WWTP	Wastewater Treatment Plant

Executive Summary

Exxaro Mpumalanga Resources (Pty) Ltd (Exxaro) operates a coal mining complex between the towns of Belfast and Carolina. The complex is referred to as the North Block Complex, and consists of the Glisa, Eerstelingsfontein and Strathae Coal Mines. Through the Belfast Open-pit Coal Mine Project (Belfast Project), Exxaro is expanding its operations to extract coal resources from an estimated 46 Megaton (Mt) reserve. The envisaged mining activities will require the relocation of 32 non-landowning households which will be directly impacted by the proposed mining operation are situated on this mining right area.

Exxaro commenced with the resettlement action plan (RAP) in 2013. As part of the RAP, Exxaro will be donating approximately 80 ha of land (owned by Exxaro) to the affected 32 household community. A small piece of the donated area will be used to develop a small scale rural farming development for the community. Each affected community member will receive 2500m plot.

The purpose of this application is to establish 32 (2500m^2) plots sufficient in size for establishing residential- and outbuildings (500 m^2 each of the 2500m^2) has been allocated for this purpose each. The remainder of each plot to be used for and various small scale agricultural activities (2000 m^2 of the 2500m2 has been allocated for this purpose each) e.g. including poultry, small livestock, fruit trees, dryland cropping and homestead vegetable gardens. A new community multi-purpose facility on a 2500m^2 plot, catering for approximately 120 people will also form part of the resettlement area, The remainder of the 80ha property can be used by the households for example grazing or other agricultural activities as may be required by the community to be resettled. Additional grazing areas will also be made available to the community as required (although the additional grazing areas will not be donated to the community). Stormwater within the resettlement, will be drained in an earth-lined stormwater channel running alongside the road. This channel will be a 2m wide vee-shaped and will have a reinforced concrete toe to prevent erosion at the foot of the channel.

Exxaro has commissioned an Integrated Water Use Licence Application process(IWULA) for the impacts associated with the relocation process in terms the National Water Act, 1998 (Act No. 36 of 1998) [NWA].The proposed activity will be located in the B41A quaternary catchment of the Olifants Water Management Area (WMA).

Out of the seven locality alternatives initially considered during the RAP, two sites alternatives were investigated and consulted with the communities for this proposed project. These two alternatives are discussed in more detail in Section 3. The community preferred resettlement site that has been indentified is located on Zoekop Farm 426 JS Portion 13, Leewubank Farm 427 JS Portion 13 and Paardeplaas Farm 425 JS Portion R (the Study Site).

This document provides detailed motivation in support that the water uses identified for the follow project be considered in the form of a general authorisation as the activities are a low risk.

Both ground and surface water resources will potentially be affected (low impact) by the proposed resettlement. The environmental authorisation process for the proposed project is being undertaken by

Aurecon (Pty) Ltd. The Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) has acknowledged the application for the proposed listed activity in terms of NEMA and has issued a reference number (14/12/16/3/3/1/988). Refer to **Appendix B** for the Draft Basic Assessment Report (BAR) and the Draft Environmental Management Plan Report (EMPr) prepared in support of the application for environmental authorisation of the NEMA listed activities.

Table 1: Summary of Water Uses

Water Use	Ref Point	Latitude	Longitude	Description	Volumes	Properties Affected
Schedule 1	BH2 and BH5			Section 21 (a) Abstraction of water in term of Schedule 1 for domestic water use	17kl/day or 8,678 m^3/a	Paardeplaats 425 JS remainder Zoekop 426 JS Portion 13
	ET1	25° 45' 40.24" S	29° 57' 56.019" E	Section 21 (b) Storage of water	42,442 m^3/a of water stored on an elevated water tank	Paardeplaats 425 JS remainder Zoekop 426 JS Portion 13
WU1	1	25° 45' 31.791" S	29° 57' 55.059" E	Resettlement housing and roads Section 21 (c & i): Within 500m of wetland HGM unit 1 (Hill Slope Seep)	None	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13
	2	25° 45' 32.445" S	29° 58' 18.071" E			
	3	25° 45' 41.753" S	29° 58' 14.643" E			
	4	25° 45' 42.888" S	29° 57' 54.994" E			
WU2	1	25° 45' 31.791" S	29° 57' 55.059" E	Resettlement housing and roads Section 21 (c & i): Within 500m of wetland HGM unit 2 (Hillslope Seep)	None	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13
	2	25° 45' 32.445" S	29° 58' 18.071" E			
	3	25° 45' 41.753" S	29° 58' 14.643" E			
	4	25° 45' 42.888" S	29° 57' 54.994" E			
WU3	1	25° 45' 31.791" S	29° 57' 55.059" E	Resettlement housing and roads Section 21 (c & i): Within 500m of wetland HGM unit 4 (Hillslope Seep)	None	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13
	2	25° 45' 32.445" S	29° 58' 18.071" E			
	3	25° 45' 41.753" S	29° 58' 14.643" E			
	4	25° 45' 42.888" S	29° 57' 54.994" E			
WU4	SP1	25° 45' 38.807" S	29° 57' 58.302" E	Section 21 (c & i): Sewer Pipeline within 500m of wetland (HGM unit 1 & HGM Unit 2)	None	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13
	SP2	25° 45' 34.176" S	29° 57' 56.276" E			
	SP3	25° 45' 33.331" S	29° 58' 18.107" E			
	SP4	25° 45' 40.730" S	29° 58' 13.125" E			

WU5	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 (c & i): WWTP within 500m of wetland (HGM Unit 1)	None	Zoekop 426 JS Portion 13
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E			
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E			
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E			
WU6	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 g: Waste water treatment facility	Treatment of a maximum of 6,312 m^3/a	Zoekop 426 JS Portion 13
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E			
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E			
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E			
					Total storage of treated waste water in tanks 6,312 m^3/a	
WU7	**TSE Out**	25° 45' 32.903" S	29° 58' 17.943" E	Section 21 f : Discharge of waste water	Overflow will be discharges. Amount of water cannot be determined	Zoekop 426 JS Portion 13
WU8	**1**	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 e: use of treated waste water for irrigation	Approximately 6,312 m^3/a of treated waste water will be used for irrigation.	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13
	2	25° 45' 32.445" S	29° 58' 18.071" E			
	3	25° 45' 41.753" S	29° 58' 14.643" E			
	4	25° 45' 42.888" S	29° 57' 54.994" E			

Commented [RN1]: As per your comment regarding the new GA for section 21 c & I. Please not this regulation falls away when there is an Integrated water use licence application with more that one water use. Therefore this activity will be excluded from the GA, Please check section 3 © of the new GA (GN 506 of 2016)

Contents

Commented [TD2]: Please check that this is all in line with that of the guidelines of the DWS for IWULA and IWWMP

Commented [RN3]: Tarryn this is in line with both the aide memoir and the IWULA. As both WWTP and a other water uses this is the most applicable format that has to be used

Appendices

Appendix A

Draft BAR and EMPr

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1 Project Description

1.1 Project Locality

The settlement is proposed on portion 13 of the farm Zoekop 426 JS, part of the remainder of the farm Paardeplaats 425 JS and portion 13 of the farm Leeuwbank 427 JS, 11.5 km from Belfast Town in Mpumalanga Province. The site is located 10km southwest of Belfast Town and 10 km east of the N4 and R33 interchange. It falls under the jurisdiction of Ward 1 of the eMakhazeni Local Municipality in the Nkangala District Municipality. The property is owned by Exxaro Coal (Pty) Ltd. The proposed project location is shown in **Figure 1**, and includes the affected properties .

Coordinates of the centre of the proposed Exxaro Belfast Resettlement Project:

Latitude: 250 45' 37.54" S

Longitude: 290 58' 16.85" E

Four household groups will be relocated. The distances of current community/household locations to the proposed resettlement site is approximately 6.4 km, 5 km, 5.2 km, and 3.6 km. The proposed site is located approximately 6.5 km north of the southernmost point of the mine.

1.2 Project Overview

The intention of the project is to establish a small-scale farming settlement on the farm Zoekop 426 JS portion 13, Leeuwbank 427 JS portion 13 and a portion of the remainder of the farm Paardeplaats 425 JS (**Figure 1**). The proposed site is one of seven potential resettlement sites initially identified in the RAP that was selected based on various criteria concerning settlement size, location, land use, land potential, access to services and employment, land claims and servitudes. The preferred site is within the Belfast Project mining right area and on land owned by Exxaro, but outside the 500 m safety buffer around proposed pits and mine infrastructure. The land is currently zoned as agricultural land and is approximately 5 km from the community's current location.

No municipal services will be required, as Exxaro will provide all services to the community to be relocated. Water will be obtained from two boreholes located on the property and a waste water reticulation network and treatment plant will be constructed to treat all sewage generated by these households. Exxaro will support and maintain these services for three years as per the RAP Entitlement Framework. A landowners association will be established consisting of all the home owners within the resettlement area. After the initial 3 year period, the landowners association will take over the responsibilities from Exxaro and be responsible for the maintenance of all structures, infrastructures and services. Services to be established at the site include roads, storm water drainage, potable water, sanitation, fencing and electricity. Each plot or stand will be fenced off with a wire fence and fitted with a steel fate wide enough to admit a motor vehicle. A concept layout of the resettlement site is shown in **Figure 2**.

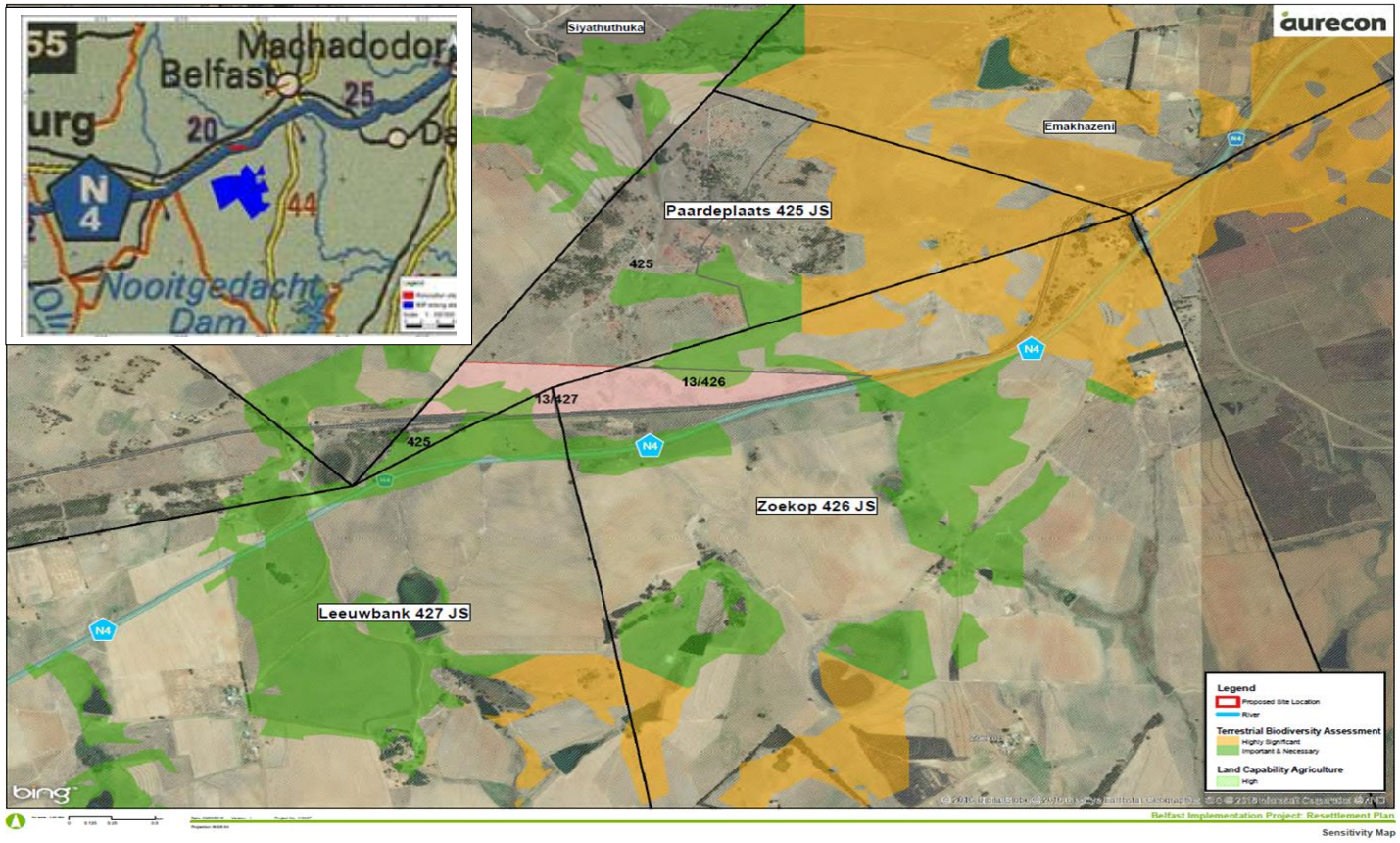

Figure 1: Project Locality

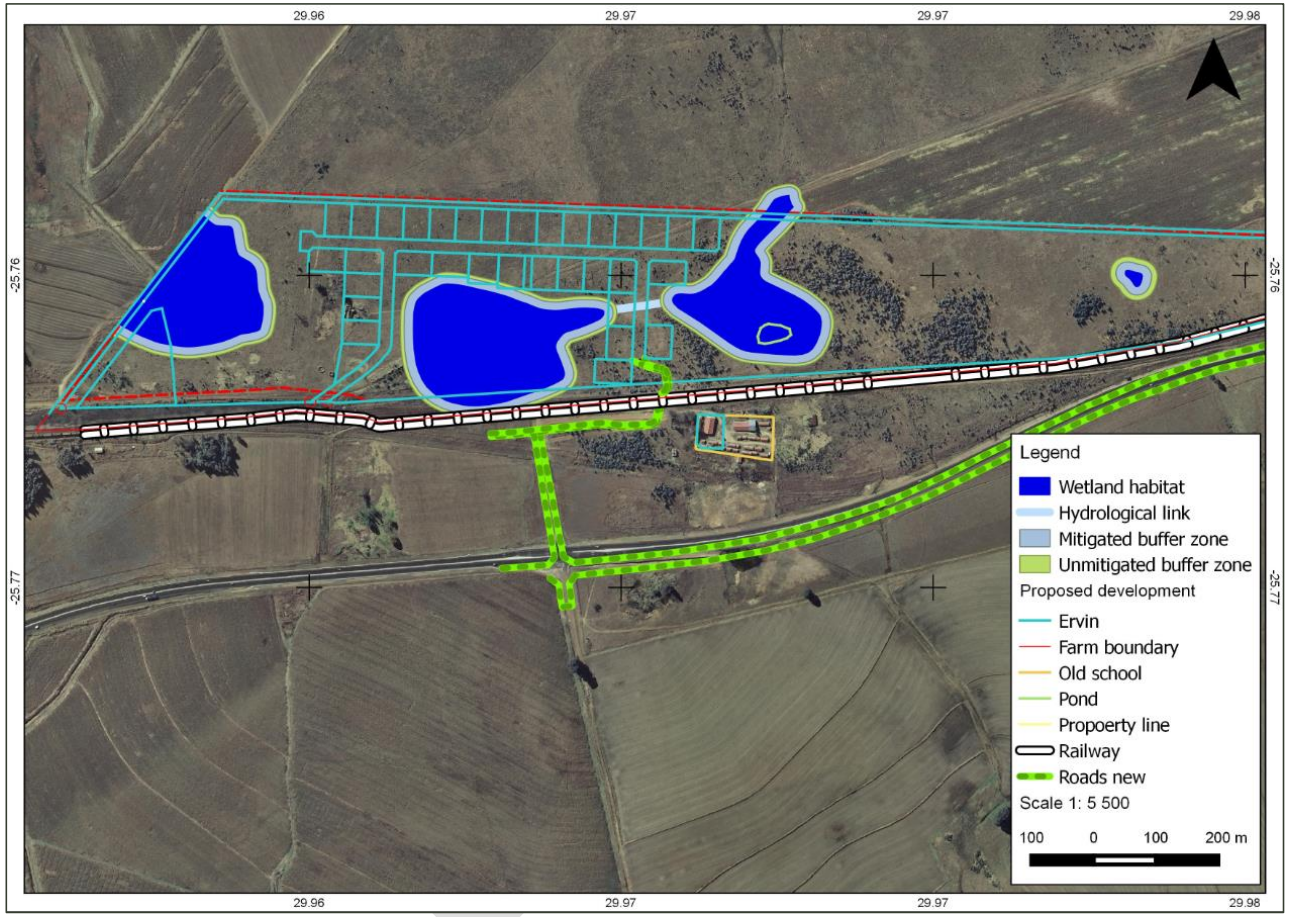

Figure 2: Concept site layout (Digby Wells Environmental, 2015)

1.1.1.1. Resettlement housing construction

Exxaro will, through a contractor, undertake to build the main structures of the each household.

The following arrangements will apply with regard to replacement housing (Digby Wells Environmental, 2015):

- Each household will receive one single storey residential structure with a floor area that is similar in size to that of residential structures currently owned by households, and with living space that is large enough to comfortably accommodate all current household members. The houses will have between two and eight bedrooms.
- Each replacement residential structure will consist of the following:
  - A concrete foundation;
  - Walls of either face brick or plastered brick, depending on the household's preference. If the latter option is selected, the walls will be painted with polyvinyl acetate paint in the colour white;
  - Corrugated roof sheeting;
  - A ceiling;
  - Gutters around the whole house and one point leading to a water tank;
  - Indoor plumbing;
  - Electrical reticulation;
  - A front door and a back door; and
  - Glass windows with steel frames.

The houses will be placed on cut-to-fill platforms, extending 1 m from outside walls to prevent ponding against houses. *In situ* materials will be used for platform construction.

The main features of concept designs for various services to be supplied at the residential resettlement site include the following (Digby Wells Environmental, 2015):

- ***Roads:*** Access to the property will be via secondary local access roads, which will provide access from the N4 highway. It is foreseen that the development will generate a negligible amount of private vehicular trips, as very few of the relocated families own cars. For this reason, no upgrades to the N4 intersection will be required. The internal and main access roads will be gravel with a maximum of two *in-situ* layers.
- ***Storm water management:*** Storm water drainage will be by means of trapezoidal, 3 m wide and 0.5 m deep, unlined channels on road shoulders or on the streets. Pipe culverts with a diameter of 600 mm will be provided at driveways obstructed by storm water channels to ensure access to stands during a storm.
- ***Potable water:*** Since there is currently no municipal water supply or bulk water line in the area, it is envisaged that water would be most sustainably supplied through the use of groundwater accessed by boreholes located to the east and north east of the proposed property. Water from the boreholes would be pumped to an elevated steel tank; this would be positioned at the highest point on the development to ensure sufficient head to supply the site's water needs without additional booster pumps being required. Water reticulation will lead to individual connections on the residential stands, and indoor plumbing in homes.

The average water consumption based on a population of 200 people is estimated at 17 170 litres per day, as set out in **Table 2.**

Table 2: Average water consumption for a population of 200 people

Domestic Appliances	Average Water Consumption (l/d/p) (obtained from SANS 10252-1)	Average Water Consumption (l/d)
Car washing and garden use	6	1,200
Drinking, food preparation and cooking	22	4,400
Laundry	15	3,000
Personal washing and bathing	30	6,000
Washing dishes	12	2,400
WC – waterless		
Subtotal	**85**	**17,000**
Allow for 10% losses	8.5	170
Total	**93.5**	**17,170**

Following the Ground Water Assessment, the two boreholes to be abstracted yields 129 600 litres per day, which is more than required for a population of 200 people.

- ***Sanitation:*** The preferred option for the resettlement site are full waterborne flushing toilets inside houses. A waste water reticulation network and wastewater treatment plant will be constructed to treat all sewage generated by these households.
- ***Fencing:*** The site is to be fenced along the site perimeter. In addition, each stand will be fenced off with a 1.2 m high, 6-strand barbed wire fence. Two 1.8 m wide farm / swing gates will be installed per stand to will allow for vehicular and pedestrian access.
- ***Electricity:*** Electricity supply to the site will have two components:
  - Communal supply to the boreholes and other possible service points outside the residential stands. All such communal services will be supplied with solar installations.
  - House connections will be equipped with prepaid meters. An existing 11 kV overhead power line, which is supplied from the Kraal / Wonderfontein Eskom substations, supplies the surrounding farming communities and is situated on the northern boundary of the site. Required infrastructure to connect the households to this line includes two 50 kVA transformers, a medium voltage overhead feeder line, and a low voltage overhead service connection to each dwelling. No street lighting will be installed. Houses will be supplied with gas or coal stoves to limit electricity demand and cost (Digby Wells Environmental, 2015).

1.1.1.2. Services at the resettlement site

Stands for the replacement houses at the resettlement site will be provided with water, sanitation, indoor plumbing, and electricity services at the cost of Exxaro. As far as possible, these services will be self-contained by installing, for instance, solar power technology and borehole water.

Exxaro will, for a period of three years from date of resettlement, be responsible for the repair and/or maintenance of the internal services, as well as for the provision of potable water that complies with drinking water standards. After this, the households will be liable for any repair and/or maintenance required (Digby Wells Environmental, 2015). Exxaro will transfer these service assets to the Local Municipality for maintenance.

1.1.1.2.1. Standing crops

Standing crops refer to crops that are on the field or fruit on the trees at the time of resettlement. In the event that there are such standing crops, compensation for these standing crops will be in the form of a monetary payment calculated on the basis of local market rates at the time.

1.1.1.2.2. Fruit trees

Households will, at Exxaro's cost, receive five peach saplings which will be planted by Exxaro. Households who currently own more than five trees will receive additional trees of the same number and type as they currently own. Exxaro will be responsible for transporting the saplings to household resettlement sites, as well as for digging the holes for each tree and have it planted by a horticulturist at a permissible place of the resettled household's own choosing.

Resettled households will be responsible for the watering of the trees at the resettlement site (Digby Wells Environmental, 2015).

2 Administrative Information and Project Description

2.1 Applicant

Exxaro Coal Mpumalanga (Pty) Ltd is the water use licence applicant. Details of the applicant are as follows:

Table 3: Contact details of the applicant

Name of the site	**Exxaro Coal Mpumalanga (Pty) Ltd**		
Contact Person	Johan van der Bijl		
Postal Address	P.O. Box 1454, Pretoria, 0001		
		Tel. Number	012 307 7468
Email	johan.vanderbijl@exxaro.com	**Fax Number**	012 307 4612

2.1.1 Details of the project consultant

Exxaro appointed Aurecon as an independent environmental consultant to compile the application for the proposed activity. Aurecon's details are presented below **(Table 4).**

Table 4: Project consultant details

Company Name	**Aurecon South Africa (Pty) Ltd**
Physical Address	Aurecon Centre, 4 Daventry Street, Lynnwood Manor Tshwane 0081
Contact Details	012 427 2170
Representative	Roshantha Nanoolal

2.2 Regulatory framework

2.2.1 National Water Act, 1998 (Act No. 36 of 1998)

Section of the NWA	Description of listed activity as per the project description
21(c)	***Impeding or diverting the flow of water in a water resource;***
21 (i)	***Altering the bed, banks, course or characteristics of a water resource;***
21 (e)	***Discharge of water containing waste for irrigation***
21 (f)	***Discharge of water or water containing waste through pipe conduit or canal***
21(g)	***Disposing of waste in a manner that may detrimentally affect a water resource;***
22(1)	***a person may only undertake the abovementioned water uses if it is appropriately authorised:*** ***A person may only use water*** ***(a) without a licence*** ***(i) if that water use is permissible under Schedule 1 (of the NWA);*** ***(ii) if that water use is permissible as a continuation of an existing lawful use; or*** ***(iii) if that water use is permissible in terms of a general authorisation issued under section 39;*** ***(b) if the water use is authorised by a licence under this Act; or*** ***(c) if the responsible authority has dispensed with a licence requirement under subsection (3).***
39(1)	***Minister which are of a general nature, such as the powers of delegation and expropriation, and intervention in litigation. More specific powers and duties are dealt with elsewhere in the Act.*** ***Delegation of powers and duties by Minister***
39(2)	***Minister to consult with the public when making regulations under this Act, and also to submit regulations for scrutiny by the National Assembly and by the National Council of Provinces. If the National Assembly rejects a regulation it must be repealed or amended.***

2.2.2 General Authorisation

In terms of General Notice 506 of the 26 August 2016, the following condition applies to the proposed activity for Section 21 (c & i) water uses. As the water uses are of a low risk. Due to the nature of an IWULA condition set out in Section 3(c) and (d) of GN 506, excludes the proposed Section 21 (&i) water uses form being authorised in terms of a General Authorisation .

2.3 Existing Exemptions

There are no existing exemptions.

2.4 Contract between the Water Services Authority (WSA) and the Water Services Provider (WSP)

Not applicable as the WSA and WSP are the same.

2.5 Magisterial District

The proposed resettlement project falls within the Emakhazeni Local Municipality and the Nkangala District Municipality.

2.6 Nearest Town

The nearest town is Belfast, which is located 11.5km away **Appendix B.1**.

2.7 Surface Infrastructure Serving the Site

Currently there is no surface infrastructure on the resettlement site **Appendix B.2**.

2.8 Ownership of Land

The settlement is proposed on portion 13 of the farm Zoekop 426 JS, part of the remainder of the farm Paardeplaats 425 JS and portion 13 of the farm Leeuwbank 427 JS, 11.5 km from Belfast Town in Mpumalanga Province. Copies of the title deeds are attached in **Appendix E**.

2.9 Longitude and Latitude of water uses

Table 5: Water uses location

Water Use	Ref Point	Latitude	Longitude	Description
WU1	1	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Within 500m of wetland HGM unit 1 (Hill Slope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	

Commented [TD4]: We need something like this up front with volumes and capacities and property

Commented [RN5]: Added up front

	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU2	**1**	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Within 500m of wetland HGM unit 2 (Hillslope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU3	**1**	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Within 500m of wetland HGM unit 4 (Hillslope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU4	**SP1**	25° 45' 38.807" S	29° 57' 58.302" E	Section 21 (c & i): Sewer Pipeline within 500m of wetland (HGM unit 1 & HGM Unit 2)
	SP2	25° 45' 34.176" S	29° 57' 56.276" E	
	SP3	25° 45' 33.331" S	29° 58' 18.107" E	
	SP4	25° 45' 40.730" S	29° 58' 13.125" E	
WU5	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 (c & i): WWTP within 500m of wetland (HGM Unit 1)
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E	
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E	
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E	
WU6	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 g: Waste water treatment facility
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E	
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E	
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E	
WU7	**TSE Out**	25° 45' 32.903" S	29° 58' 17.943" E	Section 21 f : Discharge of waste water
WU8	**1**	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 e: use of treated waste water for irrigation
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	

2.10 Ownership of the Adjacent Land

The settlement is proposed on portion 13 of the farm Zoekop 426 JS, part of the remainder of the farm Paardeplaats 425 JS and portion 13 of the farm Leeuwbank 427 JS, 11.5 km from Belfast Town in Mpumalanga Province. The property is owned by the Exxaro Coal Mpumalanga (Pty) Ltd. The proposed project location is shown in **Table 6**, and affected properties

Table 6: Property details

WATECOURSE	PROPERTY	TITLE DEEDS
Wetland (HGM Unit 1)	Paardeplaats 425 JS Remainder Zoekop 426 JS Portion 13	T77923/2003 T77921/2003
Wetland (HGM Unit 2)	Paardeplaats425 JS Remainder Leewubank 427 JS Portion 13	T77923/2003 T4980/1929

	Zoekop 426 JS Portion 13	T77921/2003
Wetland (HGM Unit 4)	Paardeplaats 425 JS Remainder Leewubank 427 JS Portion 13 Zoekop 426 JS Portion 13	T77923/2003 T4980/1929 T77921/2003

2.11 Zoning of the Adjacent Land

The adjacent land is zoned as agricultural.

2.12 River Catchment

The project area is located on the eastern edge of Quaternary Catchment B41A. The N4 road is aligned along the boundary of the quaternary catchment. Catchment B41A forms part of the greater Olifants River primary catchment area. In hierarchical terms, starting from the site in the upper reaches of the catchment, HGM 4 feeds the Grootspruit River, a National Freshwater Ecosystem Priority Area (NFEPA) with a Class C Present Ecological State (PES), indicating that it is considered to be moderately modified. HGMs 1 and 2 feed indirectly into the Langspruit, also a Class C NFEPA water resource. The Langspruit and the Grootspruit confluence approximately 3.5km north of the site to form the headwaters of the Steelpoort River. This is also an NFEPA river of national importance, and its ecological state varies from Class B, Largely Natural, (in the upper reaches) to Class C and Class D lower down. The Steelpoort confluences with the Olifants River approximately halfway along the latter's course, although this is a considerable distance north of the site.

2.13 Intention of this Application

The intention of this application is to all water uses (in terms of Section 21 of the NWA) associated with proposed Belfast Resettlement, namely:

- Section 21 (c): Impeding or diverting the flow of water in a watercourse;
- Section 21 (e): Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- Section 21 (f): Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
- Section 21 (g): Disposing of waste in a manner that may detrimentally affect a water resource; and
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

3 Description of Environment

3.1 Climate

The study site is situated in the Mpumalanga Highveld, with the climate characterised by temperate summers and cool winters. The rainfall is strongly seasonal, occurring mainly in summer, and frost is frequent during the winter months. The site occurs in quaternary catchment B41A, as defined by Midgley et al. (1994), and mean annual precipitation (MAP) is relatively high at 714.7mm. Evaporative demand (Potential Evapotranspiration, or PET) is 1863.5mm (Schulze 2007), which suggests that the wetlands within the catchment would have a Moderately High sensitivity to hydrological impacts within the catchment (Macfarlane et al., 2007)..

3.2 Topography and Drainage

The landscape in which the site is situated consists of a level, gently undulating topography characterised by broad, low, convex hills separated by open, shallow valleys. The underlying geology consists of a mosaic of Ecca Group shales and sandstones. These generally give rise to shallow, weakly structured clay soils (in the case of shale), and deep, sandy, well-drained apedal soils (sandstone).

The N4 national road forms a local watershed, and the landscape drains northwards into a substantial wetland and riparian system to the north of the site. The site is situated in the upper reaches of the watershed. The wetland hydrogeomorphic types identified suggests that the local catchments soils are deep, sandy, well-drained apedal soils that are either luvic, or underlain by an impervious layer of parent material. The dominant hydrological processes are: (1) the infiltration of rainfall; (2) vertical percolation of rainfall through the soil profile until contact is made with the aquiclude or aquitard; and (3) subsequent subsurface lateral movement along the impervious layer. Water is discharged into the landscape lower down in the landscape where the impervious layer is exposed, forming a hillslope seepage wetland.

HGM 4 forms the upper reaches of a large seepage wetland system that drains north-west from the site. HGMs 1 and 2 are essentially part of the same system, since there is hydrological linkage, and this drains west, parallel to the railway line. Wetlands form where the top 50cm of soil is saturated for sufficient time to influence the vegetation and the soil morphology. They are hence surface features, and are influenced by surface topography. It is likely that the subsurface topography associated with the site slopes consistently to the north, allowing subsurface water to drain into the large drainage system to the north of the site.

3.3 Soil

Soils (**Figure 3**) can be characterised by deep greyish sands, eutrophic plinthic catenas, red-yellow apedal freely drained soils with high base status and clayey in bottomlands (Terblanche, 2002).

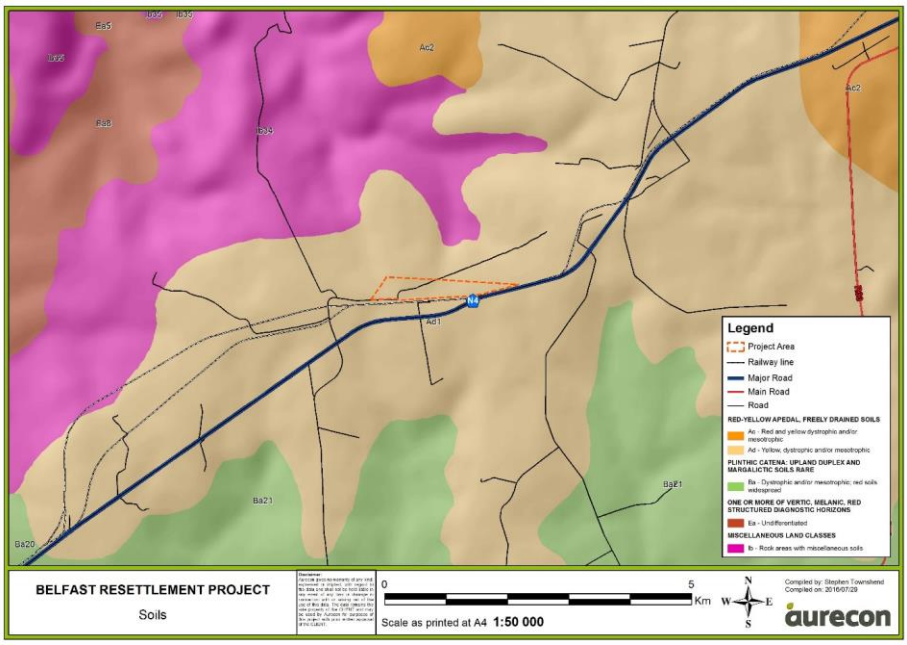

Figure 3: Soils in area of proposed Belfast resettlement project

3.4 Geology

According to the 1:250 000 geological map (2528 Pretoria), the study area is underlain by sedimentary rocks of the Vryheid Formation, Karoo Supergroup. The rocks consist of sandstone, shale, gritstone, conglomerate with coal seams in places near the base and top. The few wetland areas within the study site are characterised by alluvial soils. **Figure 4** gives an indication of the geology of the project area while **Figure 4**, indicates the freely drained soil type.

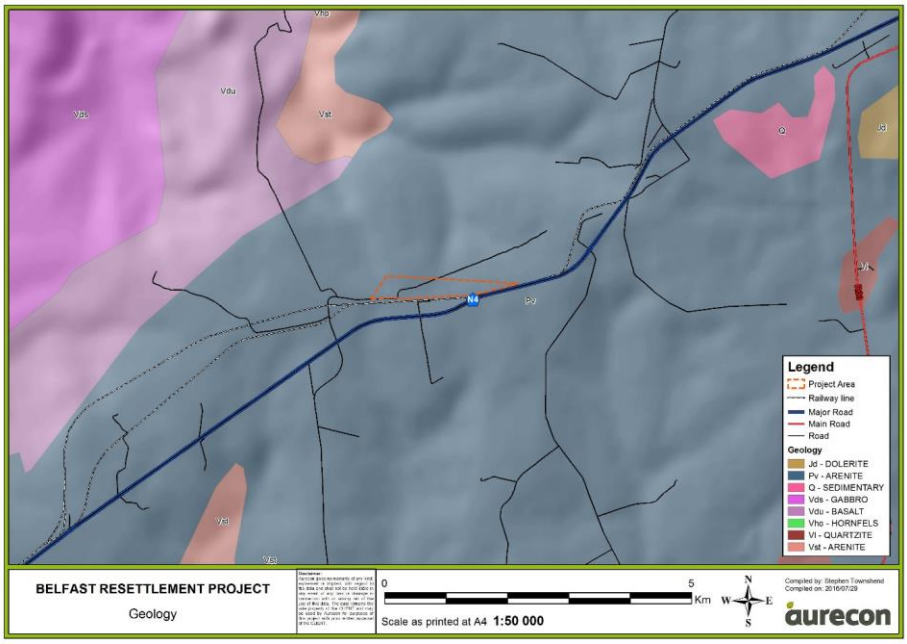

Figure 4: Geology of the study area *(Source: Stroebel and Terblance, 2015)*

3.5 Land Use

The proposed site is currently zoned as agricultural, but undeveloped. Located north of a railway line and the N4 highway, it's bordered by cultivated lands to the east and west. Evidence of an old eucalyptus plantation can be found, as well as exotic trees and the aforementioned small wetlands. **Figure 5** gives an indication of the land cover of the project area.

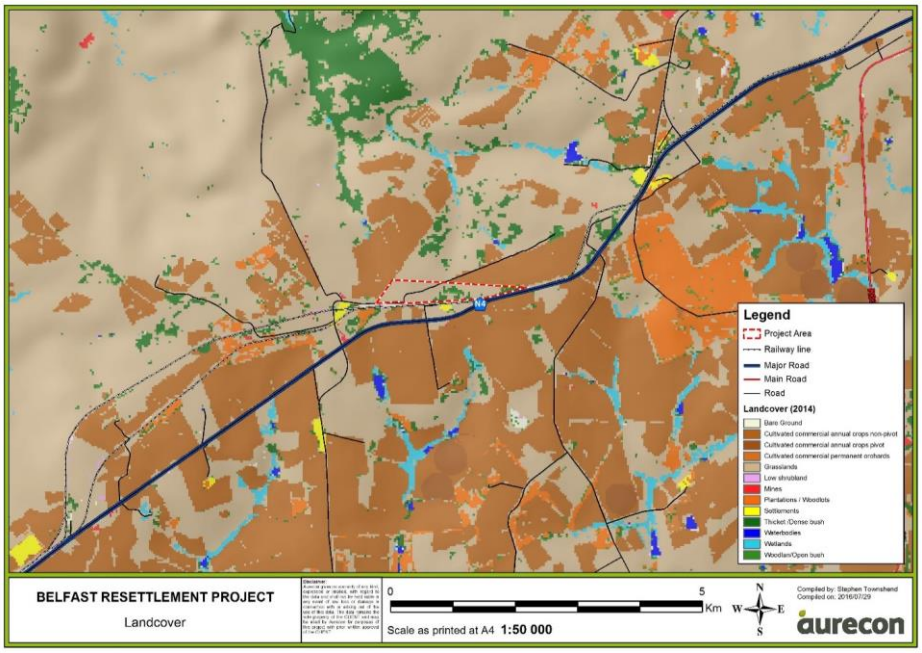

Figure 5: Land cover

3.6 Biodiversity

The Biodiversity Impact Assessment was carried out by Afrika Enviro and Biology. The baseline results are summarised below (see **Annexure C**.).

3.6.1 Flora

The study area is located within the Eastern Highveld Grasslands and is rated as Endangered, as only 44% of this vegetation type is officially conserved as small fragments. According to the Mpumalanga Biodiversity Sector Plan (MBSP) (MTPA, 2014), pockets within the proposed site are classified as heavily or Moderately Modified **(Figure 6)**. A large portion of the property is classified as a Critical Biodiversity Area (CBA) with Aquatic Ecological Support Areas also present

.

The extreme northern section of the property is classified as “other natural areas” which are Heavily of Moderately Modified according to the MBSP (MTPA, 2014). The aquatic biodiversity in this section, is rated as irreplaceable, and provides an ecological and aquatic support area.

The vegetation consist of the aforementioned Eucalyptus plantations, as well as fragments of natural grasslands and small wetland areas. Two RDL species were recorded, namely *Boophane disticha (L.f.) Herb* and *Eucomis autumnalis (Mill.) Chitt. Subsp. Clavata (Baker),* shown in **Figure 9**. The biodiversity investigation indicated that the natural habitat on the site had been fragmented as result of human

induced impacts. The old Eucalyptus plantations are in a state of recovery, with pioneer grassland covering large sections of the site. The sensitivity ratings (based on floral integrity, fauna potential and ecological functions) for the different habitats are summarised in **Table 5**. Various alien invasive species and weeds were recorded at the site, including, but not limited to, Eucalyptus and pine tree species.

Figure 7–**Figure 9** has been included to indicate the sensitivity, the ratings in terms of the MTPA Biodiversity Sector Plan as well as the LN3 ratings as compiled by the DARDLEA for biodiversity and ecosystem importance.

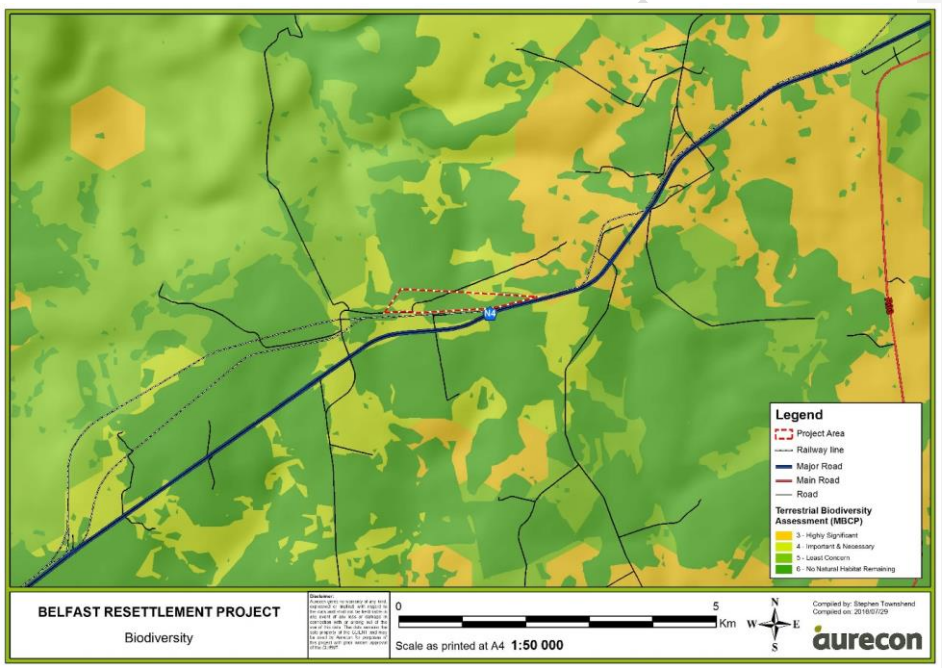

Figure 6: Map indicating the sensitivity of the project area

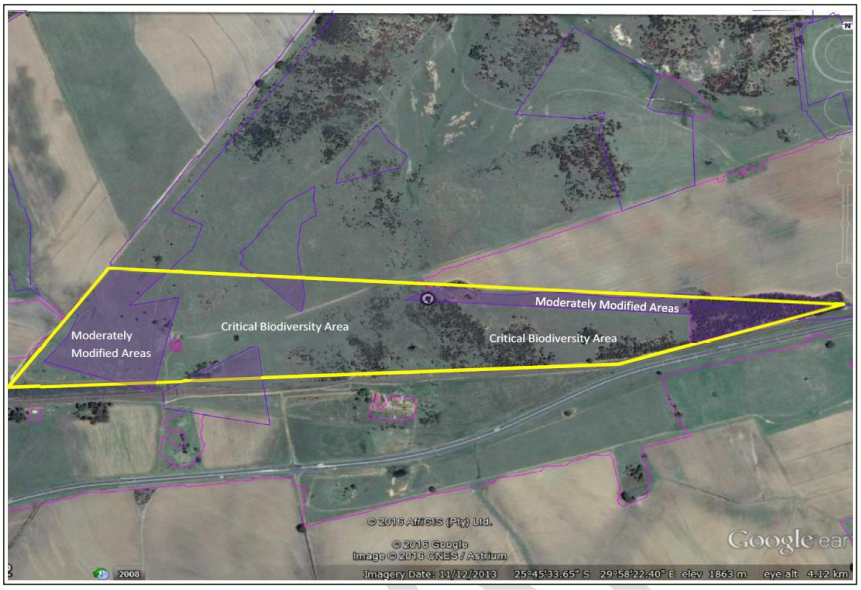

Figure 7: The study site in relation to the MTPA Biodiversity Sector Plan ratings for biodiversity and ecosystem maintenance.

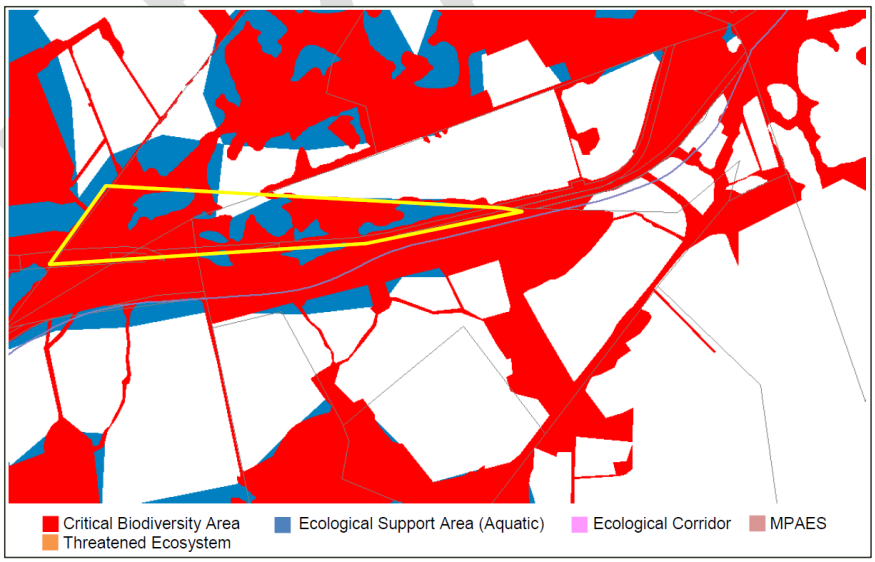

Figure 8: The study site in relation to the LN3 ratings as compiled by DARDLEA for biodiversity and ecosystem importance.

Figure 9: RDL species Boophane disticha (left) and Eucomis autumnalis (right).

Table 7: Sensitivity ratings of vegetation communities on the proposed resettlement site (Afrika Enviro & Biology, 2016)

Vegetation Community	Sensitivity Rating
Eucalyptus plantations and transformed land	Low
Disturbed land and pioneer grassland	Low to Medium
Fragmented grassland	High
Wetland zones	Medium to High

3.6.2 Fauna

Fragmentation and degradation will mostly have a negative impact on these species. The proposed project will have a small ecological footprint and with correct site selection it is not anticipated that it will have a significant impact on the terrestrial fauna if the natural habitat and adequate buffer zones are conserved.

Amphibians

The potential important frog assemblage for the study area is diverse but none of them have Red Data status. Six of the species potentially found are endemic/near endemic species. No amphibians were recorded on site during the survey but several of the potential species may utilise the natural habitats on the site.

Reptiles

The study area possesses 18 endemic and near endemic species which have the potential of being present in the study area.

Birds

More than 300 species' range of distribution fall within the study area. Twelve RDL and 19 endemic or near endemic species may occur in the study area. However, no Red Data or endemic species were observed during the survey.

Mammals

Sixteen RDL species and 10 endemic species can potentially be found in the study area. No RDL species could be confirmed during the assessment.

Invertebrates

No Red Data invertebrates are expected in the study area, however the natural habitats on site may offer refuge to numerous invertebrate groups.

3.7 Surface Water

3.7.1 Drainage region

The proposed location of the resettlement is located in the Olifants WMA, more specifically the Steelpoort River Catchment quaternary catchment s B41A and X11D (**Figure 10**). Majority of the resettlement area fall within the B41A quaternary catchment.

The dominant hydrological process driving the wetlands with the site under the current scenario is subsurface seepage. The development is likely to alter this process substantially, by increasing the extent of hardened surfaces in the wetland catchments, this associated with houses, yards, and roads. Hardened surfaces serve to intercept rainfall that would have infiltrated into the soil (establishing the subsurface seepage), and convert into surface runoff. In addition, the hardened surfaces remove the storage capacity of the soils from the landscape. The result is that water that would have entered, and been stored by, the soil before re-entering the receiving environment over a period of years is now introduced to the receiving environment immediately. This results in an increased quantity of water entering wetland and riparian systems, moving at higher velocities with a consequent elevated risk of severe soil erosion and subsequent sediment deposition downstream. In summary, the development is likely to alter the external hydrology of wetlands by increasing the proportion of the water budget entering the wetlands as surface flow at the expense of subsurface seepage.

These changes are, however, unlikely to manifest themselves on the rivers downstream of the site according to the following rationale:

- The development occurs outside HGM 4's catchment and is hence shouldn't influence the current *status quo*;
- The longitudinal slope supporting HGM's 1 and 2 is shallow, and provided the wetlands remain densely vegetated and surface flow remains diffuse there is unlikely to be environmental degradation. The connecting channel between the two wetlands should also be deactivated, severing their surface connection.
- The likely consequence of the development is likely to be an increase in the quantity of water entering the wetlands, manifesting as more saturated conditions and a change in plant species composition. The subsurface hydrology connecting the wetlands to the rest of the landscape is unlikely to be affected. The surface water is unlikely to be able to move, and hence a greater volume of water will be lost to the atmosphere via evaporation and evapotranspiration.
- The same quantity of water will enter the receiving NFEPA rivers, via the same process and of the same quality.

3.7.2 Surface Water Quality

Currently there are no surface water streams and rivers on proposed site area. Therefore baseline water quality for surface water could not be undertaken.

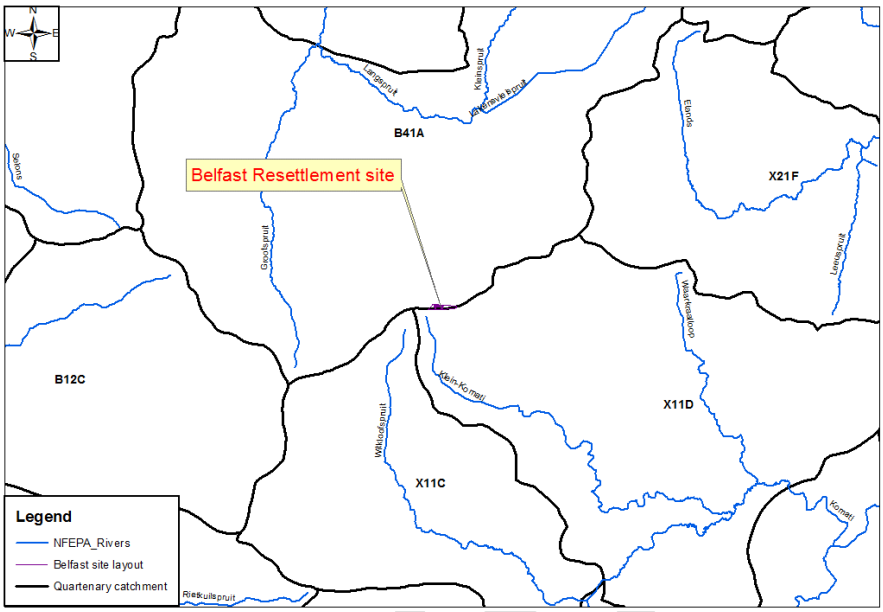

Figure 10: Drainage regions of the study area *(Source: Coertzen, 2015)*

3.8 Wetlands

The study site falls within the B41A quaternary catchment. Considering the aforementioned MAP and PET typical to this catchment, the wetlands on the study site have a moderately high sensitivity to hydrological impacts in the surrounding catchment. The (HGM) units identified within the study site have been classified as two hillslope seeps linked to a stream channel (HGM Unit 1 and 2), an isolated hillslope seep (HGM Unit 4) and a depression or pan (HGM Unit 3) wetland (GroundTruth, 2016). These four HGM's are shown in **Figure 11**. Depression wetlands are regarded as critically endangered, and seepage wetlands are considered endangered owing to the fact that neither of them are protected.

The wetland units in the study area provide intermediate to moderately high levels of ecosystem services. These wetlands are considered to be particularly effective in flood attenuation, enhancing water quality, providing erosion control, phosphate trapping and nitrate removal. In terms of its ecological importance and sensitivity to changes in water quality and floods, all of the HGM units were classified as having biodiversity that is insensitive to flow and habitat modifications. The wetland units in the study area provide intermediate to moderately high levels of ecosystem services.

In terms of its ecological importance and sensitivity to changes in water quality and floods, all of the HGM units were classified as having biodiversity that is insensitive to flow and habitat modifications.

They are also considered to play an insignificant role in moderating the quantity and quality of water of major rivers.

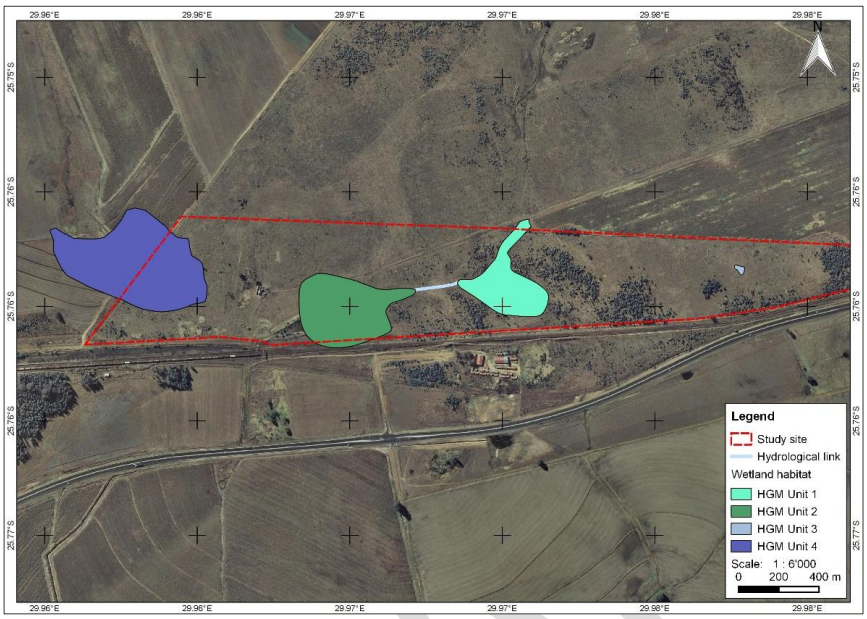

Figure 11: Wetland units within the proposed study area (GroundTruth, 2016)

3.8.1 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) of the four HGMs were all rated as D-class overall, falling in the Low / Marginal EIS category. D-class wetlands are not ecologically important or sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an *insignificant* role in moderating the quantity and quality of water of major rivers.

3.8.2 Present Ecological State

The ecological integrity or Present Ecological State (PES) of the HGM units associated with the proposed development are shown according to the hydrology, geomorphology and vegetation components of the HGMs in **Table 8**, with explanations of the impacts scores provided in **Table 9**.

Table 8: Summary of the overall PES of the HGMs

		Hydrology	Geomorphology	Vegetation	Overall Score
HGM Unit 1	Impact Score	3.5	2.5	5.0	3.7
	PES Category	**C**	**C**	**D**	**C**
HGM Unit 2	Impact Score	1.5	2.7	3.6	2.4

		Hydrology	Geomorphology	Vegetation	Overall Score
	PES Category	**B**	**C**	**C**	**C**
HGM Unit 3	Impact Score	1.0	1.0	2.4	1.4
	PES Category	**B**	**B**	**C**	**B**
HGM Unit 4	Impact Score	3.5	3.5	7.3	4.6
	PES Category	**C**	**C**	**E**	**D**

Table 9: Descriptions of PES-ratings

Description	Impact Score	Present State Category
Unmodified, natural.	0 – 0.9	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1.9	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2 – 3.9	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4 – 5.9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognisable.	6 – 7.9	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 – 10	F

3.8.3 Assessment of impacts on hydrology

The impact scores recorded for the hydrological component of the three wetlands ranged from 1.0 to 3.5, translating into a Present Hydrological State (PHS) category of **B** to **C**. The change in ecosystem processes therefore ranges from largely natural to moderately modified, with the modifications to the wetlands' PHS being linked primarily to the following factors:

- Impeding features resulting in flooding of portions of the systems;
- Infilling directly within the wetland habitat;
- Alien invasive vegetation within the wetland habitat, increasing the direct uptake of water; and
- Altered water flows into the wetlands linked to catchment changes.

3.8.4 Assessment of impacts on geomorphology

The impact scores recorded for the geomorphic component of the three wetlands ranged from 1.0 to 3.5, which indicates a Present Geomorphic State (PGS) category of **B** to **C**. The modifications to the wetlands' PGS are linked primarily to the following factors:

- Altered water flows into the wetland linked to catchment changes; and
- Infilling directly within the wetland habitat.

3.8.5 Assessment of impacts on vegetation

The impact scores recorded for the vegetation component of the three wetlands ranged from 2.4 to 7.3, translating into a Present Vegetation State (PVS) category of **C** to **E**. The change in ecosystem processes and loss of natural habitat ranges from moderately to seriously modified, with modifications to the wetlands' PVS being linked primarily to the following factors:

- Encroachment of alien invasive and pioneer vegetation into portions of the wetland habitat;
- Impeding features resulting in flooding of portions of the systems;
- Infilling directly within the wetland habitat; and
- Excavation of portions of wetland habitat.

3.9 Groundwater

According to Barnard (2000), the groundwater yield potential is classed as low, as 83% of the boreholes on record produce less than 2 litres per second. It can be assumed that the regional groundwater flow direction will emulate to local topography. Due to the fact that the site is situated on a water divide, groundwater flow will be in two directions, namely in a north westerly and north easterly direction towards the intermittent stream that both flow into the Steelpoort River downstream as well as a southern direction towards the intermittent stream flowing into the Klein Komati River. However, no rivers occur within the study site. Surface water investigations were, therefore, limited to the Wetland specialist study described above.

During the groundwater assessment, six boreholes were drilled. A summary of the newly drilled boreholes is provided in **Table 10**.

Table 10: Summary of newly drilled boreholes

BH No.	S (WGS84)	E (WGS84)	Target on Geophysical Traverse	Depth (m)	Diameter (mm)	Water Strikes (m)	Blow Yield (l/h)
BRBH1	25.76156	29.96534	Re-drilled existing borehole	80	165	22	Seepage
BRBH2	25.75937	29.96526	C-180m	80	165	19	7,200
BRBH3	25.75619	29.96611	DI-480m	80	165	13	7,200
BRBH4	25.75947	29.96539	C-163	80	165	70	Seepage
BRBH5	25.75881	29.96888	DI-55m	80	165	9.71	7,200
BRBH6	25.75829	29.96506	H-53	80	165	21	4,680

The Flow Characterisation Method developed by the Institute of Groundwater Studies at the University of Free State was used to calculate the sustainable yield of the boreholes, as shown in **Table 11**.

Table 11: Summary of sustainable yields of boreholes

Borehole No.	Depth (m)	Static Water Level (m)	Available Drawdown (m)	Sustainable Yield (l/h) Pumping 24 hours / day	Volume / day (m^3)
BRBH2	80	7.98	10.2	900	21.6
BRBH5	80	13.62	57.38	1,800	43.2
BRBH6	80	15.98	5.02	3,600	86.4
			Total volume / day (m^3)		**151.2**

Based on the available data, it can be concluded that a total volume of 151.2 m^3 per day can be abstracted from these boreholes, should all three boreholes be utilised.

The water quality of all three boreholes were tested and the results are shown in **Table 12** below:

Table 12: Water quality of drilled boreholes

Sample No.	BRBH2	BRBH5	BRBH6	Standard Limits
Ca	23.50	19.90	14.70	~
Mg	8.20	6.10	5.41	~
Na	9.28	8.60	7.47	200
K	5.39	4.40	4.19	~
Mn	0.02	0	0	0.1
Fe	2.43	0	0	0.3
F	0	0.27	0.16	1.5
NO_3-N	0.37	0.24	0.29	11
NH_4-N	0.09	0.01	0.07	1.5
Al	0	0	0	0.3

Sample No.	BRBH2	BRBH5	BRBH6	Standard Limits
PO_4	0.04	0.06	0.096	-
Cl	4.8	2.7	1.2	300
SO_4	31.3	5.7	4.2	250
TDS	131	106	88	1,200
T-Alk	76	95	81	~
pH	8.23	8.06	8.25	5.0 – 9.7
EC	20	18	17	170
E. Coli count	0	0	0	0
Total Coli count	0	0	4	≤10
Faecal Coliform.	0	0	0	0
Notes:				
Acceptable				
Exceeds Standard limits				
Below detection limit of analytical technique				

From **Table 12** above it can be concluded that, with the exception of BRBH2 (having elevated iron (Fe) concentrations), the water quality of the tested boreholes falls within the Drinking Water Quality Standard Limits.

The high iron concentrations within BRBH2 will result in problems with plumbing. Slight health effects may be expected in young children and sensitive adults. High iron concentrations may result in haemachromatosis, where tissue damage occurs as a result of iron accumulation. Treatment includes aerating the water or mixing the water with that of borehole 5 and 6 to lower the concentration of iron.

However, Exxaro has decided to only utilise borehole 5 and 6, as an accumulated yield of 129 600 litres per day will be more than the required 17 100 litres per day for a population of 200 people.

3.10 Public Participation Process and Interested and Affected Parties

Engagement and consultation with Interested and Affected Parties (I&APs) forms an integral component of the Environmental authorisation process and enables, *inter alia,* potentially directly affected landowners, neighbouring landowners and communities, authorities and key stakeholders to provide input into the proposed development. The PPP for both the Basic Assessment and IWULA was conducted in parallel.

I&APs were identified during the public participation phase of the project. All the members of the community have automatically been registered as an Interested and Affected Party for the BA. The registered I&AP list is attached as Appendix H.

Other methods for informing the public involved:

- Distributing a Background Information Document (BID) to all registered interested and affected parties, as well as providing the Ward Councillor of the community with BIDs to distribute amongst the households on 6 June 2016. The BID was available in English and Zulu. Through

registered mail, and email BIDs were distributed to certain I&APs, proof of which is attached in **Appendix H**

- Placing two site notices at the proposed site, one at the proposed entrance of the resettlement area and one at the south-western corner of the site (see **Appendix HI**); and
- Placing a newspaper advert in the Lowvelder on 3 June 2016 (see **Appendix H**).

The draft Basic Assessment Report (BAR) (containing the Draft IWULA) will be made available for review and comment by I&APs from 24 October 2016 to December 2016.

3.11 Consultation with DWS

Pre application stage consultation was held with both the National and Regional Office of DWS, the table below provides details of the consultation**. Appendix H** contain all supporting documents for the meeting which includes:

- Meeting Minutes
- Attendance Register
- Presentations

Date	Type of Consultation	Organisation Involved
17 May 2016	Pre Application Meeting: DWS Lydenburg Regional Office.	• DWS Lydenburg Representatives • Exxaro Representative • Aurecon Representatives
30 May 2016	Pre Application Meeting: DWS National Office	• DWS E&R Representatives • DWS Lydenburg Representatives • Exxaro Representative • Aurecon Representatives

4 Water Uses

4.1 Water Use

Commented [TD6]: Do we have a water use map?

Commented [RN7]: Will include a map

4.1.1 Sources of water for operational usage by 32 Households

Water will be obtained from boreholes located to the North and North east of the Exxaro Belfast resettlement site. The total amount of water required for the 200 people within the settlement is as follows:

Table 13: Quantity of water used

Domestic Appliances	Average Water Consumption (ℓ/d/p) *(obtained from SANS 10252-1)*	Average Water Consumption (ℓ/d)
Car washing and garden use	6	1 200
Drinking, food preparation and cooking	22	4 400
Laundry	15	3 000
Personal washing and bathing	30	6 000
Washing dishes	12	2 400
Sub-Total	**85**	**17 000**
Allow for 10% losses	8.5	170
Total	**93.5**	**17 170**

The following water use is regarded as a schedule 1 water use which is described as the following:

Schedule 1: A person may, subject to this Act -

(a) Take water for reasonable domestic use in that person's household, directly from any water resource to which that person has lawful access;

(b) Take water for use on land owned or occupied by that person, for -

(i) Reasonable domestic use;

(ii) Small gardening not for commercial purposes; and

(iii) The watering of animals (excluding feedlots) which graze on that land within the grazing capacity of that land, from any water resource which is situated on or forms a boundary of that land, if the use is not excessive in relation to the capacity of the water resource and the needs of other users.

4.1.2 Yearly usage pattern

According to the Concept and Viability Report the WWTP of the measured flow ranged from 7 kℓ/day in the dry season to 17 kℓ/day in the wet season.

4.1.3 Yearly water use

Yearly water usage is approximately 17.1 kℓ/day.

4.1.4 Water rights

Riparian rights: Not applicable

Public or private water

Entitlements: Not applicable

Water court order: Not applicable

Quotas: Not applicable

Agreements: Not applicable:

4.1.5 Storage of water

Water abstracted from borehole BRBH5 and BRBH6 will be stored in an elevated storage tank with a capacity of 42,442m^3 per day.

4.2 Section 21 (c & i) water uses: Impeding and diverting a water course

The following resettlement will impact on three (**Figure 12**) wetlands, namely:

- HGM Unit 1(Hill slope seep)
- HGM Unit 2(Hillslope seep)
- HGM Unit 4(Isolate Hillslope seep)

The Section 21 (c & i) are related to all activities within 500m of the three wetlands provided in the figure below. Activities include the construction of infrastructure such as roads, storm water system, construction of houses, multipurpose community facility, sewer pipe lines and WWTP. This water uses do trigger a General Authorisation in terms of General Notice 506 of 26 August 2016, for activities of low risk within the 500m buffer of a wetland. As there is more than one water use that requires water use licence Section 3(c) of GN 506 applies and therefore the activities cannot be generally authorised.

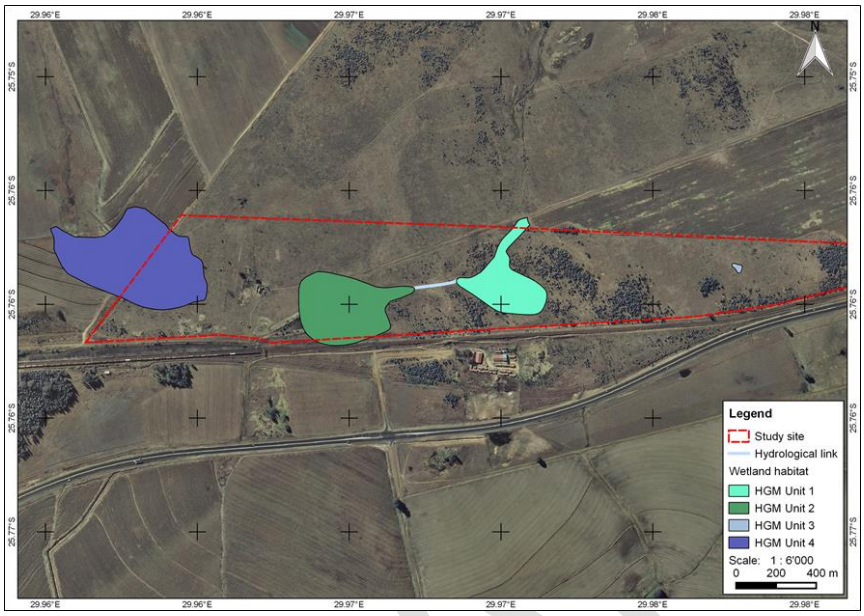

Figure 12: Wetlands within study area

The water uses for the Section 21 (c & i): are indicated in **Table 12**.

Table 14: Section 21 (c & i) water uses.

Water Use	Ref Point	Latitude	Longitude	Description
WU1	1	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Activities within 500m of wetland HGM unit 1 (Hill Slope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU2	1	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Activities within 500m of wetland HGM unit 2 (Hillslope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU3	1	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 (c & i): Activities within 500m of wetland HGM unit 4 (Hillslope Seep)
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	
WU4	SP1	25° 45' 38.807" S	29° 57' 58.302" E	
	SP2	25° 45' 34.176" S	29° 57' 56.276" E	
	SP3	25° 45' 33.331" S	29° 58' 18.107" E	

	SP4	25° 45' 40.730" S	29° 58' 13.125" E	Section 21 (c & i): Sewer Pipeline within 500m of wetland (HGM unit 1 & HGM Unit 2)
WU5	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 (c & i): WWTP within 500m of wetland (HGM Unit 1)
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E	
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E	
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E	

4.3 Section 21 (e): Discharge of water containing waste for irrigation

The Treated Sewage Effluent (TSE) will be used for irrigation of the 32 household agricultural activities. The total estimated area to be irrigated is 8100m^2 or 253m^2 per household. The estimated amount of water required for irrigation is 6,312m^3/a.

4.4 Section 21 (f) Discharge of water or water containing waste through pipe conduit or canal

In the event that the TSE is not used for irrigation, the estimated amount of 6,312m^3/a of TSE will be discharged directly into the veld. Because there is no existing stable stream on site, the discharged TSE will flow along the natural ground profile and will form part of the natural stormwater drainage of the site. This discharge method will also be applicable for any overflow of TSE from the WWTP.The amount of overflow cannot be determined.

4.5 Section 21 (g): Disposing of waste in a manner that may detrimentally affect a water resource

The waste water treatment plant triggers a section 21 g, as it contain s raw sewage that has the potential to detrimentally impact both wetland and ground water. The biological waste water treatment plant is a container facility, description of the process is provided in **Section 6 and** 7 to follow. The amount of waste water that is treated per annum is 6312m^3.

Table 15: Discharge Water Uses

Water Use	Ref Point	Latitude	Longitude	Description
WU6	**WWTP 1**	25° 45' 33.289" S	29° 58' 17.998" E	Section 21 g: Waste water treatment facility
	WWTP2	25° 45' 33.287" S	29° 58' 18.374" E	
	WWTP3	25° 45' 32.825" S	29° 58' 18.370" E	
	WWTP4	25° 45' 32.828" S	29° 58' 17.994" E	
WU7	**TSE Out**	25° 45' 32.903" S	29° 58' 17.943" E	Section 21 f : Discharge of waste water
WU8	**1**	25° 45' 31.791" S	29° 57' 55.059" E	Section 21 e: use of treated waste water for irrigation
	2	25° 45' 32.445" S	29° 58' 18.071" E	
	3	25° 45' 41.753" S	29° 58' 14.643" E	
	4	25° 45' 42.888" S	29° 57' 54.994" E	

4.6 Stormwater Management

Stormwater will be drained in an earth-lined stormwater channel running alongside the road. This channel will be a 2m wide vee-shaped and will have a reinforced concrete toe to prevent erosion at the foot of the channel. Pipe culverts with a diameter of 600 mm 450 mm will be provided at plot entrances driveways obstructed by storm water channels to ensure vehicular access to the plots where the vehicles need to cross over the stormwater channel stands during a storm. Gabion structures will also be placed within some of the channels to slow down the velocity of the stormwater within the channels. Stone-pitching will be provided at the various discharge points, to prevent erosion of material further downstream. **Appendix C** contains a layout of the stormwater management system (Drawing No. NBC-AUR-IF-0016).

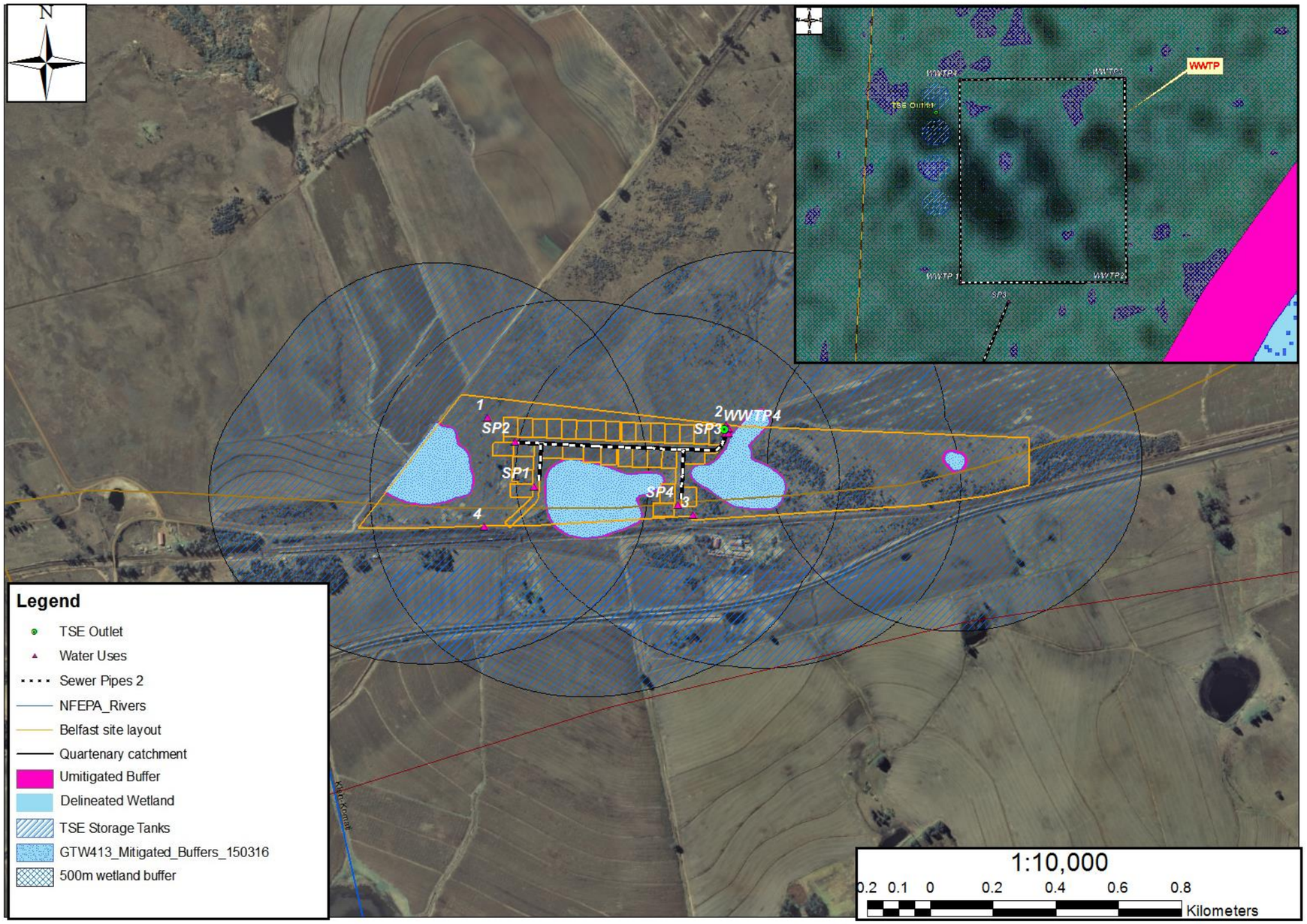

Figure 13: Water Uses

Commented [RN8]: GIS to update with new combined infrastructure

5 Description of Reticulation System

5.1 Percentage of area served which is Unsewered

Currently the percentage of the study area unsewered is 100%.

5.2 Percentage of area Sewered or to be Sewered

The study area which includes 32 household that will be sewered.

5.3 Nature of Sewage

5.3.1 Domestic component

The sewage is of a domestic component as the 32 households (approximately 200 people) sewage will be treated. The daily volumes are approximately 19.04 m^3/day. The new resettlement village will be service by the proposed new Waste Water Treatment Plant (WWTP).

5.4 Hydraulic and Organic Loading

The hydraulic loading capacity of the existing works is to be maintained at 20 m^3/d.

Feed effluent into WWTP are normally from potable sources that gets contaminated during usage for example toilet flushing, showers, dish washing etc, this ensure that the feed quality is consistent and a very accurate plant can be designed without a water analysis. WKL used the following values (**Table 16**) as a baseline for the design of the WWTP, as no analysis can be submitted:

Table 16: Analysis of the Raw Waste Water received at the works

PARAMETER	UNIT	AVERAGE
AMONIA	mg/l	50
PH	Value	6-8
COD	mg/l	800

6 Description of Sewage Treatment Works and Classification

6.1 Project Overview

Exxaro design team intends to use biological WWTP with a buffer tank. A service provider, WKL Environmental Solutions for design and installation of the WWTP The proposed treatment facility is designed according to the following specifications (**Appendix C** provide technical detail regarding the WWTP):

- Flow per day required 20KL as per day flow rate
- All effluent will be gravity fed into an feed sump/ feed screen
- Final Effluent to be in-line South African special / Aqua limits
- The following feed information will be used as design assumptions
- Most cost effective system for transportation.
- Reduced installation cost, because the complete plant is constructed and tested at WKL workshop site.

6.2 Proposed Design

6.2.1 Design Specifications:

The design is based on the ***WRC Report No. TT 1869/09***, which provide guidelines in respect to daily flow calculations, capacity and retention.

Containerized WWTP				
Description	**Qty of People**	**Flow rate per person**	**Flow rate (Liter per 24 Hour)**	**Required System**
Containerised	200	95	19 000	BioBloo CB20SP

Invert Level	COD	KW per hour	Voltage	Diffuser	Volume of Plant per litre	Number of Mech, equip	Number of Bio Block	Total Air (m^3pH)
-250mm	105	9.70	380	32	125000	7	198	250

Screen type	Container Tanks	Qty	Container Tanks	Qty	Containers	DB Board
BFT-3.5kl	10f Iso Container	0	40f Iso Container	2	2	included

6.2.2 Design Components

Total sewage effluent to be treated	**20 Kl per 24 hour**
Total KW required per hour	9.7 KW per hour
Total COD to be treated	800 mg per l per day
Total diffusers	32
Total amount of containers	2 x 12m container
Total volume of plant	125 000l
Aeration Method	Blower with micro bubble disc diffusers

6.3 Scope of Work

WKL will be proposing a complete containerized Biological WWTP for this project (refer to **Figure 14** - **Figure 17**). The technology is based on submersed bio-media with return activated sludge.

The proposed solution will consist of the following phases:

- **Intake works**
  - All effluent to report to an in-ground screen the screen is fitted with 2 x rake-able screens of 40mm & 20 mm apertures respectively. This is to ensure that no non-organics will enter the plant.
  - The screen flows into a buffer tank that can accommodate 3 hours of peak discharge.
  - Feed pumps to be installed in the buffer tank
  - The feed pump will be submersible sewage specific pumps that will feed the plant at the designed flow rate.
- **Screening**
  - The feed pumps will feed in-line screen
  - The screen is fitted with a 5mm mesh to prevent inorganics from entering the plant
  - The inline screen will feed the Containerized WWTP
- **Anaerobic digestion tank**
  - There will be two tanks in series that will serve as the anaerobic digestion phases
  - These phases will be built into the ISO Containers, which is PE100 Plastic sheet lined with a 10mm lining, and sealed using plastic welding.
- **Aerobic digestion or Bioreactors**
  - There will be two aerobic tanks that serve as the aerobic digestion phase
  - Each tank will be fitted with micro bubble diffusers which allows for high dissolved oxygen transfer into the effluent.

- These phases will be built into the ISO Containers, which is PE100 Plastic sheet lined with a 10mm lining, and sealed using plastic welding.
- A double stage blower will be used for air injection

- **Clarifier or Re-activated sludge tank**
  - There will be one tank that will serve as the clarifier.
  - The clarifier will be fitted with lamella settler pack to optimize clarification.
  - Submersible pump will be installed to feed the anaerobic phase
- **Disinfection or sterilization**
  - There will be one tank that will serve as the disinfection tank
  - The tank will be fitted with an ozone contact chamber to optimize disinfection
- **De-sludge**
  - Manual De- slugging drains will be installed on each of the tanks, when sludge build-up is excessive sludge can be drained to the feed sump.
  - Sludge management is excluded in this proposal
- The scope of work entails the design, construction and installation of the plant, however all civil works are excluded.
- Bulk feed reticulation and discharge from the plant is not included

6.4 Compliance with specification as set out by The Department of Water and Sanitation (DWS)

Table 17: Discharge water quality specification

Chemical Oxygen Demand	75 mg / l	30 mg
Ionized and unionized	3.0 mg / l	2.0 mg / l
Nitrate (as N)	15mg/l	1.5 mg / l
pH	Between 5.5 and 9.5	Between 5.5 and 7.5
Residual Chlorine (as Cl)	0.25 mg / l	0
Suspended solids	25mg/l	10mg/l
Phosphorous (Ortho	10 mg	1 mg / l
Total Iron (as Fe)	0.3 mg / l	0.3 mg / l
Faecal Coliforms per 100ml	1000	0

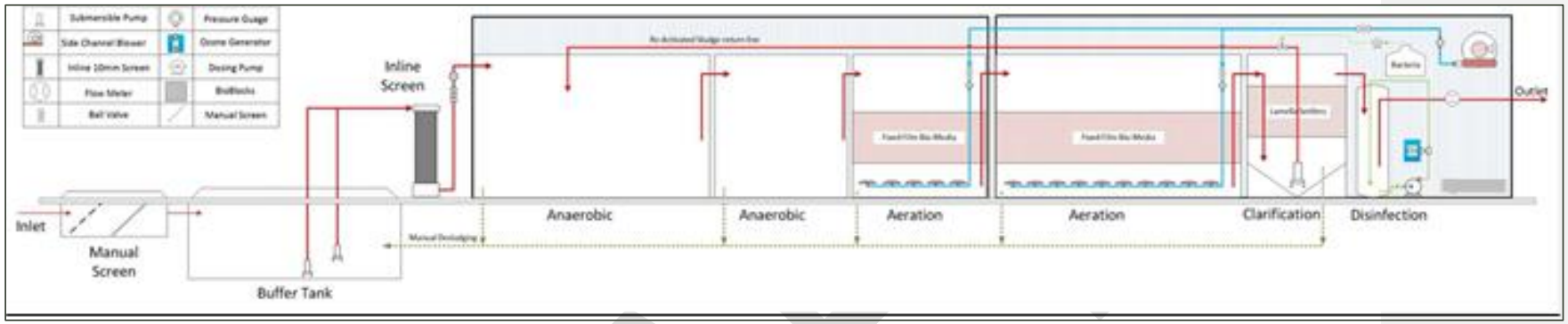

Figure 14: Process of the WWTP

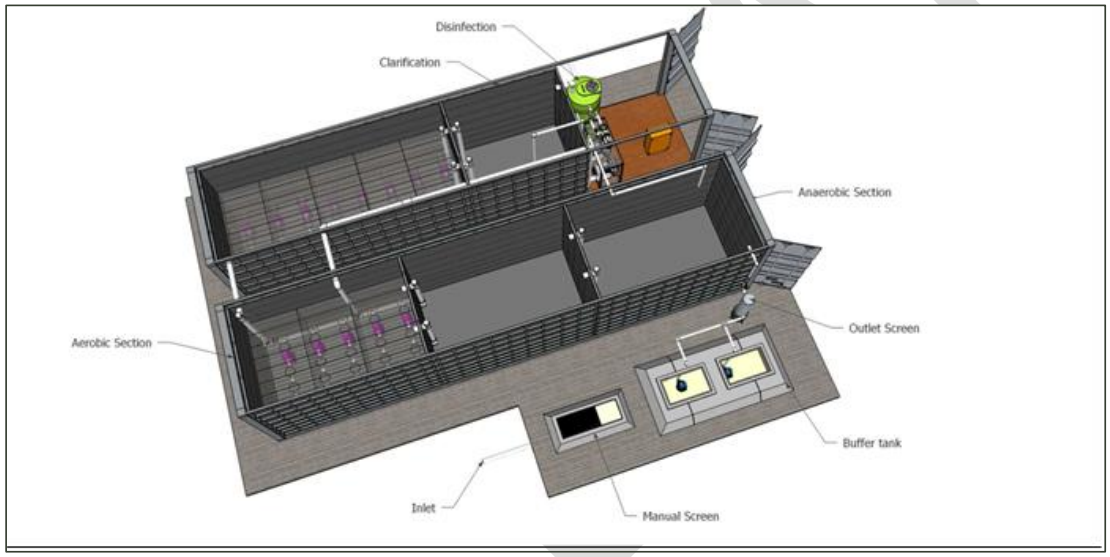

Figure 15: Layout of the WKL WWTP

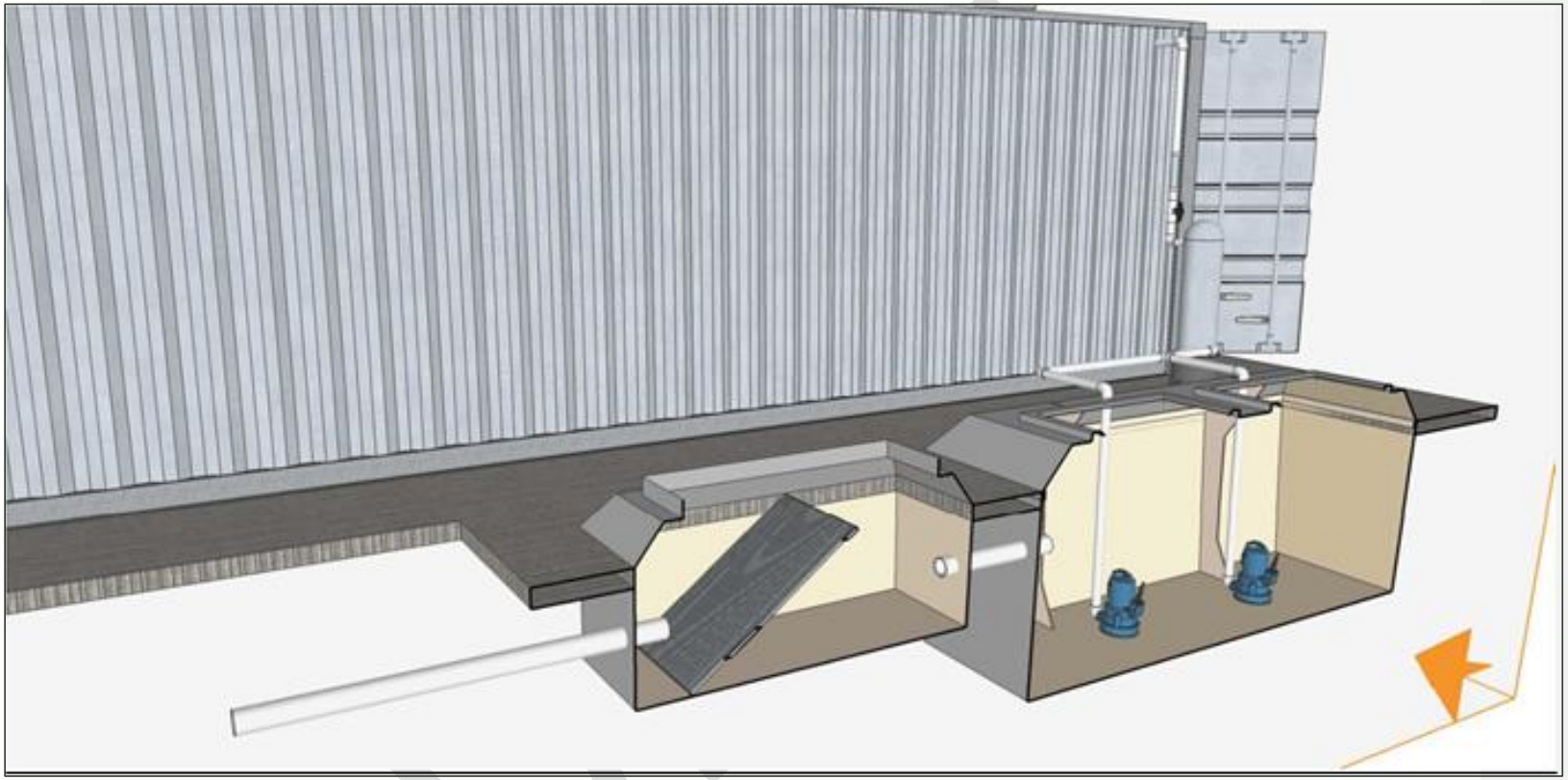

Figure 16: Connection pipes to the WWTP

Figure 17: Inside view of a typical WWTP

6.5 Principle of Waste Water Treatment Plant System

6.5.1 First Phase (Number 1) (lifting station)

- Screening takes place at the point of entrance in the WWTP.
- This is done manually.

6.5.2 Second Phase (Number2) (part of system)

- There are two anaerobic chambers. The first chamber allows for digestion of sewage and the separation of solids i.e. those that settle and those that float. The middle cut of the effluent then flows through to the second chamber.
- The second chamber breaks down the fine sewage particles and alters to carbon dioxide and water. This ideal effluent then passes into the aerobic chamber for polishing.
- The de-nitrification cycle takes place in this phase.
- This function is responsible for the breaking down of nitrates to nitrogen gas.

6.5.3 Third Phase (Number 3)

- In this phase the digestion takes place in an aerated environment. This phase can be divided into two or three bioreactors added together.
- This phase is called aerobic digestion or simpler terms the Bioreactor.
- Air is infused using Blowers with maximum efficiency in mind and air is delivered through Micro Bubble Defusers to ensure a high level of dissolved oxygen in the water.
- This phase takes the smaller solids and bio-degrade them further.
- This phase is also called the “polishing phase”.
- The type of bacteria that operates in this environment is called aerobic bacteria. It is very important to aerate this phase to enrich the liquid with oxygen.
- The bacteria perform at their optimum in an oxygen enriched environment.
- In the aerobic phase the nitrification takes place. This process breaks down the ammonia to nitrites and the nitrites to nitrates.
- To provide these bacteria with their “homes” we have designed a very effective aerobic zone.

6.5.4 Fourth Phase (Number 4)

- Secondary settling takes place in the fourth phase.
- The cell material and settle able solids settle in this phase and form the so-called “sludge blanket “.
- The sludge blanket is very important for the process. When the blanket matures it is re-circulated to the primary settling tank in phase one to “seed” or inoculate the raw sewerage entering into the plant and to alter the nitrates to nitrogen gas.
- This cycle is called the re-activated sludge cycle. This technology improves the efficiency of the process and the plant.

6.5.5 Fifth Phase (Number 5)

- In the fifth and final phase the final effluent is prepared for final discharge.

- The effluent is disinfected or sterilized to prevent any dangerous or harmful bacteria from entering our environment.
- This is achieved by either dosing with chlorine or treatment by means of Ultra Violet or Ozone Systems

6.6 Maintenance

6.6.1 Daily Maintenance

- Should there be any inorganic build-up it should be removed using a rake and disposed of in the appropriate manner, in-line with hazardous waste disposal legislation.
- Clean Inline Screen by removing basket

6.6.2 Weekly Maintenance

- Check that all mechanical Equipment is operational
- Check the timers to ensure that the timing has not changed due to electrical failure.
- Remove all non-organic material from manual- and Inline Screen
- Ensure that flow meter is set to prescribed flow rate

6.6.3 Monthly Maintenance

- ***Sampling*** – take feed sample and final treated effluent sample for SANAS accredited lab analysis
- ***Manual Screen*** - Remove all non-organic material & agitate the accumulated organic material.
- ***Feed & Discharge Pumps*** - Verify that the submersible pumps are clear of obstructions and in good running order.
- ***Blower***s – Verify that blowers are clear of obstruction and grease mechanical components where required
- ***Clarifier Pumps -*** Verify that the submersible pumps are clear of obstructions and in good running order
- ***Ozone Equipment -*** Measure & record Ozone Generation is to design specifications
- ***Dosing Equipment -*** Measure & record dosing ratio & check bacteria level in bacteria holding tank and mix bacteria.
- ***Sludge ratio's -*** Measure & record sludge levels (both top & bottom Blanket) in each tank.
- ***Flow meter & inline Screen -*** Strip & clean flow meter & in-line screen also ensure that flow meter is set to prescribed flow rate.
- ***Electrical -*** Check timers is set to correct intervals for the clarifier pumps and test & ensure time is accurate
- ***Post maintenance procedures -*** House Keeping of immediate plant area and control room & dispose of hazardous waste materials
- ***Report -*** Full independent lab analysis for discharge effluent & full fault report and corrective action requirements to be provided.

6.7 Primary Sedimentation Tanks

Not applicable.

6.8 Septic Tanks

Yes the buffer tank will act as a septic tank.

6.9 Biological Filtration Systems

Not applicable.

6.10 Activated Sludge Systems

Please refer to **Section 6.4 and 6.5**.

6.11 Humus Tanks or SST

Not applicable.

6.12 Sludge Handling

Sludge will be removed by an eternal service provider to a licenced waste facility. A honey sucker will remove the sludge as in the removal of sludge from o septic or conservancy tank

6.13 Oxidation Pond Systems

Not applicable.

6.14 Tertiary Treatment

Not Applicable.

6.15 Fencing around the Works

The WWTP is to be fenced off

6.16 Classification of Works and Operators

Information not available at the moment. The treatment facility is a package plant

7 Water Balance

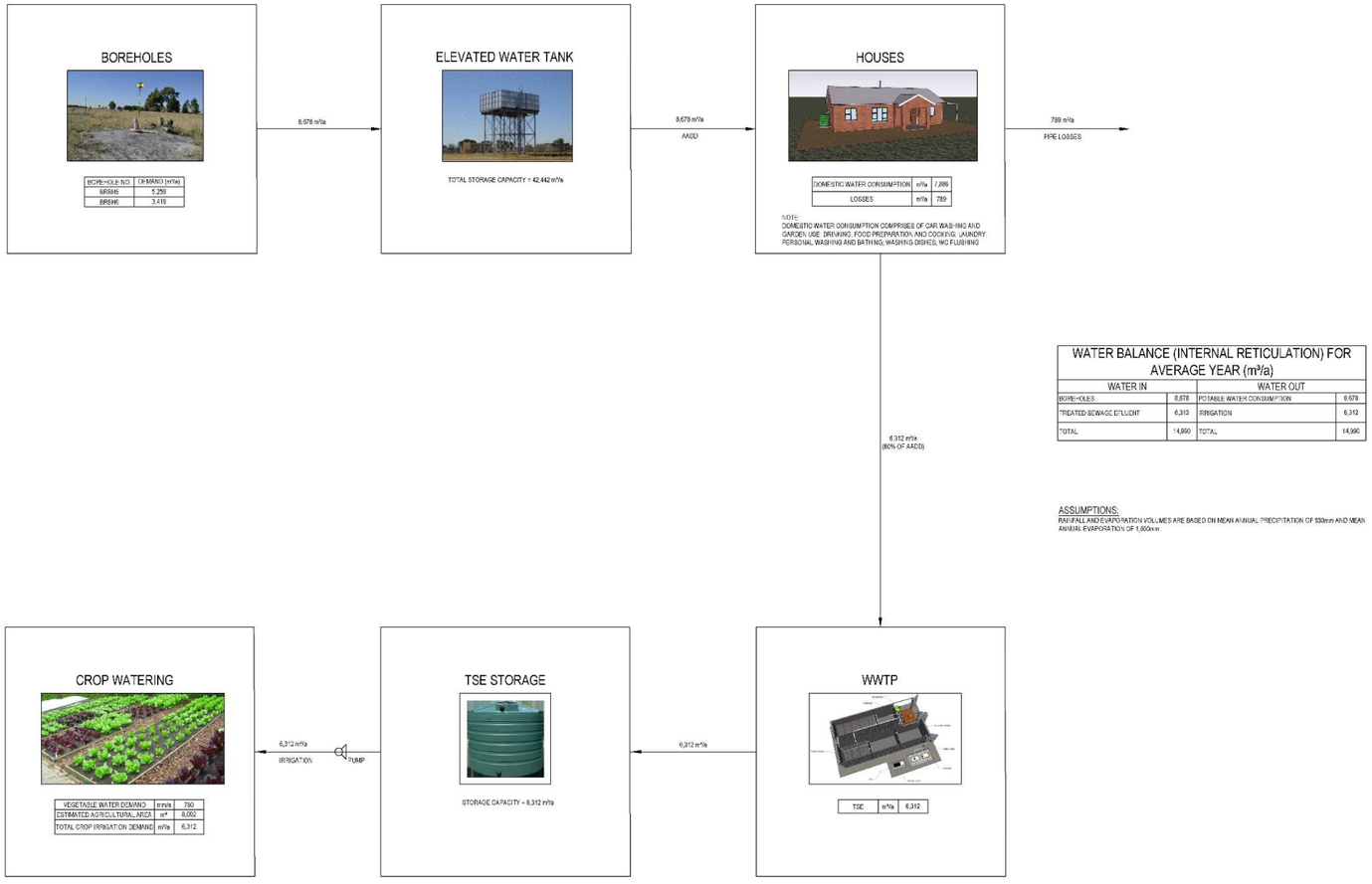

Figure 18: Water Balance Diagram

8 Management Systems and Pollution Prevention Methods

8.1 Operating Staff

Exxaro Mpumalanga (Pty) Ltd will manage the facility for the first 5 years. Thereafter a designated member in the community will be responsible for the management of the facility. This designated member will be trained on how to manage and maintain the facilities.

8.2 Mechanical Maintenance Staff Availability

Mechanical staff is required for repair and preventative maintenance work. Exxaro will appoint the relevant maintenance team for the first 5 years to overlook maintenance of the WWTP but during the process community members will be trained for take over roles.

8.3 Electrical Maintenance Staff Availability

Electrical maintenance is undertaken by the mine electricians as well as service providers when required for the first 5 years.

8.4 Process Control Staff Availability

The process control staff is still too be allocated for the following WWTP.

8.5 Drainage By-Laws

No drainage by laws.

8.6 Technology

8.6.1 Waste treatment process

This form of waste water treatment process for this particular plant is identified as the best option, as it separates the sludge and effluent as well as purifies the effluent decreasing the amount of COD, BOD and nutrients which are released back into the environment.

8.6.2 Disposal practice is the best option

The process used by the WWTP involves the re-circulating of sludge to the primary settling tank to assist with the breaking down of the raw sewage which comes in and settles in the primary settling tank.

Should there be any sludge which will need to be removed and disposed of, the intention is to have the sludge removed by means of a honeysucker, in the same way that a standard septic tank and conservancy tank would be emptied. The following forms of waste disposal can be considered the best options as it limits the negative impacts on the environment:

- Sludge will be disposed of at a registered waste disposal site; and
- Effluent- treated and reused by resettlement residents for the irrigation of agricultural fields.

8.6.3 Best available technology

The WWTP is the best available option with reference to the geology and geohydrology of the site,

8.6.4 Alternative options for disposal or treatment

Alternative options were considered:

- Dry chemical system
- Septic tank with soak away.

8.6.5 Reason for choice of option

If well maintained the existing WWTP has the capacity to process the volumes of raw water entering the site and release purified effluent back into the environment. This option also has the least environmental impact as the impact is localised to a single area.

8.7 Water Quality Operational Management Plan

8.7.1 Chances of system failure

An electrical power failure will cause the screens to stop working. This will result in screens becoming blocked causing the wastewater to dam up in the channels and pipelines where the grit will settle out. Once the power is back on and the screens are raked the settled grit will be lifted causing the degritters to be overloaded. It is reported that an emergency by-pass has been provided however it is recommended that emergency power is provided.

Other system failures include the screens and grits becoming blocked as they are not regularly cleaned.

8.7.2 Management and maintenance plan

There is reportedly no formal maintenance plan; however the mine will be responsible for all maintenance and management of the site for the next 5 years.

8.7.3 Standby equipment availability

- Blower is one on duty one on standby
- A alarm when in fault status coupled with a flashing red light and GSM controller
- Timers on Blowers & Clarifier Pumps (24 hours with 15minute interval settings)
- A GSM Unit to be installed that will report via SMS any equipment trip or malfunction, this will also provide monthly reports on the operational status of the plant.

8.7.4 Accident and emergency plans

There is reportedly no accident and/or emergency plan on site.

8.7.5 Potential pollution prevention plans

There is reportedly no site specific pollution prevention plan.

8.7.6 Monitoring plan

The water quality monitoring plan is in place. Water testing is undertake on a weekly basis. A groundwater monitoring programme has also been formulated as per the geohydrological study.

Surface water monitoring

Monitoring requirements include the following:

Water quantity

The quantity of the water containing waste discharged into wetlands shall be metered and recorded daily;

Monitoring for the quantity of water containing waste shall be done at the point where the waste is discharged;

Flow metering, recording and integrating devices shall be maintained in a sound state of repairs and calibrated by a competent person at intervals of not more than two years. Calibration certificates shall be available for inspection by the Chief Director or his representative upon request.

Water quality

The quality of the water containing waste shall be monitored by taking grab samples every week at the monitoring points (as specified in section 0). Each sample shall be analysed for the following variables:

- pH in mS/m
- Electrical conductivity in mg/ℓ
- Chemical oxygen demand in mg/ℓ
- Ammonia as N in mg/ℓ
- Orthophosphate as P in mg/ℓ
- Nitrate as N in mg/ℓ
- Suspended solids in mg/ℓ
- Faecal coliforms in counts per 100mℓ

And/or any other variable as may be required from time to time.

The date, time and monitoring points in respect of each sample taken shall be recorded together with the results of the analysis.

Monitoring points

Monitoring for the water quality and flow shall only be carried out at the monitoring points listed below:

Monitoring point for flow: At the inlet point of the sewage works and at the discharge point for water containing waste.

Monitoring points for quality: At the outlet point of the sewage works and in consultation with and approved by the Chief Director.

Methods of analysis

Analyses shall be carried out in accordance with methods prescribed by and obtainable from the South African Bureau of Standards (SABS), in terms of the Standards Act, 182 (Act 30 of 1982).

Ground water monitoring

A regular monitoring plan should be implemented as recommended by the geohydrology specialist. A groundwater monitoring network has been developed to monitor both downstream and upstream of the WWTP (**Table 18**). It is important to note that a groundwater-monitoring network should be dynamic. This means that the network should be extended over time to accommodate the migration of contaminants through the aquifer as well as the expansion of infrastructure and/or addition of possible pollution sources.

Table 18: Monitoring boreholes to be included into the monitoring program

Borehole Number	Objective
BRBH5	North East of Resettlement Site
BRBH6	North of Resettlement Site

Parameters to be monitored

In an effort to identify the existing source which could possibly be impacting on the groundwater, especially in the vicinity of monitoring well MO-BH 2, a range of parameters will be monitored.

Water samples must be taken from all the monitoring boreholes using an approved sampling techniques and adhering to recognised sampling procedures. **Table 19** below presents the parameters (both physical and chemical) and frequency that should form part of the groundwater monitoring program. The results should be recorded on a data base and reported annually to the DWS.

Furthermore, if the monitoring network is to be extended in the future, boreholes should be drilled in the areas where expansion is likely to be done. Should it become evident from the monitoring program that pollution of the groundwater occurs; corrective and remedial actions should be implemented.

Table 19: Proposed monitoring requirements

Class	Parameter	Frequency	Motivation
Physical			
	Static groundwater levels	Monthly	Time dependant data is required to understand the groundwater flow dynamics of the site. An anomaly in static water levels caused by mounding below the drainage field may give early warning to spillages or leakages from lined/unlined facilities.
	Rainfall	Daily	Recharge to the saturated zone is an important parameter in assessing groundwater vulnerability. Time dependant data is required to understand the groundwater flow dynamics of the site.
	Groundwater abstraction rates (if present)	Monthly	Response of groundwater levels to abstraction rates could be useful to calculate aquifer storativity – important for groundwater management. Could also explain anomalous groundwater level measurements.
Chemical			
	Major chemical parameters: Ca, Mg, Na, K, NO3, NH4, SO4, Cl, Fe, Mn, F, Alkalinity, pH, EC, TDS.	Quarterly (Jan., Apr., Jul., Sept) May be reduced to biannual (April & Sept.) as more data becomes available)	Background information is crucial to assess impacts during operation and thereafter. Changes in chemical composition may indicate areas of groundwater contamination and be used as an early warning system to implement management/remedial actions. Legal requirement.
	Minor chemical constituents Cr & Cr6, Ni, As, Cu, Pb, Cd, Zn Stable isotopes	Ad hoc Basis.	Changes in chemical composition may indicate areas of groundwater contamination and be used as an early warning system to implement management/remedial actions. The monitoring program should allow for research and refinement of the conceptual hydrogeological model. This may, from time to time, require special analyses like stable isotopes.

Groundwater monitoring points

As per the groundwater monitoring program discussed above, the points referred to in **Table 20** and located in **Figure 19** needs to be monitored.

Table 20: Monitoring Points

Borehole Number	Co-ordinates (WGS84) Latitude	Longitude
BRBH5	25.75881	29.96888
BRBH6	25.75829	29.96506

Alarm system at the pump station

An alarm when in fault status coupled with a flashing red light and GSM controller

Notification procedures for downstream users

There is no procedure for the notification of downstream users.

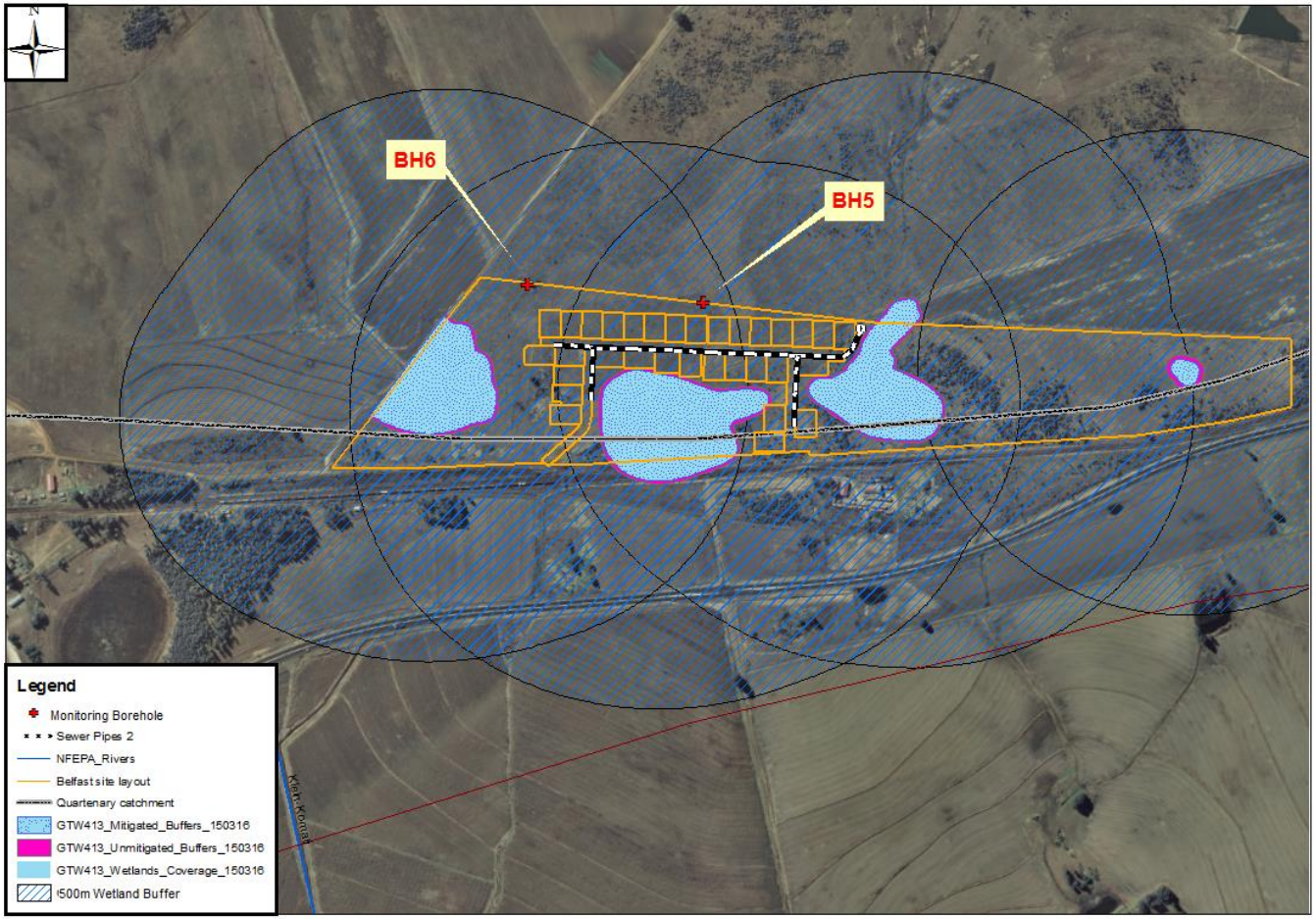

Figure 19: Ground water monitoring points

9 Disposal of Solid Waste and Sludge

9.1 Description of Solid Waste

Solid waste can be in the form of grit which can include sand, cinders, silt, glass, metal, small stones and other large sized relatively non-putrescible organic and inorganic substances. The amount of grit to be removed cannot be estimated at this phase.

Solid waste analysis is not available.

9.2 Description of Sludge's

The sludge is classified as sewage sludge. A quantity of sludge cannot be estimated. Should there be any sludge which will need to be removed and disposed of, the intention is to have the sludge removed by means of a honeysucker, in the same way that a standard septic tank and conservancy tank would be emptied. (Attached in **Appendix C** of this report).

10 Final Waste Disposal Evaluation

This section aims to discuss different disposal options for different waste products.

10.1 Quantity

Irrigation of agricultural area of the 32 households, which is estimated to be a total 8100m^2 area or 253 m^2 per plot, a total of 6132m^3/A of water (TSE water) is required. This water will be used from the TSE storage facility.

10.2 Land Disposal – Ponds and Dams

Not applicable. There are no final waste disposed of in ponds. Only treated effluent is pumped to the storage tanks, from where the users take their share for irrigation, while the remainder is release to the environment.

10.3 Land Disposal – Irrigation areas

If the TSE will be used for irrigation, then the TSE will first be discharged into storage tanks, and then pumped for irrigation reticulation

10.4 Disposal to Ground Water

Not applicable. No disposal to groundwater takes place.

10.5 Disposal to Surface Water

Only treated water is discharged into the environment.

10.6 Discharge to Lagoon and Estuary

Not applicable.

10.7 Discharge to Sea

Not applicable.

10.8 Disposal by Evaporation

Not applicable

10.9 Municipal or Private Waste Purification Plant

Not applicable.

11 Recommendations from other Interested Parties

11.1 Department of National Health

Not Applicable

11.2 Department of Environmental Affairs and Tourism

Not Applicable

11.3 South African Bureau of Standards

Not Applicable

11.4 Nature Conservation Bodies

Not Applicable

11.5 Regional Government Institutions

Not Applicable

11.6 Local Government Institutions

Not Applicable

11.7 Department of Agriculture

Not Applicable

11.8 Department of Mineral and Energy Affairs

Not Applicable

11.9 Other Specialists

Not Applicable

11.10 Non – Governmental Organisations

Not Applicable

11.11 Interested and Affected Parties

Not Applicable

11.12 Public Participation

Section 3.10 provides a proper description of the public participation process that has been undertaken thus far. This section also included the consultation with the relevant Water Regulatory authority.

12 Conclusion and Recommendations

This report has been compiled in support of water uses to be authorized as per the NWA. Not only will this ensure the WWTP is complying with the General Wastewater Limit requirements but also ensure the continuous service provision.

12.1 Conclusion: Section 27 Motivation

This section has been compiled in line with the requirements of the DWS in terms of Section 27 of the NWA. This section outlines matters relevant to all GAs and WULs issued under the Act. The motivation of licence application provided in this section guides competent authorities in the exercise of their discretion to make informed decisions (i.e issue and to attach conditions to GAs and/or WULs). Section 27 also states that the issuing of a licence under the Act does not imply any assurance regarding the availability or quality of water which it covers.

12.1.1 Section 27(1) (a): Existing lawful water uses

Exarro Belfast Mine currently has an existing water use licence for activities related to the mining. The Resettlement of the 32 household's within the mine property does not have an existing water use licence, as this is the reason for the application. As the water uses will belong to the community during operational phase.

12.1.2 Section 27(1) (b): The need to redress the results of past racial and gender discrimination

In terms of historically disadvantaged South Africans (HDSA), the water uses will have definite positive impact on the quality of life of the community to be resettled, particularly the black Africans which make up 100% of the population. Currently the community does not have access to water at their homes and supplying water to all the households within the resettled community will most definitely improve the quality of life of the entire community.

12.1.3 Section 27(1) (c): Efficient and beneficial use of water in the public interest

The water will be used for human consumption and other daily activities such as cooking, flushing toilets, washing etc. The use of water is therefore not only beneficial but also essential for the wellbeing and livelihood restoration of the community members that will be living on the relocated site.

12.1.4 Section 27(1) (d): The socio economic impacts

Lack of water, lack of electricity, unemployment, the distance to the main road, is currently causing problems within the community to be relocated. The community is currently living in very poor conditions.

Improving the living conditions of these community members will have an enormous positive social impact for the community. The approval of the resettlement of this community will give community members houses with sufficient space to accommodate all the family members, enough space for self-sustainable farming activities, and access to water and electricity. It will increase the possibility of employment as the community will be located closer to the N4, providing transport opportunities to and from potential employers.

12.1.5 Section 27(1) (e): Any catchment management strategy applicable to the relevant water resource

The catchment management strategy for the Olifants WMA has been developed. This includes *inter alia*:

Short term

- Develop the Water Conservation and Demand Management plan, with clear performance targets;
- Limit wasteful water use in order to control water consumption;
- Carry out a borehole census to validate and revise the current groundwater use estimates; and
- The formalisation of groundwater use and monitoring of boreholes used for water supply and irrigation purposes.

Long term

- Monitoring and development of the Water Conservation and Water Demand Management strategy;
- Upgrading of the oxidation ponds in order to exchange effluent with raw water from the Doorndraai Dam;
- Monitoring of groundwater resources to prevent water being mined and ensuring good water quality;
- Transfer of effluent from Polokwane to source the mines in the area;
- The loss of water has accumulated to 30% of the total water supply and should. This calls for the implementation of an efficient metering system;
- Elimination of all illegal connections and initiation of an extensive water billing system; and
- Implement an alien invasive action plan, whereby alien vegetation is removed aiming to increase the available yield in the area.

12.1.6 Section 27(1) (f): The likely effect of the water use to be authorised on the water resource and on the water users

The only possible impact is that should the WWTP be insufficient to accommodate the volume of waste (given the population growth or malfunction of the WWTW), this might lead to seepage or overflow of untreated water hence pose a risk of groundwater and surrounding wetlands. During operational phase there is possibility that resettlement occupant ant may not follow management protocols and further impact on the surround wetland, as identified above.

Commented [TD9]: Surely the design should allow for this?

Commented [RN10]: We have to include the possibility of the WWTP not being able to accommodate volume of waste. As that would be a risk

12.1.7 Section 27(1) (g): The class and the resource quality objectives of the water uses

There is currently Resource Quality Objectives (RQO) for the Olifants WMA.

Resource Water Objectives (RQO) are defined for each prioritised resource unit (RU) for every IUA in terms of water quantity, quality, habitat and biota. The quaternary catchment B41A fall within the RU54 and the following RQO (**Table 21 and Table 22**) have been placed for that specific RU. The resource quality and habitat and biota quality objectives have not been established for this RU, as yet.

Commented [TD11]: Perhaps mention them?

Table 21: RWQO: River Water Quantity

RIVER WATER											
IUA	**Class**	**River**	**RU**	**Biophysical Node Name**	**REC**	**Component**	**Sub Component**	**RQO**	**Indicator/ measure**	**Numerical Limits**	
6	III	One node at outlet of B41A. Included: Grootspruit (outlet of quaternary) and Langspruit, including Lakenvleispruit and Kleinspruit	RU54	54	C	Quantity	Low Flows	Low flows must be maintained to provide for the ecosystem and the angling industry.	EWR maintenance low and drought flows: Grootspruit in B41A VMAR = $41.97x10^6m3$ PES=C category	Maintenance low flows (m^3/s) (Percentile)	Drought flows (m^3/s) (Percentile
										Oct	0.157 (70)	0.086 (99)
										Nov	0.242 (70)	0.058 (99)
										Dec	0.319 (70)	0.172 (99)
										Jan	0.418 (80)	0.224 (99)
										Feb	0.529 (70)	0.282 (99)
										Mar	0.446 (70)	0.224 (99)
										Apr	0.417 (70)	0.220 (99)
										May	0.322 (70)	0.146 (99)
										Jun	0.251 (70)	0.138 (99)
										Jul	0.189 (70)	0.105 (99)
										Aug	0.157 (70)	0.089 (99)
										Sep	0.143 (70)	0.082 (99)

Table 22: RWQO: Dam Water Quantity

IUA	**Dams**	**RU**	**Component**	**Sub Component**	**RQO**	**Indicator/ Measure**	**Numerical Limits**		**IUA**
6	Belfast Dam (25°39'56.12"S; 30°0'44.62"E)	RU54	Quantity	Low Flows	The dam must be managed to provide sufficient releases for the protection of ecosystem function downstream as well as for other users.	Flow releases: Langspruit in B41A; VMAR = $41.97x10^6m3$; PES=C category*. (Releases to Langspruit - no gauge close by)	Maintenance low flows (m^3/s) (Percentile)		Drought flows (m^3/s) (Percentile)
							Oct	0.157 (70)	0.086 (99)
							Nov	0.242 (70)	0.058 (99)
							Dec	0.319 (70)	0.172 (99)
							Jan	0.418 (70)	0.224 (99)
							Feb	0.529 (70)	0.282 (99)
							Mar	0.446 (70)	0.224 (99)
							Apr	0.417 (70)	0.22 (99)
							May	0.322 (70)	0.146 (99)
							Jun	0.251 (70)	0.138 (99)
							Jul	0.189 (70)	0.105 (99)
							Aug	0.157 (70)	0.089 (99)
							Sep	0.143 (70)	0.082 (99)

12.1.8 Section 27(1) (h): Investments already made and to be made by the water user in respect of the water use in question

The investment already made is not known.

a) The required construction budget for Phase 1 is summarised:

Contract 1A (Refurbish Existing Mokopane WWTP)	R 9 150 000
Contract 1B (Refurbish Existing Sewer Lines)	R 7 983 016
Sub Total	R 17 133 016
Add 10% Contingencies	R 1 713 301
Total (Excl. VAT)	R 18 846 317
Total (Incl. VAT)	**R21 484 802**

b) The required construction budget for Phase 2 is summarised:

Contract 2A (New WWTP Civil Works for 10Ml/d plant)	R 84 100 000
Contract 2B (New WWTP M&E Works for 10Ml/d plant)	R 26 590 000
Contract 2C (New Bulk Lines and Rehabilitation)	R 7 336 000
Sub Total	R 118 026 000
Add 10% Contingencies	R 11 802 600
Total (Excl. VAT)	R 129 828 600
Total (Incl. VAT)	**R 148 004 604**

Phase 1 and 2 should be commissioned simultaneously.

The Total budget requirement for Phase 1 and 2

Total Excl. VAT	R 148 674 917
Total Incl. VAT	**R 169 489 406**

Commented [RN12]: Require input from Exxaro

12.1.9 Section 27(1) (i): The strategic importance of the water use that has been authorised

Based on the strategic importance of the water use is to meet the increasing demands for water supply for both domestic consumption.

To validate the abovementioned; the water requirements for the resettlement of the 32 household within the Belfast Exxaro mine is approximately 19000 litres per day which equates to 6783 m^3 per year.

12.1.10 Section 27(1) (j): The quality of water in the water resource which may be required for the Reserve and for meeting international obligations

The reserve determination for the water resource of concern is not yet in place and the WWTP is not expected to have additional impacts on the quality of the water resource during its operation.

12.1.11 Section 27(1) (k): The probable duration for any undertaking that a water use has been authorised

The water uses applied for will cease when the operation of the WWTP ceases.

13 Impact Assessment

13.1 Impact assessment methodology

The impact assessment methodology used in this IWULA is based on the requirements of the DWS's '*Operational Guideline*' (DWS, 2010). The impact assessment process requires that all the relevant data for the water uses and the impact of the water uses on the water resources be identified and used in the assessment. The impact assessment process includes the following data:

- Monitoring data;
- Published data; and
- Data available from the DWS or other stakeholders in the area.
- The above-mentioned data was used for impact identification for the water uses on the water resource. The impact assessment was based on the following key elements:

13.1.1 Probability of occurrence:

This describes the likelihood of the impact actually occurring and is indicated as:

- Improbable, where the likelihood of the impact is very low;
- Probable, where there is a distinct possibility for the impact to occur;
- Highly probable, where it is very likely that the impact will occur; and
- Definite, where the impact will occur regardless of any management measure.

13.1.2 Consequence of occurrence:

In terms of:

- Nature of the impact (positive or negative);
- Probability of the impact occurring, being none, improbable, low probability, medium probability, high probability or definite;
- Extent of the impact, either local, regional, national or across international borders;
- Duration of the impact, either short term (0-5 years), medium term (6-15 years) or long term (the impact will cease after the operational life of the activity) or permanent, where mitigation measures by natural processes or human intervention will not occur; and
- Magnitude of the impact, either having a minor, low, moderate, high or very high effect on the natural, cultural and social functions and processes.

13.1.3 Significance level of the impact:

This is determined through a synthesis of the probability of occurrence and consequence of occurrence.

The impact rating is based on the assessment as described above and categorised into high, medium or low significance impacts. Management measures were then identified to mitigate, prevent and/ or reduce the impact. These measures primarily focus on the impacts identified as high in the ranking matrix, but will also include measures for impacts of medium and low significance.

In order to assess each of the factors for each impact, the ranking scales as contained in **Table 23** were used.

Table 23: Ranking scales for assessing impact consequence

PROBABILITY = P	**DURATION = D**
5 – Definite / don't know	5 – Permanent
4 – High probable	4 – Long-term (ceases after operational life)
3 – Medium probability	3 – Medium-term (5 – 15 years)
2 – low probability	2 – Short-term (0-5 years)
1 – Improbable	1 - Immediate
0 – None	
EXTENT = E	**MAGNITUDE = M***
5 – International	5 – Very high / Don't know
4 – National	4 – High
3 – Regional	3 – Moderate
2 – Local	2 – Low
1 – Site	1 – Minor
0 – None	

**Note: the magnitude is rated from 1 to 5, twice. First for the environmental impact and then for the social impact, thereby having a total weight of 10 points.*

Once the factors had been assessed for each impact, the significance of each impact could be determined by applying the significance points (SP). The SP formula can be described as:

SP = (**magnitude** + **duration** + **extent**) x **probability**

The maximum value of SP is 100. Environmental effects could therefore be rated as either high (H), moderate (M), or low (L) significance on the following basis:

- More than 60 points: high (H) significance;
- Between 30 – 60 points: moderate (M) significance; and
- Less than 30 points: low (L) significance.

Table 24: Impact assessment for the Section 21 water uses

IMPACT ASSESSMENT CRITERIA									
Associated water use	Infrastructure or Activity Involved	Aspect	Potential Impact	Mitigation Measure	Rating Scale	Impact rating prior to mitigation		Impact rating post-mitigation	
CONSTRUCTION PHASE IMPACT ASSESSMENT									
Section 21 c: Impeding or diverting the flow of water in a watercourse And **Section 21 i:** Altering the bed, banks, course or characteristics of a watercourse	Use of vehicles and equipment on site	Surface and groundwater	**NEGATIVE IMPACT(S)** Surface and groundwater contamination due to: • Hydrocarbon spillage and • Erosion (of wetland and 500m buffer of wetland) of loose topsoil as a result of vegetation loss.	• Vehicles and equipment leaking fuel, oil or any other hazardous substance must be removed from site and repaired before allowed back on site. • Where on-site emergency repairs are required, this shall be done within a designated workshop only. The workshop shall consist of an impermeable surface with a suitable bund wall to contain any hazardous substances. • All fuel bowsers used on site must be accompanied by a drip tray. The drip tray must be used to contain any possible spillages that may occur during refuelling. • All containers of hazardous materials being used on site must be placed on a drip tray where no impermeable surface is available. • All hazardous materials and containers must be kept in a lockable, roofed, well ventilated store. The store must also contain an impermeable bunded surface with sufficient capacity to contain 110% of the volume of material stored within. • Any water or soil contaminated with hazardous materials must be collected and stored or disposed of accordingly. • Only designated access routes may be used by all vehicles entering and operating on site. • All stockpiles, laydown areas and other structures must, as far as possible, be placed on a previously disturbed, non-vegetated area as approved by the ECO. • Silt stockpiles must be placed away from surrounding watercourses and measures (such as silt fences or berms) must be put into place to prevent any silt from causing sedimentation in the nearby watercourses in the event of rain. • Any erosion observed on site must be dealt with immediately. Prevention of further erosion must be implemented by making use of berms or swales to divert the water causing erosion away from the affected area. • Re-vegetation must be done where groundcover has been removed from site for construction purposes as soon as possible. • No spills may be hosed down into the river, or into the surrounding natural environment. All soil that is contaminated during the desilting operation must be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate registered landfill site. • Implement the Maintenance Management Plan.	Extent	4	**40**	4	**28**
					Duration	2		2	
					Magnitude	4		2	
					Probability	4		3	
	Construction of resettlement housing and related infrastructure	Wetlands	**NEGATIVE IMPACT(S)** • Loss of plants and habitats; • Loss of important flora species; • Increased levels of alien invasive plants; • Changes to and fragmentation of habitats; • Loss of general terrestrial fauna; • Impacts on wetland areas; and • Negative impacts on biodiversity priority areas and ecological support areas	• It is recommended that the remaining natural habitat and wetlands are not considered for development; • Development areas must be planned to make use of already disturbed areas; • Search for- and rescue important taxa before commencing with site preparation. • The wetland zones must be considered for development and must be protected by at least a 15 m buffer. Additionally, the following measures must be included with the management plan: • Use only indigenous flora for landscaping; • Implement an alien invader plant control program; • Topsoil must be protected and stabilized. • The wetland and aquatic ecosystems must be protected and monitored for any signs of degradation/pollution or negative impacts arising from the construction and operational phases.	Extent	4	**50**	4	**40**
					Duration	2		2	
					Magnitude	4		2	
					Probability	5		5	

IMPACT ASSESSMENT CRITERIA									
Associated water use	Infrastructure or Activity Involved	Aspect	Potential Impact	Mitigation Measure	Rating Scale	Impact rating prior to mitigation		Impact rating post-mitigation	
OPERATIONAL PHASE IMPACT ASSESSMENT									
Section 21 c: Impeding or diverting the flow of water in a watercourse And **Section 21 i:** Altering the bed, banks, course or characteristics of a watercourse	Use of vehicles and equipment on site	Surface and groundwater	**NEGATIVE IMPACT(S)** Surface and groundwater contamination due to: • Hydrocarbon spillage and • Erosion (around the riparian habitat) of loose topsoil as a result of vegetation loss.	• Vehicles and equipment leaking fuel, oil or any other hazardous substance must be removed from site and repaired before allowed back on site. • Where on-site emergency repairs are required, this shall be done within a designated workshop only. The workshop shall consist of an impermeable surface with a suitable bund wall to contain any hazardous substances. • Any water or soil contaminated with hazardous materials must be collected and stored or disposed of accordingly. • Only designated access routes may be used by all vehicles entering and operating on site. • All stockpiles, laydown areas and other structures must, as far as possible, be placed on a previously disturbed, non-vegetated area as approved by the ECO. • Silt stockpiles must be placed away from surrounding watercourses and measures (such as silt fences or berms) must be put into place to prevent any silt from causing sedimentation in the nearby watercourses in the event of rain. • Any erosion observed on site must be dealt with immediately. Prevention of further erosion must be implemented by making use of berms or swales to divert the water causing erosion away from the affected area. • No spills may be hosed down into the wetland, or into the surrounding natural environment. • Implement the Maintenance Management Plan.	Extent	2	**40**	2	**24**
					Duration	5		4	
					Magnitude	3		2	
					Probability	4		3	
	Movement of people animals and services.	Wetlands	**NEGATIVE IMPACT(S)** • Loss of plants and habitats; • Loss of important flora species; • Increased levels of alien invasive plants; • Changes to and fragmentation of habitats; • Loss of general terrestrial fauna; • Impacts on wetland areas; and • Negative impacts on biodiversity priority areas and ecological support areas	• It is recommended that the remaining natural habitat and wetlands are not considered for development; • Development areas must be planned to make use of already disturbed areas; • Search for- and rescue important taxa before commencing with site preparation. • The wetland zones must be considered for development and must be protected by at least a 15 m buffer. Additionally, the following measures must be included with the management plan: • Use only indigenous flora for landscaping; • Implement an alien invader plant control program; • Topsoil must be protected and stabilized. • The wetland and aquatic ecosystems must be protected and monitored for any signs of degradation/pollution or negative impacts arising from the construction and operational phases.	Extent	2	**33**	1	**16**
					Duration	5		5	
					Magnitude	4		2	
					Probability	3		2	
Section 21 e: Discharge of waste water for irrigation And **Section 21 f:** Discharge of waste or water containing waste through a **pipe** **Section 21 g**	Discharge of water from WWTP	Soil, groundwater contamination	**Negative impacts** • Deterioration of ground water quality • Deterioration of surface water quality • Functionality of wetland • Health risk	• Refuse bins with lids must be provided at the construction site for all general waste. • Skips must be used to store general waste on a temporary basis until waste is collected and disposed of at a registered landfill site. • All construction waste material must be stored in a specific location until it can be disposed of at a registered landfill site. • A contractor who is registered to dispose of hazardous waste must collect all hazardous waste on site and should there be any hazardous spills during the construction phase, a registered contractor must be contacted to clean up the spill. • Use of hazardous substances at a construction site is controlled by various pieces of legislation. However, the management and protection of the environment would be achieved through the implementation of an EMPr, which would, inter alia, specify the storage conditions of hazardous compounds and the emergency procedures to follow in the event of a spillage. • Ground water monitoring was be undertaken as per the recommendations made in Section 8 • Exxaro must provide the occupants of the resettlement with a proper hand over plan to ensure that management of the WWTP and associated infrastructure is properly managed	Extent	**3**	**36**	**3**	**22**
					Duration	**5**		**5**	
					Magnitude	**4**		**3**	
					Probability	**3**		**2**	

14 Recommendations

According to the eco-hydrological assessment, the background water quality data clearly demonstrate the magnitude of impact with regards to water quality on a spatial scale between the upstream and downstream monitoring sites. However, numerous high impact land-uses (with regards to their contribution to increasing nutrient loads) are located upstream and surrounding the Belfast resettlement. It is therefore imperative that:

- The efficiency and capacity of the WWTP to successfully treat and discharge water of acceptable quality into the environment be addressed; and
- The polishing of water quality using treatment wetlands is only feasible with treated water and will not succeed in the case of failing infrastructure that leaks / discharge untreated sewage.

According to the geo-hydrological study, a groundwater monitoring program should be implemented to monitor the impact of the WWTP on the hydrogeological environment. Should it become evident from the monitoring program that pollution of the groundwater occurs, corrective and remedial actions should be implemented.

Once the licence is approved, it will be regularly reviewed and audited by independent environmental auditors (contracted by Exxaro) as part of the EMPr for the Belfast Resettlement Project. Based on the findings of the audits, corrective action will be taken, where necessary.

A detailed handover plan should be provided to the residence of the Belfast resettlement after the 5 year overseeing period by Exxaro. This will ensure that the residence will manage and maintain the WWTP and provide accurate mitigation measures to impacts relating to the watercourses. Exxaro should also provide accurate training for operation staff of the Belfast resettlement community, this will allow skills to be transferred and help with preventing further degradation to surrounding water courses.

With effective planning and management the impact on both ground water and wetlands can be of a low impact. If all steps are undertaken, resettlement community with the help of Exxaro will provide a community project that will be positive for both the individuals in the community and the environment.

15 References and Supporting Documents

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Appendices

Appendix A
Draft BAR and EMPr

Appendix B
Maps

Appendix C
Technical Design

Appendix D
Application Forms

Appendix E
Title Deed

Appendix F
Proof of Payment

Appendix G
Relevant Specialist Studies

Appendix H
PPP

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