

**PROPOSED TOWNSHIP DEVELOPMENT, PLOT
1890, REMAINDER OF FARM 144 AND
REMAINDER OF FARM 142, BOEGOEBERG,
!KHEIS LOCAL MUNICIPALITY**



**FINAL
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

D:E&NC reference number: NC/EIA/12/ZFM/!KHE/BOE1/2020

APRIL 2021

!KHEIS LOCAL MUNICIPALITY

**PROPOSED TOWNSHIP DEVELOPMENT, PLOT
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EXECUTIVE SUMMARY

Introduction

Consideration is being given to the development of a new township, consisting of approximately 550 erven, and associated infrastructure (including roads and powerlines) over a forty-nine (49) ha extent, on Plot 1890, Remainder of Farm 144, and Remainder of Farm 142, Boegoeberg, !Kheis Local Municipality. The proposed development will be comprised of approximately:

- **550 x Residential Zone I units:** land use includes residential housing where one residential unit comprises of a self-contained interlinking group of rooms for the accommodation and housing of a single family, or a maximum of four persons;
- **11 x Business Zone I units:** land use includes business-related buildings / premises comprising of shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms, etc.);
- **4 x Institutional Zone II units:** land use includes places of worship (i.e. places for practising religion);
- **14 x Open Space II units:** land use includes public open space which is to be utilized by the public as an open space, park, garden, playground, and / or recreational site;
- **1 x Transport Zone I unit:** land use includes a public street reserved for street purposes including facilities for public transport; and
- **1 x Authority Zone I unit:** land/ erven and buildings utilized by the Local and / or District Municipality to carry out mandatory functions.

The proposed site is situated approximately 12km east of Groblershoop, south of the N8 and the Orange River. The site is situated within Ward 4 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape at the following location: 28°55'48.10"S; 22° 7'12.78"E.

The applicant is !Kheis Local Municipality who will undertake the activity should this application be approved. EnviroAfrica CC has been appointed as the independent environmental assessment practitioner (EAP) responsible for undertaking the relevant EIA and the Public Participation Process required in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA).

The Application Form and Draft Scoping Report was submitted to the DENC on the **29th July 2020**. The Final Scoping Report and Plan of Study for this EIA was submitted to the Department of Environment and Nature Conservation (DENC) on the **8th October 2020**. The Scoping Report and Plan of Study for EIA were approved by DENC on the **11th December 2021** and EnviroAfrica were advised to proceed with the EIA process (**Appendix 1B**).

Environmental Requirements

The National Environmental Management Act (Act 107 of 1998) (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the relevant authorities based on the findings of an environmental assessment. The NEMA is a national act, which is enforced by the Department of Environmental Affairs (DEA). These powers are delegated in the Northern Cape to the Department of Environment and Nature Conservation (DE&NC).

On the 04 December 2014 the Minister of Water and Environmental Affairs promulgated regulations in terms of Chapter 5 of the NEMA, namely the EIA Regulations 2014. These were amended on 07 April 2017 (GN No. 326, No. 327 (Listing Notice 1), No. 325 (Listing Notice 2), No. 324 (Listing Notice 3) in Government Gazette No. 40772 of 07 April 2017). Listing Notice 1 and 3 are for a Basic Assessment and Listing Notice 2 for a full Environmental Impact Assessment.

According to the regulations of Section 24(5) of NEMA, authorisation (in line with a full EIA) is required for the following listed activities for the proposed housing development:

Government Notice R327 (Listing Notice 1) listed activities:

- 9** *The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water;*
 (i) *with an internal diameter of 0,36 metres or more; or*
 (ii) *with a peak throughput of 120 litres per second or more;*
excluding where;
 a) *such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or*
 b) *where such development will occur within an urban area.*
- 10** *The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes*
 (i) *with an internal diameter of 0,36 metres or more; or*
 (ii) *with a peak throughput of 120 litres per second or more;*
excluding where;
 (a) *such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or*
 (b) *where such development will occur within an urban area.*
- 12** *The development of;*
 (i) *dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres;*
 (ii) *infrastructure or structures with a physical footprint of 100 square metres or more;*
where such development occurs;
 (a) *within a watercourse;*
 (b) *in front of a development setback; or*
 (c) *if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*
- 19** *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;*
 (a) *will occur behind a development setback;*
 (b) *is for maintenance purposes undertaken in accordance with a maintenance management plan; or*

(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.

- 24** *The development of a road;*
 (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
 (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;

 but excluding a road;
 (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; or
 (b) where the entire road falls within an urban area; or
 (c) which is 1 kilometre or shorter
- 27** *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for;*
 (i) the undertaking of a linear activity; or
 (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
- 56** *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre;*
 (i) where the existing reserve is wider than 13,5 meters; or
 (ii) where no reserve exists, where the existing road is wider than 8 metres;

 excluding where widening or lengthening occur inside urban areas.

Government Notice R325 (Listing notice 2) listed activities:

- 15** *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for;*
 (i) the undertaking of a linear activity; or
 (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

Government Notice R324 (Listing notice 3) listed activities:

- 4** *The development of a road wider than 4 metres with a reserve less than 13.5 metres*
- 12** *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.*
- 14** *The development of;*
 (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres;
 (ii) infrastructure or structures with a physical footprint of 10 square metres or more;

 where such development occurs;
 (a) within a watercourse;
 (b) in front of a development setback; or

*(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;
Excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;*

Need and Desirability

Housing is a national need, including in the !Kheis Local Municipality.

The !Kheis Local Municipality aims to promote socioeconomic development through the eradication of backlogs associated with housing, water and sanitation, and electricity, as well as improve basic services within Boegoeberg and the surrounding area. In order to meet the needs of the community within Boegoeberg (Brandboom), the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) for this proposed development. As per the !Kheis Integrated Development Plan (IDP) 2019/2020, a key performance indicator includes the provision of infrastructure and basic service through securing suitable land for human settlement projects. Suitable land for this purpose was previously identified in Boegoeberg, Groblershoop, Topline, Wegdraai, Grootdrink, Gariep, and Opwag. The provision of affordable housing remains a high priority for the Municipality which aims to restore the dignity of disadvantaged people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed !Kheis housing development falls in line with key strategic and development objectives, as outlined in the !Kheis Local Municipality's (KLM) IDP. The aim of which is to improve and maintain basic service delivery through specific infrastructural projects including human settlements, water, sanitation, electricity, as well as streets and storm water management¹. As per the Land Development Plan/ Rural Spatial Development Framework (2014), the Boegoeberg has been classified as a low development potential/ high human development need (Category 3 Investment type = small-scale monetary capital, basic services and social capital). Furthermore, one of the key spatial challenges identified by KLM for Boegoeberg was inadequate housing. The proposed location is considered to be a viable option as the proposed site for development is located adjacent to the existing residential areas of Brandboom, allowing accessibility and linkage to the existing services infrastructure. The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including water, electricity, roads, appropriate waste management (e.g. sewage disposal infrastructure), and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in Boegoeberg and its surroundings. !Kheis Local Municipality is committed to the vision of the National Government of which it committed itself towards accelerating shared growth to halve poverty and unemployment and promote social inclusions. Housing forms an integral component of this vision.

Site Description

The site of the proposed Boegoeberg Housing Development is located on Plot 1890, Remainder of Farm 144, and Remainder of Farm 142, Boegoeberg, !Kheis Local Municipality. The proposed site is located approximately 12km east of Groblershoop, south of the N8 and the Orange River, and is situated within Ward 4 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The site is mostly vacant and undeveloped. However, a large part of the site has been used for illegal

¹ Integrated Development Plan of !Kheis Municipality, 2017-2022 (Review for 2019 – 2020 Financial Year).

dumping of domestic and construction waste. This is especially prevalent towards the middle of the site, and to the north, closer to the town. The site is generally undisturbed to the south.

Alternatives

Site Alternatives

The proposed site is the only viable site available at this stage and the only one that will be investigated in this application. The current land use, namely the Brandboom Settlement, is in line with the nature of the proposed development. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment. Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application.

Layout Alternatives

Four (4) design layouts were proposed of which Alternative 4 was the preferred layout. Alternative 4 was preferred due to this layout being in line with recommendations and information received from the Botanical Impact Assessment (Appendix 6A), Heritage Impact Assessment (Appendix 6B), Freshwater Impact Assessment (Appendix 6C), Geotechnical Investigation (Appendix 6D), SPLUMA Application (Appendix 4A), and Engineer's Services Report (Appendix 4B). Alternative 4 is also the preferred layout due to information received from the municipal infrastructure departments in relation to existing services infrastructure, requirements for additional land uses/ changes to proposed land uses (by the local municipality) as well as specific spacing of these land uses. This alternative also provides sufficient erven and housing opportunities (high and lower density), as well as providing for Municipal and Government land use opportunities, more Open Space and sufficient buffer zones recommended by the Botanical and Freshwater specialists. According to the SPLUMA Application (**Appendix 4A**), the erven are broken down as follows:

- **550 x Residential Zone I units;**
- **11 x Business Zone I units;**
- **4 x Institutional Zone II units;**
- **14 x Open Space II units;**
- **1 x Transport Zone I unit; and**
- **1 x Authority Zone I unit.**

Activity Alternatives

Activity alternatives are also limited with no feasible alternatives besides residential development to assess. Due to the need for housing in the !Kheis Local Municipality, the housing development and associated infrastructure on the property is therefore the only activity considered.

No-Go Alternative

This is the option of not developing the proposed housing development. Although the no-go development may result in no potential negative environmental impacts, the direct and indirect socio-economic benefits (such as housing shortages as well as loss of potential employment and skills-development opportunities) associated with constructing residential developments will not be realised. The need for additional housing opportunities in the !Kheis Local Municipality will not be realised. The population in Boegoeberg is predicted to increase, further impacting the non-operational wastewater treatment works which may result in increased pollution and health risks. In addition, the WWTW requires extensive maintenance and investment to meet current demand. The predicted increase in

population will result in the need for upgrades / construction of the WWTW to operate effectively and at full capacity.

Tasks to be undertaken during the EIA Phase

The following tasks must still be undertaken during the EIA phase of the process:

- Compile Draft Environmental Impact Report (EIR) for public comment based on specialist information;
- Distribute and/or make the Draft EIR available to registered Interested and Affected Parties for viewing and comment;
- Receive comments on Draft EIR. All comments received and responses to the comments have been incorporated into the Final Environmental Impact Report (EIR) (i.e. please refer to comments and responses table); and
- Preparation of a Final EIR for submission to DENC for consideration and decision-making.

Summary and Conclusions of Specialist Studies

The following specialist studies were undertaken as part of this Environmental Impact Assessment:

- Botanical Impact Assessment (Appendix 6A)
- Heritage Impact Assessment (Appendix 6B)
- Freshwater Assessment (Appendix 6C)
- Geo-technical Assessment (Appendix 6D)

Botanical Impact Assessment (with Biodiversity input):

According to the Botanical Impact Assessment (Appendix 6A), due to the size of the proposed project (49ha), the proposed development will result in the significant loss of vegetation of which approximately 60-70% (29.4 – 34.3ha) is still covered by indigenous vegetation. The site is located within the Bushmanland Arid Grassland vegetation type, a vegetation type which typically does not support high plant diversity. Plant species diversity, associated with the proposed site for development, was notably low. According to the Northern Cape CBA maps the proposed site falls within a CBA area however, the site will not impact on any recognised centre of endemism. According to the Botanical Specialist, the proposed Boegoeberg development is likely to result in a **Low impact**, which can be further reduced with the implementation of proposed mitigation measures and effective environmental control during the construction phase. Moreover, with the implementation of proposed mitigation measures, the proposed development is unlikely to significantly contribute to / impact the:

- Loss of vegetation type and associated habitat;
- Loss of ecological processes, including but not limited to migration patterns, pollinators, and river function;
- Loss of local biodiversity and threatened plant species; and
- Loss of ecosystem connectivity.

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities. Such activities include, but are not limited to, animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Chapin *et al.*, 2000²). Although smaller mammals, such as genet and mice, are still expected to occur within the proposed site – apart from livestock (namely goats), none of these faunal species were observed (not even traces of their presence – e.g. droppings). It is also considered highly unlikely that game (small and large mammals) occur within the

² Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. & Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, 405(6783), pp.234-242.

proposed development footprint due to its proximity to the settlement and the scarcity of natural hiding (i.e. vegetation structure pertinent to the site). With regards to avi-fauna, although smaller, common birds were observed during the site visit, no larger birds were observed. Because of the location (next to the existing settlement) the proposed footprint enlargement is not expected to have any significant impact on the surrounding bird populations, especially if larger trees next to the seasonal drainage lines are protected. No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for various reptile species however, these species are likely to be terrestrial species adapted to the dry Nama-Karoo environmental conditions. Amphibian species are unlikely to occur within the proposed drainage lines due to the ephemeral nature of the watercourses and degree of contamination associated with the pre-existing oxidation ponds.

The specialist concluded that, *“with the available information it is recommended that the project be approved, with the proposed mitigation actions”*.

Heritage Impact Assessment

According to the Heritage Impact Assessment (**Appendix 6B**), eleven (11) incidences of ESA and MSA lithic material (comprised of informal tools, knapping debris, scrapers, blades, retouched flakes and cores) were recorded across the development footprint. The majority of the lithics are Banded Ironstone Formation (BIF), an abundant raw material within the area, with some cryptocrystalline silicates (CCS) and quartzite pieces. The material was documented as widely dispersed surface scatters, with no archaeological context – and thus, not of conservation value. Although these resources will be impacted by the proposed development, these resources are of low significance and thus, the impact will be negligible. No significant heritage sites or features were identified within the proposed development footprint. No further mitigation measures were required with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists concluded that the proposed development can continue. The Boegoeberg cemetery (graded as IIIB and is of High Local Significance) is situated outside of the proposed development footprint. No further mitigation measures were recommended with regards to these resources. No other graves were identified within the development footprint.

The proposed site for development is located within an area of low palaeontological significance. Thus, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Proposed mitigation measures, as per the Heritage Impact Assessment (Appendix 6B) must be implemented and has been included in the Environmental Management Program (EMPr).

Freshwater Impact Assessment

According to the Freshwater Assessment (**Appendix 6C**), watercourses (namely drainage lines) were identified within the proposed development footprint. These watercourses are non-perennial drainage lines which are mostly dry but may have some water in them during summer rainfall events. The sub-catchment associated with the larger drainage line is approximately 156ha in extent whereas the smaller drainage line has a sub-catchment of approximately 54ha. These drainage lines have riparian zones overgrown with *Senegalia mellifera* (swarthaak). The Present Ecological State (PES) of the riparian and instream components of the drainage lines were both categorized as Class D (Largely modified - a significant loss of natural habitat, biota and ecosystem function). As no fish species were present due to the non-perennial nature of the drainage lines, the drainage lines were not classified as ecologically important (EI). The drainage lines within the proposed site for development is Ecologically Sensitive. No other endangered species, either plant or animal, were detected in or near the drainage line. In accordance with the Resources Economic Footprint, the drainage lines have a small economic footprint.

As per the Freshwater Assessment, biomonitoring was conducted at eleven (11) sampling points along the Lower Orange River, namely Augrabies Lair trust, Groblershoop, Kakamas Triple D, Hopetown Sewer, Hopetown Sewer, Keimoes Housing, Upington Erf 323, Upington Affinity, Styerkraal, Grootdrink Bridge, and Turksvy Dam. These sites were sampled based on elucidating the combined impact of the proposed developments on the Orange River, and was carried out according to Dickens and Graham, (2002). The PES of the Orange River (for both riparian and instream zones) were categorized as Class C (Moderately modified - a loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged), and is an Ecologically Important system (as classified by the Freshwater Specialist). Furthermore, the Orange River is Ecologically Sensitive.

As per the Freshwater Assessment, the wastewater treatment works (WWTW) was non-operational where the pump station was overflowing at the time of the site visit where raw sewage was flowing into the drainage line. Waste has been illegally dumped into the drainage lines. The cumulative impact of sewage and solid waste entering the drainage lines and Orange River were considered to have a Medium Impact which can be reduced to a Low impact should proposed mitigation measures be implemented. Other identified impacts include construction of housing around drainage lines, destruction of drainage lines, and change in drainage lines into a stormwater canal. These impacts can however be mitigated for by the implementation of a 50m wide buffer around the drainage lines.

The Freshwater Specialist concluded that identified impacts will have a Medium impact on the freshwater features of the site which can be reduced to a Low impact should proposed mitigation measures be implemented. Impacts associated with the condition of the sewage and solid waste management infrastructure are threats to the Water Use Authorisation (WUA) and authorities may insist that these issues be resolved prior to the approval of the WUA (General Authorisation).

Geotechnical Investigation

According to the Geotechnical Investigation (Appendix 6D), the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S. The following are the main conclusions that have been made:

- **Geology:** the proposed site for development is located between the lithology of the Kaapvaal Craton and Namaqua-Natal mobile belt where the remaining, original geology is comprised of Kaaien Terrane whereas the site is located on the Groblershoop Formation of the Brulpan Group. The bedrock associated with the site comprises of quartz-sericite schist and quartzite.
- **Hydrology:** no perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site. Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%. According to the Geotechnical Investigation, the non-perennial watercourses require no precautionary measures to ensure safety of the community against flooding. Infrastructure must be established at a safe distance from the drainage lines. The slope may result in problems associated with the design of stormwater and sewage disposal systems.
- In terms of general measures, the following recommendations were made:
 - **Founding:** The development must take place according to the SANS 10400H and NHBRC Homeowner's Manual Guidelines (published in 2015).

- **Trench backfill:** only aeolian sand can be regarded as suitable for selected fill or pipe bedding whereas all material (except for hardpan calcrete) can be used for normal backfill.
- **Layer works:** Hardpan calcrete and colluvium are of G6 quality and are suitable for the construction of layer works up to sub- and base- course level for lightly trafficked roads.
- **Wearing course for gravel roads:** no material present on site is 100% suitable for gravel wearing course.
- **Excavation conditions:** Due to the consistency and composition of the soil present on site, the use of such soil is not economically viable. Excavation of soils would require a TLB (rated at 55kW minimum) or a 30-ton excavator will be required for the excavation of the very dense hardpan calcrete which needs to be removed and thus, adequate financial provision must be made for hard rock excavation. Sidewalls of excavations may be susceptible to collapse. Precautionary measures must be provided to protect workmen in these excavations - these measures may include shoring the excavations or sloping the sides to flatter than 1(V):2(H).
- **Land slope:** Average slope across 52% of the site is less than 2% - thus, the proposed site is regarded as being of an intermediate suitability for urban development only.
- **Presence of Wastewater Facilities:** future development must comply with legal requirements to mitigate negative impact of these facilities on the receiving environment and proposed residential development.

Services

Due to the nature and size of the proposed development, an investigation into the capacities and status of existing bulk services and future bulk services required to supply the development was needed and undertaken. Bvi Consulting Engineer's compiled a Bulk Services Report (**Appendix 4B**), investigating the status of existing services and proposing recommendations relative to the construction and / or upgrade of existing infrastructure to service the proposed housing development.

Water

The calculated average daily demand (AADD) is 379.8m³/day (15.8m³/hr). It must be noted that the potable water storage capacity exceeds storage capacity of current infrastructure (by approximately 187%) where source pump station capacity and pipeline flow and raw water storage capacity is currently nearing full capacity at 73% and 71%, respectively. The average daily demand for bulk and connector services is expected to increase from 379.8m³/day to 709.8m³/d should the proposed development be authorised. The lifting pump station capacity and pipeline flow between the main storage and elevated tank needs to be upgraded from 194mm diameter (at 106.8m³/hr) to 266mm diameter (at 199.6m³/hr).

Sewerage

As per the Engineering Services Report, a new full borne sewerage system is recommended to service the existing 465 households and additional 550 households. The two pump stations have been calculated to have a required theoretical pump station capacity of 92m³ (pump station No.1) and 48m³ (pump station No. 2). Proposed recommendations required to service the proposed development include the construction of a new full born sewerage system (excluding internal sewer lines), comprising of:

- Two (2) new sewer pump stations capable of delivering 26.4 l/s and 15.7 l/s, respectively, directly to the WWTW;
- Two (2) new Huber screens at both Sewer Pump stations.
- New 250mm diameter pipelines (1 610m) between the Pump Station No. 1 and the WWTW;
- New 200mm diameter pipelines (450m) between the Pump Station No. 2 and the new rising main from Pump Station No. 1; and the construction of

- A 80m x 160m Oxidation Pond.

Roads

Existing access to site is along the N10 where roads off the N10, namely DR03293 and MR00779, are used to access the proposed site for development. As per the Engineer's Services Report, existing gravel roads can be upgraded to interlocking paved streets (with kerbs to allow for adequate surface drainage) – resulting in unskilled job creation for the Brandboom community.

Stormwater

No formal stormwater infrastructure is present within the Brandboom settlement where stormwater runoff is currently draining from the centre of the site. According to the Engineer's Services Report, the guiding principle is that the peak stormwater runoff from the site, post construction, should not exceed the full range of storm return periods (1:2 to 1:50) of the site pre-construction. Stormwater infrastructure must be constructed to:

- Accommodate minor storm events (i.e. 1:5 years) in open channels or side drains of streets;
- Accommodate major storm events (i.e. 1:50 year) through controlled overland flows, aboveground attenuation storage, and berms at the higher end of the site; and
- To prevent pooling of stormwater runoff;

In addition to parameters stipulated in the Engineer's Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

Solid waste removal

According to the Integrated Development Plan, 2019 – 2022, the proportion of households in the !Kheis Municipality whose refuse is removed by a local authority at least once a week increased from 48.1% in 1996 to 62.0% in 2016. However, there was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016. The IDP also states that in 2016, 21.1% of households dispose of waste via their own refuse dump. This is evident in the large amounts of domestic waste observed dumped within the proposed site for development, especially within drainage lines. As per the Engineer's Services Report, a designated spoil site, where illegal dumping has previously occurred, was proposed for solid waste management.

Electricity

As per INEP Guidelines, the expected additional load of the proposed development will initially be 660KVA. The proposed site for development falls within the Eskom Distribution area and existing electrified households purchase electricity directly from Eskom. Currently, the bulk connection to the Brandboom settlement is via a 22kV overhead line from the Eskom 10MVA Groblershoop substation – which is in the process of being upgraded to a 20MVA. The existing overhead feeder will only be able to accommodate the future additional 660kVA load once the Groblershoop 10MVA substation has been commissioned. It must be noted that the internal electrical network extension can only be carried out by Eskom after formulation processes have been completed as the area falls under Eskom's jurisdiction.

Conclusion

The specialist studies and the information provided within the EIA Report, indicates that the proposed Boegoeberg Housing development does not pose any significant impacts should the proposed mitigation measures be implemented. However, as per the specialist assessments, site visits, and comments received from registered I&APs, the failure of the wastewater treatment works and illegal dumping, especially in drainage lines, remain a key issue which must be addressed with the implementation of a proper waste management plan. The proposed project will increase the pressure placed on existing municipal services and therefore, if a waste management plan is not effectively implemented, the current lack of sewage and solid waste management may negatively impact the environment and socioeconomic development in the Boegoeberg area.

According to the Botanical Specialist (Appendix 6A), “ *with the available information it is recommended that project be approved, with the proposed mitigation actions*”. According to the Heritage Impact Assessment (Appendix 6B), . No significant heritage sites or features were identified within the proposed development footprint. No further mitigation measures were required with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists concluded that the proposed development can continue. The Boegoeberg cemetery is located outside of the proposed site for development and thus, no further mitigation measures were recommended with regards to these resources. No other graves were identified within the development footprint. The proposed site for development is located within an area of low palaeontological significance. Thus, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. As per the Freshwater Impact Assessment (Appendix 6C), the Freshwater Specialist concluded that identified impacts will have a Medium impact on the freshwater features of the site which can be reduced to a Low impact should proposed mitigation measures be implemented. Impacts associated with the condition of the sewage and solid waste management infrastructure are threats to the Water Use Authorisation (WUA) and authorities may insist that these issues be resolved prior to the approval of the WUA (General Authorisation). According to the Geotechnical Investigation (Appendix 6D), the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S.

Considering all the information, it is envisaged that this proposed Boegoeberg Housing Development will have a low negative impact on the environment, and the socio-economic benefits are expected to greatly outweigh any negative impacts. The mitigation measures, as recommended by the various specialists and detailed in the EMPr (Appendix 9) must be implemented. It must be noted that a proper waste management plan³, addressing the functioning of the wastewater treatment works and solid waste removal to service the proposed development (i.e. existing and increase demand for these services), as well as a Traffic Impact Assessment (TIA), must be added as conditions to the granting of the environmental authorisation. This waste management plan must be implemented to address the expected increase in pressure on existing services – as per recommendations proposed and addressed in the Engineer’s Services Report (Appendix 4B). In addition to parameters stipulated in the Engineer’s Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters

³In the context of this Final EIR, “**waste management plan**” refers to a plan addressing the wastewater treatment works and solid waste removal infrastructure / management required to service the proposed development. Please refer to Appendix 4B (Engineer’s Services Report) for more information on required infrastructure. As per the specialist assessments, site visits, and comments received from registered I&APs, the management of sewage and solid waste remains a key issue which must be addressed with the implementation of a proper waste management plan.

(Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

It is therefore recommended that the proposed Boegoeberg Housing Development (**Alternative 4**) be supported and be authorised with the necessary conditions of approval, namely the compilation of a stormwater management plan, waste management plan (addressing sewage and solid waste management), and the undertaking of a traffic impact assessment, along with the implementation of recommendations / mitigation measures proposed by Specialists (Appendices 6A-D) and included in the EMPr (Appendix 9).

CONTENTS

1. INTRODUCTION	1
1.2 SCOPE OF WORK	1
1.3 ASSUMPTIONS AND LIMITATIONS	3
2. NEED AND DESIRABILITY	6
2.1 NEED	6
2.2 DESIRABILITY	8
2.3 INTEGRATED PLANNING	10
3. LEGAL REQUIREMENTS	12
3.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA	12
3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)	12
3.3 NATIONAL HERITAGE RESOURCES ACT	17
3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES	17
3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT	18
3.7 NATIONAL FORESTS ACT	18
3.8 NORTHERN CAPE CONSERVATION ACT, ACT 09 OF 2009	19
3.9 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, ACT 16 OF 2013	19
4. ALTERNATIVES	20
4.1 ALTERNATIVE 1	20
4.1.1 ALTERNATIVE 2	20
4.1.2 ALTERNATIVE 3	20
4.1.3 ALTERNATIVE 4	21
4.1 OTHER ALTERNATIVES	22
4.2 NO-GO ALTERNATIVE	22
5. SITE DESCRIPTION	23
5.1 LOCATION	23
5.2 VEGETATION	29
5.3 FRESHWATER	31
5.4 GEOLOGY	32
5.5 GEOHYDROLOGY	33
5.6 CLIMATE	33
5.7 SOCIO-ECONOMIC CONTEXT	34
5.8 HERITAGE FEATURES	37
6. SERVICES	39
6.1 WATER	39
6.2 SEWER	41
6.3 ROADS	43

6.4	STORMWATER	43
6.5	SOLID WASTE (REFUSE) REMOVAL	43
6.6	ELECTRICITY	43
7.	PROCESS TO DATE	44
6.1	TASKS UNDERTAKEN TO DATE	44
6.2	TASKS TO BE UNDERTAKEN DURING THE EIA PHASE	46
6.3	PROFESSIONAL TEAM	47
6.4	PUBLIC PARTICIPATION.....	48
7.4.1	PUBLIC PARTICIPATION UNDERTAKEN DURING SCOPING PHASE:	48
7.4.2	PUBLIC PARTICIPATION UNDERAKEN DURING THE EIA PHASE:	50
7.4.3	INTERESTED AND AFFECTED PARTIES	50
8.	ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS	51
	Mammals	52
	Avifauna.....	52
	Reptile & amphibians.....	53
7.1	CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS	57
9.2	BRIEFS FOR SPECIALIST STUDIES TO BE UNDERTAKEN AS PART OF THE EIA.....	58
9.2.1	BOTANICAL ASSESSMENT	58
9.2.3	FRESHWATER ASSESSMENT	59
9.2.4	GEO-TECHNICAL ASSESSMENT	60
10.1.1	KEY FINDINGS	61
	Mammals	65
	Avifauna.....	65
	Reptile & amphibians.....	66
10.1.2	IMPACT ASSESSMENT	66
	Direct impacts	66
10.1.3	MITIGATION MEASURES	66
10.1.4	CONCLUSION	67
10.2.1	KEY FINDINGS	67
10.2.2	IMPACT ASSESSMENT	68
10.2.3	MITIGATION MEASURES	68
10.2.4	CONCLUSION	69
10.3.1	KEY FINDINGS	69
10.3.2	IMPACT ASSESSMENT	71
10.3.3	MITIGATION MEASURES	71
10.3.4	CONCLUSION	71
10.4.1	KEY FINDINGS	72

10.4.2	RECOMMENDATIONS.....	74
7.	SUMMARY OF IMPACTS.....	76
8.	RECOMMENDATIONS.....	78
9.	CONCLUSIONS.....	80
10.	DETAILS AND EXPERTISE OF THE EAP.....	82

FIGURES

Figure 1:	Locality Plan (1: 50 000 Map). Source: CapeFarmMappers, 2020.	4
Figure 2:	Overview of proposed site for development. Source: QGIS, version 3.10.	5
Figure 3:	Demographic and service delivery statistics in the existing Boegoeberg Settlement.....	7
Figure 4:	Boegoeberg Urban Edge. Source: SDF, (2014).	9
Figure 5:	Boegoeberg Development Framework. Source: SDF, (2014).	11
Figure 6:	The EIA Process.	16
Figure 7:	Overview of the northern section of the proposed site for development	23
Figure 8:	Coordinates of corner points of the Boegoeberg study area.	25
Figure 9:	General view of north-eastern part of the proposed site.....	25
Figure 10:	Additional image showing illegal dumping	26
Figure 11:	Overview of vegetation present on site.....	26
Figure 12:	Vegetation and informal housing, previously established.....	27
Figure 13:	Overview of one of the kraals within the proposed site for development.	27
Figure 14:	Vegetation located in the southern section of the proposed site for development.	28
Figure 15:	Proposed Boegoeberg Site located in the Bushmanland Arid Grassland	29
Figure 16:	Critical Biodiversity Area (CBA) associated with the Boegoeberg study area	31
Figure 17:	Drainage lines associated with the proposed site for the Boegoeberg Housing.	32
Figure 18:	Geological features associated with the Boegoeberg site.	33
Figure 19:	Sectoral composition !Kheis (2017-2018)(Source !Kheis Municipality IDP (2019 – 2022).	35
Figure 20:	Results of Green Drop Score (2010/11)	36
Figure 21:	Summary of the EIA process and public participation process.	46
Figure 22:	Overview of the site, showing most significant disturbed areas	62
Figure 23:	Locations of <i>Boscia albitrunca</i> individuals.	64
Figure 24:	Recorded heritage within the proposed site for the Boegoeberg Housing Development... ..	68
Figure 25:	Sub-catchments associated with the Boegoeberg Housing Development.....	70

TABLE

Table 1.	Social and Economic Aspect	37
Table 2.	Tasks undertaken in the EIA to date	44
Table 3.	Members of the professional team	47
Table 4.	List of the plant species identified during the botanical assessment.....	62
Table 5.	Summary of all impacts	76

APPENDICES

APPENDIX 1:	LETTERS FROM AUTHORITIES
APPENDIX 1A:	ACKNOWLEDGEMENT FROM DENC
APPENDIX 1B:	ACCEPTANCE OF SCOPING REPORT AND PLAN OF STUDY
APPENDIX 2:	SITE LAYOUT PLANS
APPENDIX 2A:	ALTERNATIVE 1 LAYOUT PLAN
APPENDIX 2B:	ALTERNATIVE 2 LAYOUT PLAN
APPENDIX 2C:	ALTERNATIVE 3 LAYOUT PLAN
APPENDIX 2D:	PREFERRED ALTERNATIVE 4 LAYOUT PLAN
APPENDIX 3:	PUBLIC PARTICIPATION PROCESS
APPENDIX 3A:	INTERESTED AND AFFECTED PARTIES LIST
APPENDIX 3B:	PROOF OF ADVERTISEMENT
APPENDIX 3C:	PROOF OF NOTIFICATIONS
APPENDIX 3D:	PROOF OF SITE POSTERS AND LETTER DROPS
APPENDIX 3E:	COMMENTS AND RESPONSE REPORT
APPENDIX 4:	SPLUMA AND ENGINEERING AND SERVICES REPORTS
APPENDIX 4A:	SPLUMA APPLICATION
APPENDIX 4B:	ENGINEERING SERVICES REPORT
APPENDIX 5:	MAPS
APPENDIX 5A:	LOCALITY MAP
APPENDIX 5B:	BIODIVERSITY OVERLAY MAPS
APPENDIX 6:	SPECIALIST STUDIES
APPENDIX 6A:	BOTANICAL IMPACT ASSESSMENT
APPENDIX 6B:	HERITAGE IMPACT ASSESSMENT
APPENDIX 6C:	FRESHWATER ASSESSMENT
APPENDIX 6D:	GEO-TECHNICAL REPORT
APPENDIX 7:	IMPACT ASSESSMENT SUMMARY
APPENDIX 8:	SITE OVERVIEW PHOTOGRAPHS
APPENDIX 9:	ENVIRONMENTAL MANAGEMENT PROGRAMME

ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DENC	Department of Environment and Nature Conservation (Northern Cape)
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
NCNCA	Northern Cape Nature Conservation (Act 9 of 2009)
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NFA	National Forests Act (NFA) of 1998 (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act
OESA	Other Ecological Support Area
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
TIA	Traffic Impact Assessment
WULA	Water Use Licence Application

1. INTRODUCTION

1.1 BACKGROUND

Consideration is being given to the development of a new township, consisting of approximately 550 erven, and associated infrastructure over a forty-nine (49) ha extent, on Plot 1890, Remainder of Farm 144, and Remainder of Farm 142, Boegoeberg, !Kheis Local Municipality. The proposed development will be comprised of approximately:

- **550 x Residential Zone I units:** land use includes residential housing where one residential unit comprises of a self-contained interlinking group of rooms for the accommodation and housing of a single family, or a maximum of four persons;
- **11 x Business Zone I units:** land use includes business-related buildings / premises comprising of shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms, etc.);
- **4 x Institutional Zone II units:** land use includes places of worship (i.e. places for practising religion);
- **14 x Open Space II units:** land use includes public open space which is to be utilized by the public as an open space, park, garden, playground, and / or recreational site;
- **1 x Transport Zone I unit:** land use includes a public street reserved for street purposes including facilities for public transport; and
- **1 x Authority Zone I unit:** land/ erven and buildings utilized by the Local and / or District Municipality to carry out mandatory functions.

The proposed site is situated approximately 12km east of Groblershoop, south of the N8 and the Orange River. The site is situated within Ward 4 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape at the following location: 28°55'48.10"S; 22° 7'12.78"E.

The applicant is !Kheis Local Municipality who will undertake the activity should it be approved. EnviroAfrica CC has been appointed as the independent environmental assessment practitioner (EAP) responsible for undertaking the relevant EIA and the Public Participation Process required in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA).

The Application Form and Draft Scoping Report was submitted to the DENC on the **29th July 2020**. The Final Scoping Report and Plan of Study for this EIA was submitted to the Department of Environment and Nature Conservation (DENC) on the **8th October 2020**. The Scoping Report and Plan of Study for EIA were approved by DENC on the **11th December 2020** and EnviroAfrica were advised to proceed with the EIA process (**Appendix 1B**).

1.2 SCOPE OF WORK

There has been no particular brief given to the consultants to undertake this study. However, the scope of the study has been determined with reference to the requirements of the relevant legislation and undertaken in terms of the Integrated Environmental Management Information Series on Environmental Impact Reporting (2004) issued by DEAT and the Information Document on Requirements with respect to the EIA Process (January 2003), issued by the Department of Environmental Affairs and Development Planning of the Western Cape.

The basic scope of work will include the following:

- Review of all information;
- Participating in the progress of the development proposal;
- Scoping (identification of significant issues);
- Assessment of anticipated impacts;
- Identification of suitable mitigation measures to reduce negative impacts and enhance positive impacts; and
- Submission for decision.

One of the crucial aims of an EIA is to ensure that the demands of sustainable development are met on a project level, within the context of the greater area. The definition of sustainable development, used in the context of this EIA, is development that meets the needs of the present while not compromising the needs of future generations. This EIA is therefore being undertaken with sustainable development as a goal. This EIA identifies and looks at impacts, associated with the proposed development, on the environment, assessing the significance of these impacts as well as proposed mitigation measures, as required, to reduce anticipated impacts to acceptable levels.

Moreover, the mitigation hierarchy has been applied to arrive at the best practicable environmental option. The mitigation hierarchy is comprised of four actions which are designed to be implemented sequentially⁴, namely (1) avoidance, (2) minimization, (3) rehabilitation, and (4) offset (if required), where the following actions are applicable and have been applied in the context of this environmental process to promote the best feasible environmental option:

- (1) **Avoidance:** avoiding impacts on biodiversity within the proposed site of development and surrounding area and includes identifying potential risks and investigating alternatives⁵. Avoidance was carried out in the context of this process as environmental components (namely potential botanical and freshwater impacts) were identified and rated by specialists. Moreover, design alternatives were also investigated to incorporate and reduce the impact(s) on environmentally sensitive features (e.g. drainage lines). Due to the nature of this proposed development, no site alternatives were investigated – this also aids in avoiding any potential negative impact(s) on pristine areas;
- (2) **Minimize potential impacts:** mitigation measures and recommendations have been proposed by the Botanical, Freshwater, Heritage, and Geotechnical Specialists to mitigate and reduce identified potential impacts. These mitigation measures and recommendations have been incorporated into the EMP_r and are to be implemented during the construction and operational (where applicable) phases; and
- (3) **Rehabilitation:** as per action 2 above, mitigation measures, including the need to rehabilitate areas (which also aids in reducing erosion during the operational phase) outside the construction footprint has been included in the EMP_r.

⁴Arlidge, W.N., Bull, J.W., Addison, P.F., Burgass, M.J., Gianuca, D., Gorham, T.M., Jacob, C., Shumway, N., Sinclair, S.P., Watson, J.E. and Wilcox, C., 2018. A global mitigation hierarchy for nature conservation. *BioScience*, 68(5), pp.336-347.

⁵Phalan, B., Hayes, G., Brooks, S., Marsh, D., Howard, P., Costelloe, B., Vira, B., Kowalska, A. and Whitaker, S., 2018. Avoiding impacts on biodiversity through strengthening the first stage of the mitigation hierarchy. *Oryx*, 52(2), pp.316-324.

1.3 ASSUMPTIONS AND LIMITATIONS

The assumption is made that the information on which the report is based (i.e. specialist studies, project information, information given by the applicant and client, as well as mapping tools including *CapeFarmMapper* and *BGIS*) is correct.

Future management of the site is essential, and the assumption is made that the mitigation measures recommended by the specialists will be implemented on a long-term basis. This has a major bearing on the reliability of the predictions of significance of impact.

1.4 DESCRIPTION OF THE PROPOSED ACTIVITY

The !Kheis Local Municipality is proposing that a new township development, consisting of approximately 550 erven and associated infrastructure on Plot 1890, Remainder of Farm 144, and Remainder of Farm 142, Boegoeberg. The proposed project entails the development of approximately 550 low-income erven with an average size of approximately 300m²; including associated infrastructure such as roads, and water, stormwater, effluent, and electricity reticulation. The total area to be developed measures 49ha. The proposed site is located approximately 12km east of Groblershoop, south of the N8 and the Orange River, and is situated within Ward 4 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape.

The proposed site is located at the following location: 28°55'48.10"S; 22° 7'12.78"E.

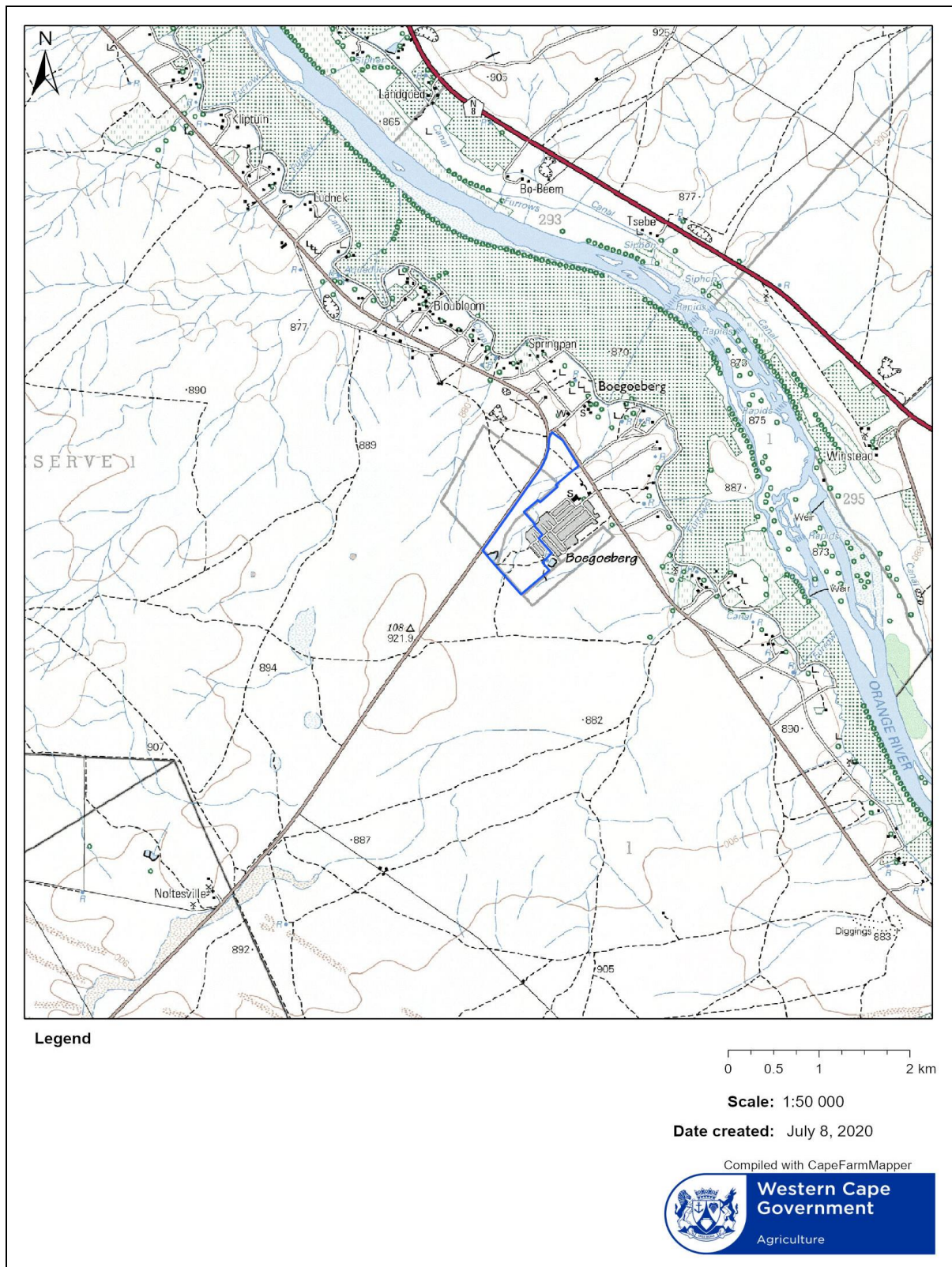


Figure 1: Locality Plan (1: 50 000 Map). Source: CapeFarmMappers, 2020.

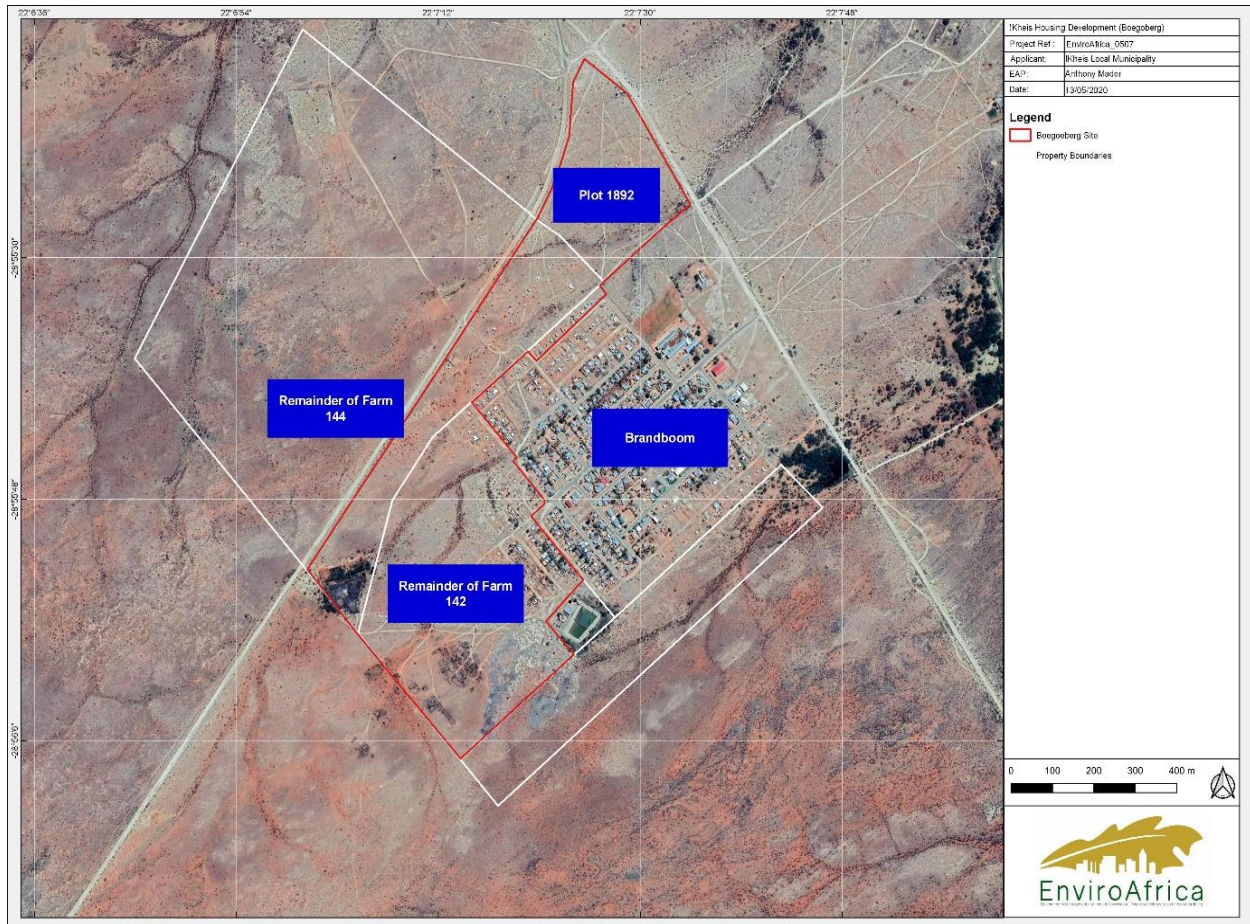


Figure 2: Overview of proposed site for development. Source: QGIS, version 3.10.

2. NEED AND DESIRABILITY

In terms of the National Environmental Management Act, as amended, EIA 2014 regulations the Scoping/EIA report must provide a description of the need and desirability of the proposed activity. The consideration of “need and desirability” in EIA decision-making requires the consideration of the strategic context of the development proposal along with the broader societal needs and the public interest.

The need for and the desirability of a proposed development forms a key component of any EIA application. The consideration of proposed developments in context of the various spatial planning tools and policy applicable to the study area forms an integral part of the present environmental processes. The “need and desirability” will be determined by considering the broader community’s needs and interests as reflected in a credible IDP, SDF and EMF for the area.

While the concept of need and desirability relates to the *type* of development being proposed, essentially, the concept of need and desirability can be explained in terms of the general meaning of its two components in which *need* refers to *time* and *desirability* to *place* – i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed? Need and desirability can be equated to *wise use of land* – i.e. the question of what the most sustainable use of land is. The impact of development on people’s health and well-being, as well as its impact on natural and cultural areas, and therefore its desirability, has also been addressed in the Environmental Impact Report (EIR) phase.

2.1 NEED

Housing is a national need, especially within the !Kheis Local Municipality.

The !Kheis Local Municipality aims to promote socioeconomic development through the eradication of backlogs associated with housing, water and sanitation, and electricity, as well as improve basic services within Boegoeberg. In order to meet the needs of the community within Boegoeberg (Brandboom), the Council resolved that a project business plan be submitted to Co-operative Governance, Human Settlements and Traditional Affairs (COGHSTA) for this proposed development. As per the !Kheis Integrated Development Plan (IDP) 2019/2020, a key performance indicator includes the provision of infrastructure and basic service through securing suitable land for human settlement projects. In line with this indicator, suitable land for this purpose was previously identified in Boegoeberg, Groblershoop, Topline, Wegdraai, Grootdrink, Gariep, and Opwag. The provision of affordable housing remains a high priority for the Municipality which will restore the dignity of disadvantaged people by providing shelter and access to basic human rights as enshrined in the Constitution of South Africa.

The proposed !Kheis housing development is in line with key strategic and development objectives, as outlined in the !Kheis Local Municipality’s (KLM) IDP. The aim of which is to improve and maintain basic service delivery through specific infrastructural projects including human settlements, water, sanitation, electricity, as well as roads and storm water management⁶. As per the Land Development Plan/ Rural Spatial Development Framework (2014), the Boegoeberg has been classified as a low development potential/ high human development need (Category 3 Investment type = small-scale monetary capital, basic services and social capital). Furthermore, one of the key spatial challenges identified by KLM for Boegoeberg was inadequate housing. In 2011, the demographic profile of the KLM consisted of a total population of 16 637 individuals with a total number of 4 145 households. According to the SDF, the

⁶ Integrated Development Plan of !Kheis Municipality, 2017-2022 (Review for 2019 – 2020 Financial Year).

population in Boegoeberg is expected to increase from 1857 (in 2001) to 2426 community members (by 2030), a 30.6% increase. This highlights this community's need for formalized, state-instituted housing, and associated, infrastructure. The proposed location is considered to be a viable option as the proposed site for development is located adjacent to the existing residential area of Brandboom, allowing accessibility and linking to the existing services infrastructure. Although undeveloped, the area surrounding the existing residential area is highly disturbed, with incidences of raw sewage and illegal dumping (including general and hazardous waste).

The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including water, electricity, roads, appropriate waste management (e.g. sewage management), and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, promoting access to basic service delivery as well as socioeconomic development in Boegoeberg and its surroundings. !Kheis Local Municipality is committed to the vision of the National Government of which it committed itself towards accelerating shared growth to halve poverty and unemployment and promote social inclusions. Housing forms an integral component of this vision.

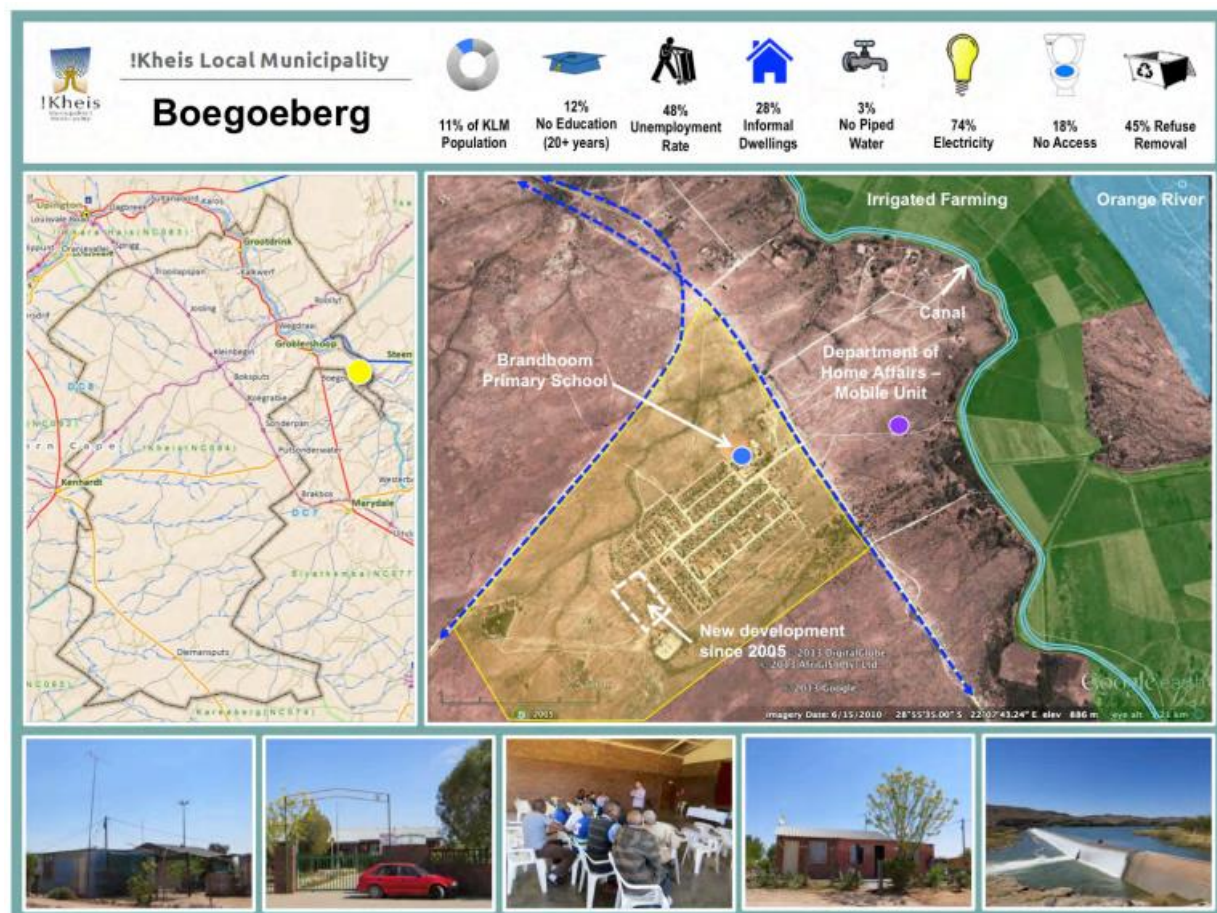


Figure 3. Demographic and service delivery statistics in the existing Boegoeberg Settlement (Brandboom). Source: SDF, (2014).

2.2 DESIRABILITY

The following factors determine the desirability of the area for the proposed residential development. As per the Needs and Desirability Report, prepared by Macroplan (August 2020), approximately 190 to 200 families live on the proposed site for development and are in dire need for formalization. It is clear from the number of existing informal houses erected on the property, that this study area is indeed habitable and that there is an urgent need for residential erven within the sub-economic market.

2.2.1 LOCATION AND ACCESSIBILITY

The proposed location is considered to be a viable option as the proposed site for development is located adjacent to the existing residential area of Brandboom, allowing accessibility and linking to the existing services infrastructure.

Due to the existing settlement, namely the Brandboom Settlement, the proposed development will expand the housing footprint in the immediate area. The proposed development will tie into existing services, reducing costs and environmental impact associated with the construction of a stand-alone development in an area where surrounding land uses are not in line with the nature of this project. The proposed site is in close proximity to the N8/ N10, enabling easy access to the site. The site is also located in close proximity to Groblershoop (12km east) and Upington (approximately 98km). According to the SPLUMA Application (**Appendix 4A**), the involved properties are located within the demarcated urban edge of Boegoeberg. Moreover, as per the !Kheis SDF, the portions of land identified for the Boegoeberg formalisation and expansion project falls within the urban edge of Boegoeberg and has furthermore been earmarked for low-cost housing, as such the development proposal is in line with the spatial vision of Boegoeberg.

There are no physical characteristics of these properties or environmental constraints which would exclude the site from development.



Figure 4. Boegoeberg Urban Edge. Source: SDF, (2014).

2.2.2 COMPATIBILITY WITH THE SURROUNDING AREA

The proposed site is directly adjacent to the existing residential area of Brandboom (Figure 2). As stated above, this would provide accessibility and allow the proposed development to link to the existing services infrastructure. Although undeveloped, the area surrounding the existing residential area is highly disturbed, with incidences of illegal dumping (including general and hazardous waste) and raw sewage. Due to the close proximity of the existing Settlement, costs and environmental impacts, associated with the excavation and laying of new pipes, will be avoided as the proposed development will tie in with existing services.

As per the SPLUMA Application, the study area comprises of land portions, which serve as the town commonage of Boegoeberg and is located on the periphery of this town. The location of these portions contributes to a strong contrast between vacant areas and built-up areas. An estimate of 300 informal stands can also be located on the involved portions of land, as such a strong residential character has already been established on the study area. All of the land portions, translating to the study area of this application, borders to the existing developments of Boegoeberg. The development proposal will therefore fit well in with the existing residential character brought forth by the existing town of Boegoeberg.

As discussed above, the site is not limited by spatial constraints due to future expansion.

2.3 INTEGRATED PLANNING

According to the Department of Environmental Affairs: Integrated Environmental Management Guideline: Guideline on Need and Desirability (2017), when considering how the development may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). According to the Application Report in terms of the Spatial Planning and Land Use Management Act (SPLUMA) (Act 16 of 2013) (**Appendix 4A**), all proposed developments, specifically pertaining to land use change applications within a municipality, must be measured against an approved Spatial Development Framework (SDF), which may be seen as the spatial translation of the Integrated Development Plan (IDP).

According to the SPLUMA Application Report (**Appendix 4A**), the !Kheis SDF was revised in 2016 to align with the principles of the Spatial Planning and Land Use Management Act (Act 16 of 2013) and has since been a valid and important document for spatial guidance. The SDF of the !Kheis Municipality adheres to the basic SDF requirements as stipulated in the Spatial Planning and Land Use Management Act (Act 16 of 2013), therefore providing a potential investor with adequate information to plan a development according to the spatial vision of the municipality. Within the !Kheis SDF, the portions of land identified for the Boegoeberg formalisation and expansion project falls within the urban edge of Boegoeberg and has furthermore been earmarked (See Annexure L) for low-cost housing, as such the development proposal is in line with the spatial vision of Boegoeberg.

In the !Kheis Municipality Land Development Plan/ Rural Spatial Development Framework (2014), a variety of projects are identified as focus areas with regards to development. These projects stem from the various municipal IDP's and SDF's and one of the outlined areas of focus is that of housing needs in urban and rural areas throughout the district and local municipalities.

As per the SDF, the key issues raised include, but are not limited to:

- Inadequate housing;
- Lack of land for housing and farming in the area where the new informal settlements are the result of new household formation in the area and not in-movement from outside the area;
- A lack of jobs and job-creation opportunities in the area;
- Water quality and supply;
- Safety risk (for children and livestock) associated with the water channels
- Dependency of shops located in Groblershoop;
- The lack of facilities for (i) secondary schooling, (ii) sports and recreation, and (iii) centres where senior citizens can meet; and
- Weak power supply.

According to the Northern Cape Provincial Spatial Development Framework (2019)(NCPSDF), as part of the Spatial Development Strategies for Infrastructure Investment and related objectives it is a set objective that, amongst others, the housing backlog within the province must be eradicated. It is furthermore indicated that, as part of policy alignment with the Spatial Planning Categories, adequate, safe and affordable housing (amongst other objectives) must be met by 2030.

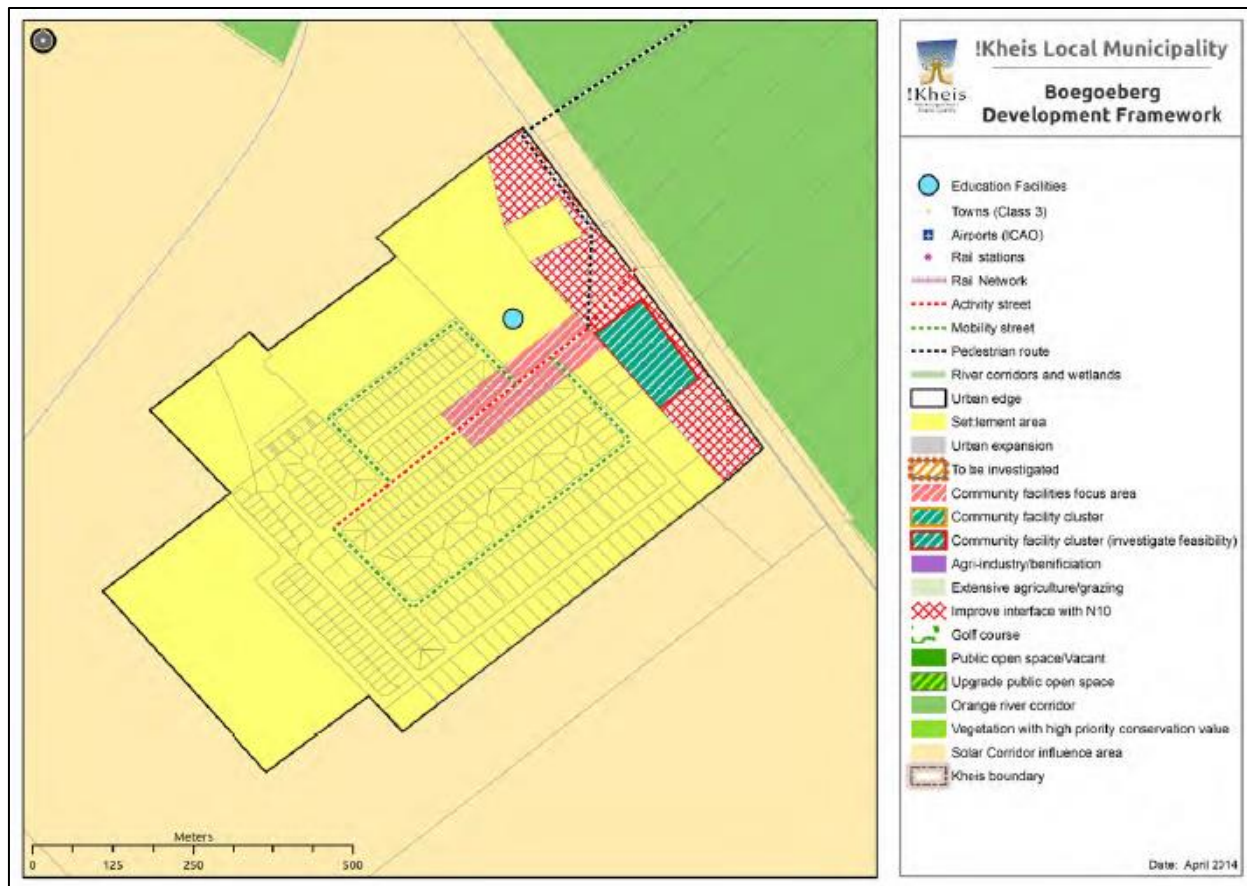


Figure 5. Boegoeberg Development Framework. Source: SDF (2014).

3. LEGAL REQUIREMENTS

The current assessment is being undertaken in terms of the National Environmental Management Act (Act 107 of 1998, NEMA), to be read with section 24 (5): NEMA EIA Regulations 2014. However, the provisions of various other Acts must also be considered within this EIA.

The legislation that is relevant to this study is briefly outlined below.

3.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment. This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (Act 107 of 1998) (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the relevant authorities based on the findings of an environmental assessment. NEMA is a national act, which is enforced by the Department of Environmental Affairs (DEA). These powers are delegated in the Northern Cape to the Department of Environment and Nature Conservation (DE&NC).

On the 04 December 2014 the Minister of Water and Environmental Affairs promulgated regulations in terms of Chapter 5 of the NEMA, namely the EIA Regulations 2014. These were amended on 07 April 2017 (GN No. 326, No. 327 (Listing Notice 1), No. 325 (Listing Notice 2), No. 324 (Listing Notice 3) in Government Gazette No. 40772 of 07 April 2017). Listing Notice 1 and 3 are for a Basic Assessment and Listing Notice 2 for a full Environmental Impact Assessment.

According to the regulations of Section 24(5) of NEMA, authorisation is required for the following listed activities for the proposed agricultural development:

Government Notice R327 (Listing Notice 1) listed activities:

- 9** The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water;
 - (i) with an internal diameter of 0,36 metres or more; or
 - (ii) with a peak throughput of 120 litres per second or more;excluding where;
 - a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or
 - b) where such development will occur within an urban area.
- 10** The development and related operation of infrastructure exceeding 1000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes

- (i) with an internal diameter of 0,36 metres or more; or
- (ii) with a peak throughput of 120 litres per second or more;

excluding where;

- (c) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or
- (d) where such development will occur within an urban area.

- 12** The development of;
- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres;
 - (ii) infrastructure or structures with a physical footprint of 100 square metres or more;
- where such development occurs;
- (a) within a watercourse;
 - (b) in front of a development setback; or
 - (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;
- 19** The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;
- (a) will occur behind a development setback;
 - (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or
 - (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.
- 24** The development of a road;
- (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or
 - (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;
- but excluding a road;
- (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; or
 - (b) where the entire road falls within an urban area; or
 - (c) which is 1 kilometre or shorter
- 27** The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for;
- (i) the undertaking of a linear activity; or
 - (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
- 56** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre;

- (i) where the existing reserve is wider than 13,5 meters; or
 - (ii) where no reserve exists, where the existing road is wider than 8 metres;
- excluding where widening or lengthening occur inside urban areas.

Government Notice R325 (Listing notice 2) listed activities:

- 15** The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for;
- (i) the undertaking of a linear activity; or
 - (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

Government Notice R324 (Listing notice 3) listed activities:

- 4** The development of a road wider than 4 metres with a reserve less than 13.5 metres
- 12** The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.
- 14** The development of;
- (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres;
 - (ii) infrastructure or structures with a physical footprint of 10 square metres or more;
- where such development occurs;
- (a) within a watercourse;
 - (b) in front of a development setback; or
 - (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;
- Excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;

The environmental process is being undertaken in distinct phases. An Application Form has been submitted to Department of Environment and Nature Conservation (DE&NC). On acknowledgment from DE&NC (**Appendix 1A**), the Scoping Process was undertaken to identify potential issues and impacts which may have been associated with the propose development. The Final Scoping Report and Plan of Study for EIA were submitted to the Department of Environment and Nature Conservation (DE&NC) on the **8th October 2020**. As per section 22 of the EIA Regulations (as amended):

- 22. The competent authority must, within 43 days of receipt of a scoping report—*
- (a) accept the scoping report, with or without conditions, and advise the applicant to proceed or continue with the tasks contemplated in the plan of study for environmental impact assessment; or*
 - (b) refuse environmental authorisation if—*
 - (i) the proposed activity is in conflict with a prohibition contained in legislation; or*
 - (ii) the scoping report does not substantially comply with Appendix 2 to these Regulations or any applicable protocol or minimum information requirements as identified and gazetted by the minister in*

a government notice and the applicant is unwilling or unable to ensure compliance with these requirements within the prescribed timeframe.

Therefore, the Draft EIR was submitted once approval/ acceptance of the Final Scoping Report was received from the competent authority.

The letter of acceptance / approval was received on the **11th December 2020** (Appendix 1B).

The principles of environmental management as set out in section 2 of NEMA have been taken into account. The principles pertinent to this activity include:

- People and their needs will be placed at the forefront while serving their physical, psychological, developmental, cultural and social interests. The activity seeks to provide additional housing, employment and economic development opportunities, which are a local and national need – *the proposed activity is expected to have a beneficial impact on people, especially developmental and social benefits, as well providing additional housing, employment and economic development opportunities.*
- Development will be socially, environmentally, and economically sustainable. Where disturbance of ecosystems, loss of biodiversity, pollution and degradation, and landscapes and sites that constitute the nation's cultural heritage cannot be avoided, are minimised and remedied. The impact that the activity will potentially have on these will be considered, and mitigation measures will be put in place - *potential impacts have been identified and considered, and any further potential impacts will be identified during the public participation process. Mitigation measures have been recommended by the various specialist assessment, and are included in the EMP.*
- Where waste cannot be avoided, it will be minimised and remedied through the implementation and adherence of the Environmental Management Programme (EMP) – *the EMP is included in the EIR as Appendix 9.*
- The use of non-renewable natural resources will be responsible and equitable.
- The negative impacts on the environment and on people's environmental rights will be anticipated, investigated, and prevented, and where they cannot be prevented, will be minimised and remedied – *potential negative impacts have been identified and considered, and any further potential impacts will be identified during the public participation process. Mitigation measures have been recommended by the various specialist assessment, and are included in the EMP.*
- The interests, needs, and values of all interested and affected parties will be taken into account in any decisions through the Public Participation Process – *refer to Section 7.4 below and Appendix 3.*
- The social, economic and environmental impacts of the activity will be considered, assessed and evaluated, including the disadvantages and benefits - *refer to Section 10 below*
- The effects of decisions on all aspects of the environment and all people in the environment will be taken into account, by pursuing what is considered the best practicable environmental option.

EIA (SCOPING AND ENVIRONMENTAL IMPACT REPORT (S&EIR) PROCESS

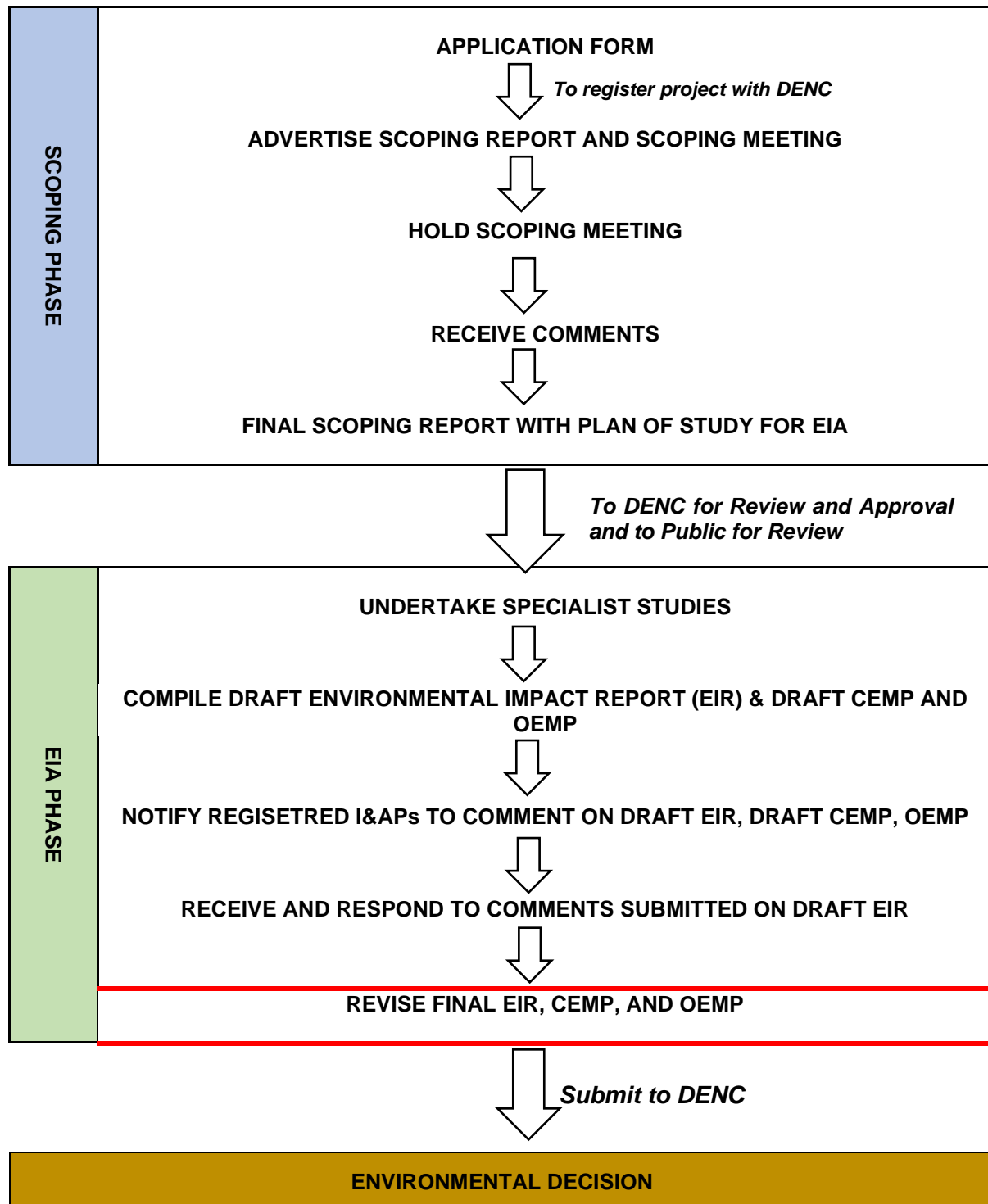


Figure 6: The EIA Process. Currently, this process is in the 'EIA Phase – Revise Final EIR, CEMP, and OEMP', as outlined in red.

3.3 NATIONAL HERITAGE RESOURCES ACT

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999). South African National Heritage Resources Agency (SAHRA) is the enforcing authority.

In terms of Section 38 of the National Heritage Resources Act, SAHRA will require a Heritage Impact Assessment (HIA) where certain categories of development are proposed. Section 38(8) also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is found to be adequate, a separate HIA is not required.

The National Heritage Resources Act requires relevant authorities were notified regarding this proposed development, as the following activities are relevant:

- *any development or other activity which will change the character of a site exceeding 5 000 m² in extent;*
- *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length*

Furthermore, in terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the SAHRA, or the responsible resources authority. Nor may anyone destroy, damage, alter, exhume or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority, in terms of Section 36 (3). In terms of Section 35 (4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES

The following are the latest guidelines and information Documents that have been consulted:

- Department of Environmental Affairs and Development Planning's (DEA&DP) *Environmental Impact Assessment Guideline and Information Document Series (Dated: March 2013)*:
 - ✓ *Guideline on Transitional Arrangements*
 - ✓ *Generic Terms of Reference for EAPs and Project Schedules*
 - ✓ *Guideline on Alternatives*
 - ✓ *Guideline on Public Participation*
 - ✓ *Guideline on Exemption Applications*
 - ✓ *Guideline on Appeals*
 - ✓ *Guideline on Need and Desirability*
- Department of Environmental Affairs and Tourism (DEAT) *Integrated Environmental Management Information Series*.

3.5 NATIONAL WATER ACT

Besides the provisions of NEMA for this EIA process, the proposed development may also require authorizations under the National Water Act (Act NO. 36 of 1998). The Department of Water Affairs, who administer that Act, will be a leading role-player in the EIA.

According to the Freshwater Impact Assessment (**Appendix 4B**), the NWA guides the management of water in South Africa as a common resource. The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact on water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the DWS is the administering body in this regard.

Defined water use activities require the approval of DWS in the form of a General Authorisation or Water Use Licence authorisation. Government Notice No. 665 of 6 September 2013 provides for General Authorisations for certain specified water use activities in terms of the disposal of wastewater which then do not require a licensing process. There are restrictions on the extent and scale of listed activities for which General Authorisations apply.

Section 22(3) of the National Water Act allows for a responsible authority (DWS) to dispense with the requirement for a Water Use Licence if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

Potential water use activities that are of relevance to the proposed Housing Development are:

- *Section 21(c): Impeding or diverting the flow of water in a watercourse;*
- *Section 21(f): Discharge of waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit;*
- *Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource; and*
- *Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.*

3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is part of a suite of legislation falling under NEMA, which includes the Protected Areas Act, the Air Quality Act, the Integrated Coastal Management Act and the Waste Act. Chapter 4 of NEMBA deals with threatened and protected ecosystems and species and related threatened processes and restricted activities. The need to protect listed ecosystems is addressed (*Section 54*).

3.7 NATIONAL FORESTS ACT

The National Forests Act, 1998 (Act 84 of 1998) (NFA) makes provisions for the management and conservation of public forests.

In terms of section 15(1) of the National Forests Act, 1998, no person may -

- (a) cut, disturb, damage or destroy any protected tree; or

- (b) posses, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except-
 - (i) under a license granted by the Minister; or
 - (ii) in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

3.8 NORTHERN CAPE CONSERVATION ACT, ACT 09 OF 2009

On the 12th of December 2011, the new Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect, which provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the Act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. The NCNCA is a very important Act in that it put a whole new emphasis on a number of species not previously protected in terms of legislation.

It also places a new emphasis on the importance of species, even within vegetation classified as “Least Threatened” (in accordance with GN 1002 of 9 December 2001, promulgated in terms of the National Environmental Management Biodiversity Act 10 of 2004). Thus, even though a project may be located within a vegetation type or habitat previously not considered under immediate threat, special care must still be taken to ensure that listed species (fauna & flora) are managed correctly.

3.9 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT, ACT 16 OF 2013

The Spatial Planning and Land Use Management Act 16 of 2013 (**SPLUMA**) is a national law that was passed by Parliament in 2013. SPLUMA provides a framework for spatial planning and land use management in South Africa.

The subject area falls under the jurisdiction of the local municipality and the appropriate zoning and subdivision would need to be allocated in order to permit the development of the land for the intended purpose.

Consideration of the Northern Cape Provincial Development Spatial Development Framework and the Northern Cape Provincial Growth and Development Strategy will be taken.

4. ALTERNATIVES

The proposed site is the only viable site available at this stage and the only one that will be investigated in this application. Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application. Various layout alternatives were proposed and have been considered during the Scoping and EIR phases. These alternatives are described below:

4.1 ALTERNATIVE 1

The current land use, namely the Brandboom Settlement, is in line with the nature of the proposed development. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment.

Alternative 1 (**Appendix 2A**) is the first of 4 concept layouts proposed. This layout included 550 erven, with an extent of 47ha, which included:

- Residential Zone I - 550 units;
- Business Zone I – one (1) unit;
- Institutional Zone II – two (2) units;
- Public Open Space; and
- Public roads.

This alternative was considered a viable option as it provided a sufficient number of housing opportunities. It was initially the municipality's preferred layout however, due to existing services and infrastructure, as well as identified environmental sensitive areas, this layout needed to be amendment (see Alternative 2 below).

4.1.1 ALTERNATIVE 2

Alternative 2 (**Appendix 2B**) is the second of 4 concept layouts initially proposed. This layout included 550 erven, over an extent of 49ha, which included:

- Residential Zone I - 550 units where units will not be constructed in the south-western section of the Boegoeberg development footprint;
- Business Zone I – one (1)
- Institutional Zone II – two (2),
- Public Open Space

Although this alternative was still considered a viable option, it was not preferred as it did not fully consider the environmental sensitive areas which were identified after this layout was drafted.

4.1.2 ALTERNATIVE 3

Alternative 3 (**Appendix 2C**) was the third of four concept layouts proposed. This layout includes 550 erven, over a 49ha extent:

- Residential Zone I - 550 units
- Business Zone I
- Institutional Zone II
- Public Open Space

This alternative was considered a viable option as it provided a sufficient number of housing opportunities and accounted for environmental features sensitive areas (namely the watercourses identified) and botanical features) and business zoning, however transport zoning was not included. Therefore, this layout needed to be amendment (see Alternative 4 – preferred layout below).

4.1.3 ALTERNATIVE 4

Alternative 4 (**Appendix 2D**) was the final of four concept layouts proposed and is the Applicant's Preferred Layout. According to the SPLUMA Application Report (**Appendix 4A**), the erven are broken down as follows:

- **550 x Residential Zone I units**: land use includes residential housing where one residential unit comprises of a self-contained interlinking group of rooms for the accommodation and housing of a single family, or a maximum of four persons;
- **11 x Business Zone I units**: land use includes business-related buildings / premises comprising of shops and/or offices (e.g. professional offices, places of assembly, doctors consulting rooms, etc.);
- **4 x Institutional Zone II units**: land use includes places of worship (i.e. places for practising religion);
- **14 x Open Space II units**: land use includes public open space which is to be utilized by the public as an open space, park, garden, playground, and / or recreational site;
- **1 x Transport Zone I unit**: land use includes a public street reserved for street purposes including facilities for public transport; and
- **1 x Authority Zone I unit**: land/ erven and buildings utilized by the Local and / or District Municipality to carry out mandatory functions.

Alternative 4 was the preferred layout due to this layout being in line with recommendations and information received from the Botanical Impact Assessment (Appendix 6A), Heritage Impact Assessment (Appendix 6B), Freshwater Impact Assessment (Appendix 6C), Geotechnical Investigation (Appendix 6D), SPLUMA Application (Appendix 4A), and Engineer's Services Report (Appendix 4B). Alternative 4 is also the preferred layout due to information received from the municipal infrastructure departments in relation to existing services infrastructure, requirements for additional land uses/ changes to proposed land uses (by the local municipality) as well as specific spacing of these land uses. This alternative also provides sufficient erven and housing opportunities (high and lower density), as well as providing for Municipal and Government land use opportunities, more Open Space and sufficient buffer zones recommended by the Botanical and Freshwater specialists. Alternative 4 is similar to Alternative 3, and was developed with amendments to Alternative 3 due to

4.1 OTHER ALTERNATIVES

Site Alternatives

The proposed site is the only viable site available at this stage due to the proposed site being located adjacent to the existing Brandboom Settlement. Therefore, this is the only site that will be investigated in this application. Housing is a constant need in the municipality, with other sites possibly earmarked for residential development that will not form part of this application. The current, surrounding land use, namely the presence of the Brandboom Settlement, is in line with the nature of the proposed development. The construction of the proposed housing development in another location would increase the construction footprint and therefore, the impact on the environment.

Activity Alternatives

Activity alternatives are also limited with no feasible alternatives other than residential development to be assessed. Due to the need for housing in the !Kheis Local Municipality, the housing development and associated infrastructure on the property is therefore the only activity considered.

4.2 NO-GO ALTERNATIVE

This is the option of not developing the proposed housing development. Although the no-go development may result in no potential negative environmental impacts, the direct and indirect socio-economic benefits (such as housing shortages as well as loss of potential employment and skills-development opportunities) associated with constructing residential developments will not be realised. The need for additional housing opportunities in the !Kheis Local Municipality will not be realised. The population in Boegoeberg is predicted to increase, further impacting the non-operational wastewater treatment works which may result in increased pollution and health risks. In addition, the WWTW requires extensive maintenance and investment to meet current demand. The predicted increase in population will result in the need for upgrades / construction of the WWTW to operate effectively and at full capacity.

5. SITE DESCRIPTION

5.1 LOCATION

The site of the proposed Boegoeberg Housing Development is located on Plot 1890, Remainder of Farm 144, and Remainder of Farm 142, Boegoeberg, !Kheis Local Municipality. The proposed site is located approximately 12km east of Groblershoop, south of the N8 and the Orange River, and is situated within Ward 4 of the !Kheis Local Municipality, ZF Mgcawu District Municipality, Northern Cape. The proposed site is located at the following location: **28°55'48.10"S; 22° 7'12.78"E**.

The site is mostly vacant and undeveloped. However, a large part of the site has been used for illegal dumping of general (e.g. household waste) and domestic waste (attributed to the non-operational WWTW). This is especially prevalent towards the middle of the site, and to the north, closer to the town. The site is generally undisturbed to the south.



Figure 7: Overview of the northern section of the proposed site for development, facing a southerly direction. Photo taken on the 19th May 2020.

The site coordinates of the site are as follows (refer to map below):

Coordinates of corner points of study area	Point	Latitude (S) (DDMMSS)			Longitude (E) (DDMMSS)		
	1	28°	55'	15.18"	22°	7'	25.00"
	2	28°	55'	17.84"	22°	7'	28.93"
	3	28°	55'	26.03"	22°	7'	34.46"
	4	28°	55'	32.08"	22°	7'	26.37"
	5	28°	55'	32.74"	22°	7'	27.00"
	6	28°	55'	37.71"	22°	7'	20.74"
	7	28°	55'	37.03"	22°	7'	19.98"
	8	28°	55'	40.79"	22°	7'	14.98"
	9	28°	55'	44.93"	22°	7'	19.03"
	10	28°	55'	45.19"	22°	7'	18.65"
	11	28°	55'	48.22"	22°	7'	21.54"
	12	28°	55'	49.29"	22°	7'	20.25"
	13	28°	55'	54.03"	22°	7'	24.91"
	14	28°	55'	57.13"	22°	7'	21.58"
	15	28°	55'	59.59"	22°	7'	24.06"
	16	28°	56'	7.45"	22°	7'	13.96"
	17	28°	55'	53.25"	22°	7'	0.27"
	18	28°	55'	20.98"	22°	7'	23.67"
	19	28°	55'	17.27"	22°	7'	23.97"



Figure 8: Coordinates of corner points of the Boegoeberg study area.



Figure 9. General view of north-eastern part of the proposed site. Note, illegal dumping was prevalent throughout the site. Moreover, livestock (including goats and pigs - red arrow) were the only fauna observed during the site visit.



Figure 10. Additional image showing illegal dumping looking over the eastern section of the proposed site for development.



Figure 11. Overview of vegetation present on site looking over the western section of the proposed site.



Figure 12. Vegetation and informal housing, previously established, looking in a north-western direction.



Figure 13. Overview of one of the kraals within the proposed site for development.



Figure 14. Vegetation located in the southern section of the proposed site for development.

5.2 VEGETATION

The proposed development footprint is located within the Bushmanland Arid Grassland (Figure 15), classified as *Least Threatened (LT)* as per the National list of ecosystems that are threatened and in need of protection (GN. 1002 of 9 Dec. 2011).

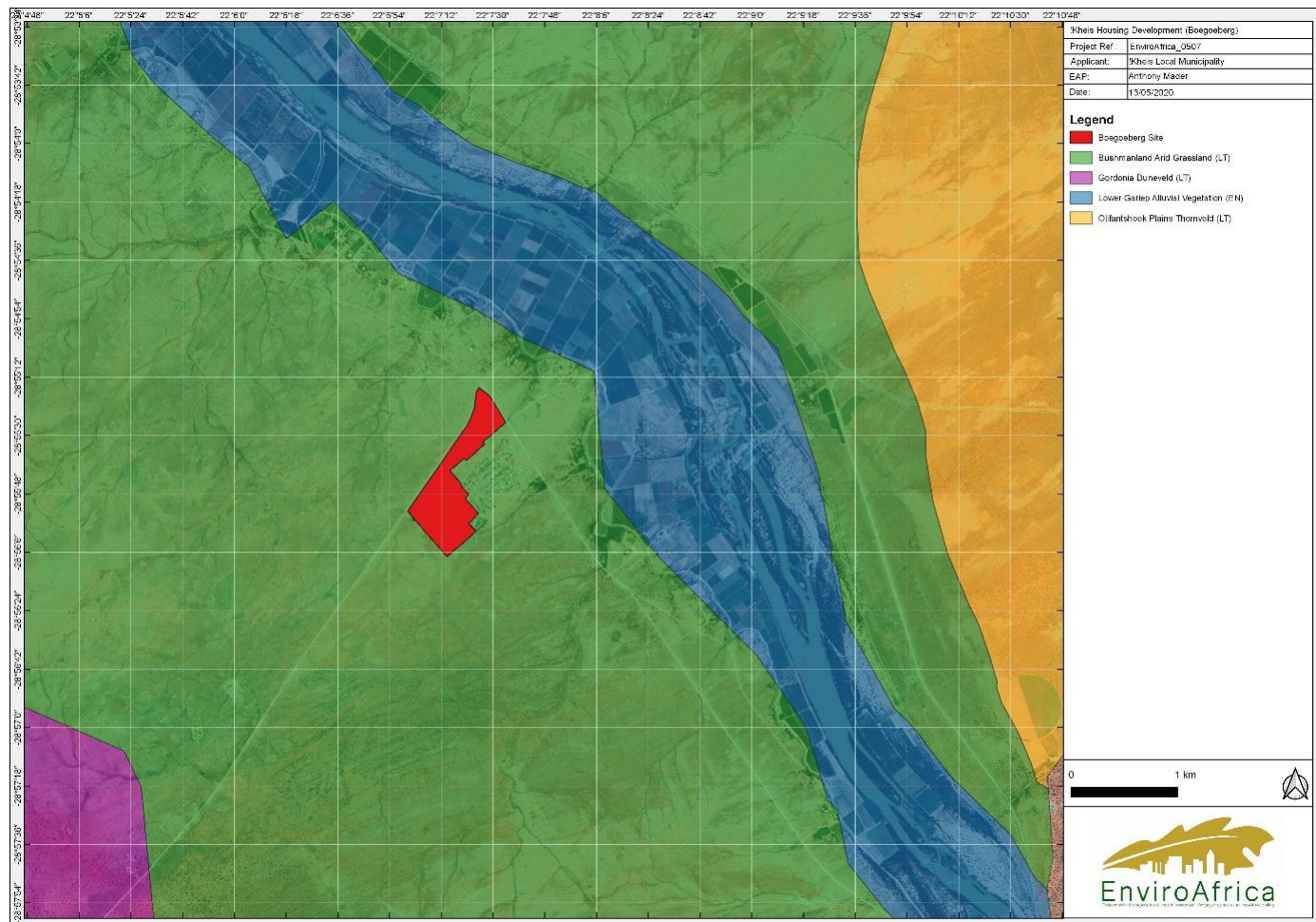


Figure 15: Proposed Boegoeberg Site located in the Bushmanland Arid Grassland, a Least Threatened ecosystem type.

According to the Botanical Impact Assessment (Appendix 6A), due to the size of the proposed project (49ha), the proposed development will result in the significant loss of vegetation of which approximately 60-70% (29.4 – 34.3ha) is still covered by indigenous vegetation. The site is located within the Bushmanland Arid Grassland vegetation type, a vegetation type which typically does not support high plant diversity. Plant species diversity, associated with the proposed site for development, was notably low. According to the Northern Cape CBA maps the proposed site falls within a CBA area however, the site will not impact on any recognised centre of endemism. Portions of the footprint are heavily disturbed as a result of illegal dumping, old ponds (e.g. sewerage works) and other physical disturbances. The absence of grasses as well as the low plant diversity may be attributed to the past and present overgrazing practices.

The northern and north-eastern corner of the site (nearest to Boegoeberg) was mostly covered by a low sparse shrubland characteristic of the Bushmanland Arid Grassland vegetation found on shallow soils on

weathering rock dominated by quartz and calcrete. Although the Northern Cape Province is currently in a severe drought (approximately 5 – 7 years), previous rainfall events have enabled the establishment of some new plant growth. Although high plant biodiversity is not a typical characteristic of the Bushmanland Arid Grassland vegetation type, species diversity within the proposed site for development is especially low where vegetation structure was mostly restricted to hardy unpalatable plant species. The absence of grasses as well as the low plant diversity, within the development footprint, is likely attributed to the combination of anthropogenic (e.g. land mismanagement through overgrazing) and environmental factors (e.g. severe drought being experienced throughout the Province). Please see below for more detailed information on sections of the proposed development.

The northern section possesses the lowest species diversity occurs in this section compared with the remainder of the proposed development footprint and receives a lot of foot traffic (observed by trampling and presence of pathways, etc). **Within the southern section**, there is less evidence of trampling observed however increased levels of grazing were noted. Overall, vegetation structure was described as low, open shrubland dominated by *Tetraena decumbens* in combination with *Justicia australis* (=Monechma) and *Tetraena microcarpa* with *Senegalia mellifera* scattered through the landscape. *Aloe claviflora*, a protected, low-growing plant species, were also very prominent. Due to the geological characteristics of drainage lines, these areas which comprise of deeper soils, supports a high tree canopy and includes plant species such as *Senegalia mellifera* (with the parasitic *Tapinanthus oleifolius* often observed on the tree), *Ziziphus mucronate*, *Lycium cinereum*, *Phaeoptilum spinosum*, and *Asparagus* species. Moreover, some *Boscia albitrunca* trees were observed, most of which appeared stressed and showed signs of being grazed or disturbed (branches cut – possibly for firewood). The alien invasive *Prosopis* tree was also occasionally observed but was more prominent in the vicinity of the livestock pens (seeds being distributed by the livestock). The following species list were observed throughout the site;

- *Aizoon burchellii*,
- *Aloe gariepensis*,
- *Aptosimum spinescens*,
- *Blepharis mitrata*,
- *Euphorbia braunsii*,
- *Euphorbia spinea*,
- *Geigeria ornativa*,
- *Kleinia longiflora*,
- *Lycium cinereum*,
- *Rhigozum trichotomum*, and
- *Salsola zeyheri*.

The 2016, Northern Cape Critical Biodiversity Area (CBA) map (Figure 16) identifies biodiversity priority areas, namely CBAs and Ecological Support Areas (ESAs), which, along with protected areas, are important for the preservation of a viable representation of all ecosystem types, species, as well as the long-term ecological functioning of the landscape (Holness and Oosthuysen, 2016). The 2016 Northern Cape CBA map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were also incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes. According to the Northern Cape CBA maps the proposed site falls within a CBA area. No alternative site, situated on Municipal land (that will not impact on the CBA), is available. As per the Botanic impact Assessment (Appendix 6A), the site will not impact on any recognised centre of endemism. The most significant botanical aspect of this site

is the presence of a three (3) protected Sheppard trees (*Boscia albitrunca*), most of which were in poor condition, as well as six (6) NCNCA protected plant species, namely *Aizoon burchellii*, *Aloe claviflora*, *Aloe gariepensis*, *Boscia albitrunca*, *Euphorbia braunsii*, and *Euphorbia spinea*.



5.3 FRESHWATER

According to the Freshwater Impact Assessment (**Appendix 6C**), non-perennial watercourses (namely drainage lines) have been identified within the proposed development footprint. These aquatic features were characterized as mostly dry where some water may be present in these watercourses during summer rainfall events. There are two of these drainage lines, a smaller one with an associated catchment area of 54ha (where the proposed housing development is intersected by the small sub-catchment in its south eastern corner) whereas the larger drainage line is associated with a catchment area of 156ha. From the road, the smaller drainage line runs through the vineyards with a drainage channel and joins the Orange River approximately 2km further on. The majority of the proposed site for development is situated within the sub-catchment associated with the larger drainage line. This drainage line, is approximately 6.1km in length where the head of the drainage line is located within the upper sub-catchment area and running towards the Orange River.

As per the Freshwater Specialist, these watercourses are small drainage lines with relatively small catchment areas (compared with catchments along the Orange River where catchment areas exceed 1000ha in extent and flooding is likely to occur during heavy rainfall events even though the catchment is located within an arid area with limited rainfall) that are not likely to cause any flooding, even during heavy

rains. An approximate decline of 13m (2.3km and a slope of 0.57 with an approximate drop of 0.5m over 100m) across the site is present where the highest point (in the south of the larger sub-catchment) is 896masl and lowest (at the dirt road) is 883masl. This change in elevation indicates that the site is not susceptible and conducive to a large erosion potential.

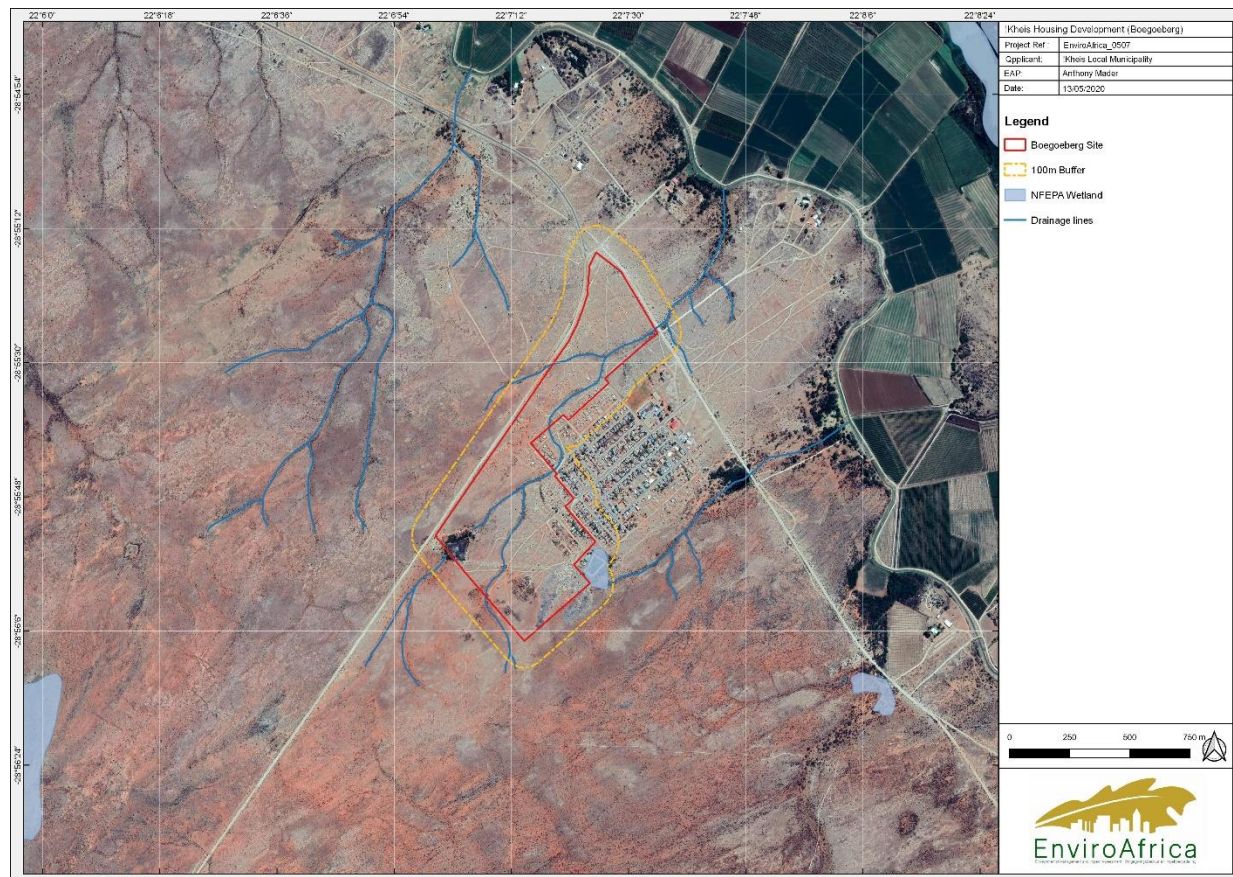


Figure 17. Drainage lines associated with the proposed site for the Boegoeberg Housing Development.

5.4 GEOLOGY

The proposed Boegoeberg site, earmarked for development, is located within the Groblershoop Formation and Kalahari Group (Figure 18). The site for the proposed development is located between the lithology of the Kaapvaal Craton and Namaqua-Natal mobile belt where the remaining, original geology is comprised of Kaaiken Terrane whereas the site is located on the Groblershoop Formation of the Brulpan Group. The bedrock associated with the site comprises of quartz-sericite schist and quartzite.

Soil Profile:

The soil profile of the site is comprised of river terrace gravels (horizon varies between 100-800mm), alluvium (horizon extends to maximum depth of 800mm), calcrete of the Mokalanen Formation, Kalahari Group (extending to depths of 100 – 900mm where refusal of excavation occurred), residual quartzite (extended depth of 300mm) and fill (stockpiled material, where surface rubble were distributed widely over the site).

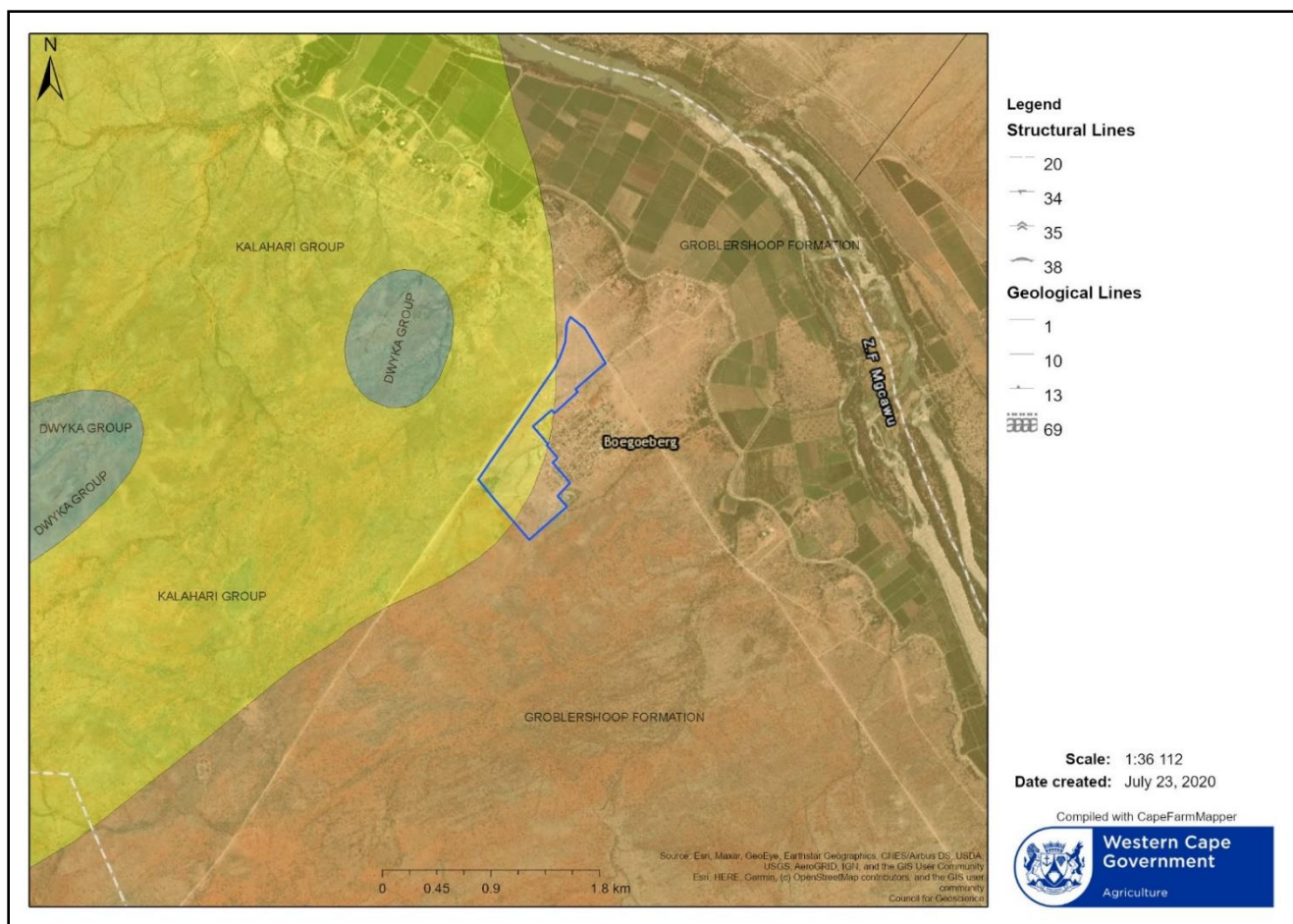


Figure 18. Geological features associated with the Boegoeberg site.

5.5 GEOHYDROLOGY

According to the Geo-technical Assessment (**Appendix 6D**), no perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site). Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

5.6 CLIMATE

Rainfall largely in late summer/early autumn (major peak) and very variable from year to year. Mean Annual Precipitation (MAP) ranges from about 70 mm in the west to 200 mm in the east. Mean maximum and minimum monthly temperatures for Kenhardt are 40.6°C and –3.7°C for January and July respectively. Corresponding values for Pofadder are 38.3°C and –0.6°C. Frost incidence ranges from around 10 frost days per year in the northwest to about 35 days in the east. Whirl winds (dust devils) are common on hot summer days⁷.

⁷ Mucina and Rutherford, (2006). The Vegetation of South Africa, Lesotho and Swaziland, *Strelitzia* 19

5.7 SOCIO-ECONOMIC CONTEXT

!Kheis Local Municipality

According to the !Kheis Municipality Integrated Development Plan (IDP 2019 – 2022), !Kheis municipality the population of Kheis increased by 1 520 people, from 15 046 people in 1996 to 16 566 people in 2016.

The total number of households in Kheis municipality increased over the period from 1996 to 2016, from 3 206 households to 4 344 households respectively. It shows an increase in the number of two-person households, from 565 households in 1996 to 823 households in 2016. There is a reduction in the number of households with 10 persons and above. two-person households increased from 17.6% in 1996 to 18.9% in 2016, this is followed by three-person households at 17.8% of the total number of households in Kheis. There was an improvement in the level of education in Kheis over the period 1996 to 2016, where there was a decline in the percentage of people aged 20 years and above with no schooling from 26.8% in 1996 to 11.7% in 2016. There is also an increase observed in the percentage of people having a matric qualification over the period from 1996 to 2016 from 6.6% to 18.0.

According to the !Kheis Municipality IDP (2019 – 2022), 20.8% of the households in Kheis reported a lack of safe and reliable water supply as being the major difficulty facing the municipality, with 11.2% reporting that inadequate housing is a problem in the municipality. About 9.8% reported inadequate sanitation/sewerage/toilet services. According to the !Kheis Municipality IDP (2019 – 2022), there was a decrease in the proportion of households that use a flush or chemical toilet in Kheis, from 45.3% in 1996 to 45.1% in 2016. There is an increase in the proportion of households using a pit latrine toilet, and a significant decrease in the proportion of households that use a bucket latrine, from 8.1% in 1996 to 1.8% in 2016.

There was a decrease in the proportion of households staying in formal dwellings in Kheis. Households occupying formal dwellings decreased by 15.7% from 75.0% in 1996 to 59.3 in 2016. An increase is observed in the proportion of informal dwellings, from 13.4% in 1996 to 16.5% in 2016. The proportion of traditional dwellings shows an increase over this period. There was an increase of 8.7% in the proportion of dwellings owned by households within the !Kheis Municipality, from 38.3% in 2001 to 47.0% in 2016. There is a decline in the proportion of households that are occupied rent-free, from 49.6% in 2001 to 7.5% in 2016. There was an increase in the proportion of households in Kheis whose refuse is removed by a local authority at least once a week, from 48.1% in 1996 to 62.0% in 2016. There was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016.

According to the !Kheis Municipality IDP (2019 – 2022), the employment rate in !Kheis municipal area has dramatically increase from 50% to 60% high from 1996 – 2001 and took a dip from 60% - 59% from 2002 - 2014 and that the unemployment rate has also increase in 1996 – 2003 from 18% - 21% but remained constant at 21% from 2004 – 2007 and took a massive increase from 2008 – 2014 from 21% – 32% due to exporting in the agriculture industry. According to the !Kheis Municipality IDP (2019 – 2022), the reason why the unemployment rate is above 20% in the !Kheis area is caused by the fact that only a very small percentage of people are highly skilled and are currently attending any tertiary education at higher institutions and the seasonal economic activities taking place in the agriculture sector which has a direct impact on the skills development levels and employment rate in the area.

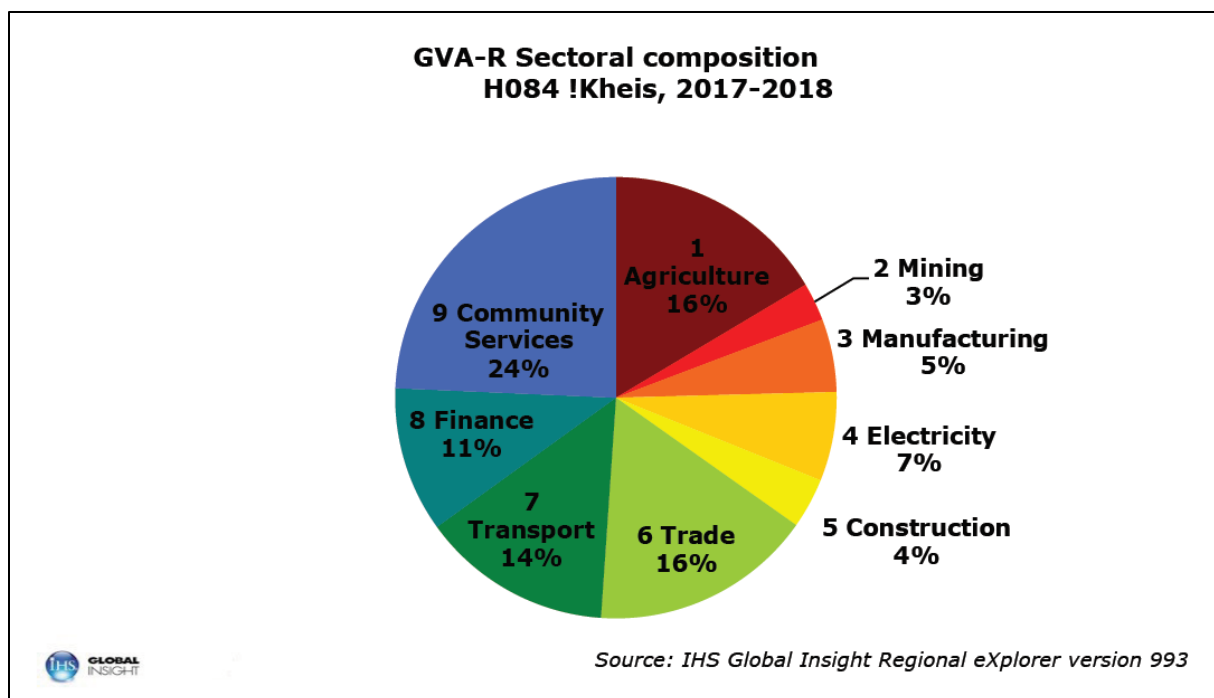


Figure 19: Sectoral composition !Kheis (2017-2018)(Source !Kheis Municipality IDP (2019 – 2022))

As per figure 19 above, the highest contributing sector was community services with 24% to the total economy and agriculture being the second highest contributing sector with 16% and the lowest two contributing sectors to the total economy in the area are mining at 3% and construction at 4% in 2015. A large number of residents are dependent on government pensions, implying that a large part of the residents of !Kheis earn less than R 2000-00 per month and that in itself has a negative influence on the payment of services. Livestock is marketed at Groblershoop, Upington, Johannesburg and Cape Town. Cotton, corn, wheat, tomatoes, peanuts, musk melons and pumpkins are cultivated under irrigation from the Orange River. In the irrigation sector, focus is mainly placed on the cultivation of table grapes.

Boegoeberg

The Boegoeberg community requires formalized, state-instituted housing and associated infrastructure (*Refer to Section 2.1*). The proposed development will distribute the density of the population, improve community member's standard of living, as well as access to essential services including roads, electricity, water supply, appropriate sewage disposal infrastructure, and environmental health in the area. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well as socioeconomic development in Boegoeberg and its surroundings. The proposed Boegoeberg Housing development is in line with the !Kheis IDPs key strategic and development objectives, namely improving and maintaining basic service delivery through specific infrastructural projects including human settlements and basic services, in the poverty-stricken Boegoeberg Township. As of 2011, the demographic profile of the KLM includes the total population of 16 637 individuals with a total number of 4 145 households. According to the SDF, the population in Boegoeberg is expected to increase from 1857 (in 2001) to 2426 community members (by 2030), a 30.6% increase. Thus, this community requires formalized, state-instituted housing, and associated, infrastructure. Therefore, the proposed development will enable adequate housing to be constructed, thereby promoting access to basic service delivery as well

as socioeconomic development in the Boegoeberg Township and its surroundings. !Kheis Local Municipality is committed to the vision of the National Government of which it committed itself towards accelerating shared growth to halve poverty and unemployment and promote social inclusions. Housing is one of the social inclusions in this vision.

The Green Drop Program (DWS incentive regulation) promotes the effective and efficient management of wastewater. As per the Green Drop Report (2010/11), the 71 treatment facilities within the Northern Province receive, on average, approximately 93mL/day. Although the total, collective hydraulic design capacity of these treatment facilities are 150ML/day, the remaining 38.5% surplus capacity may not be readily available due to inadequate maintenance and operational deficiencies at lower capacity municipalities. The current state of the Boegoeberg WWTW may not be amenable to service an increased amount of sewage generated by the expected number of community members who will be benefiting from the construction of the new housing (i.e. this proposed housing development).

!Kheis Local Municipality received a Green Drop Score Percentage of 8%, meaning that WWTWs within the Municipality are underperforming and pose a threat to the environment and public health.

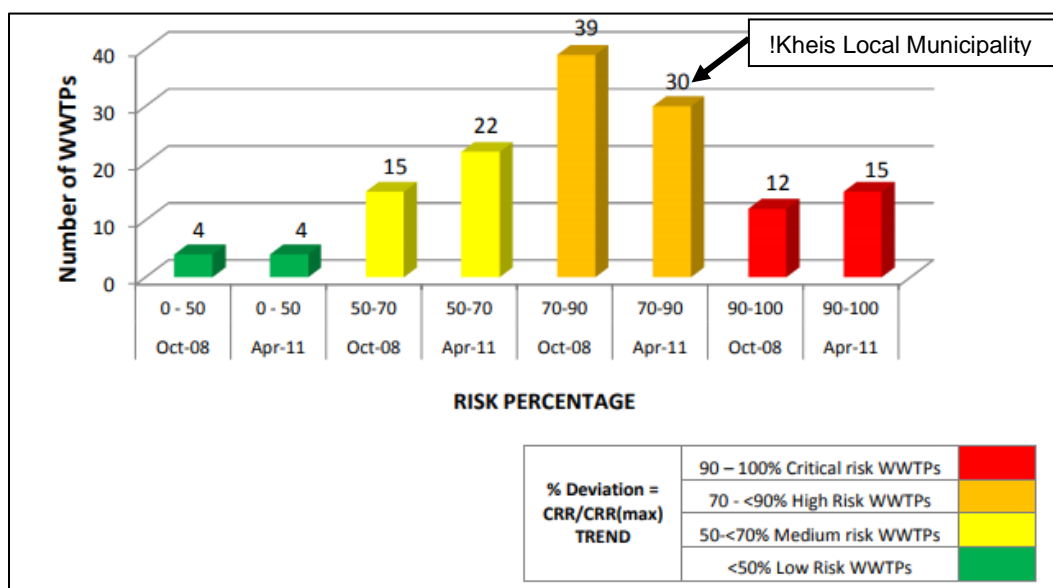


Figure 20. Results of Green Drop Score (2010/11)

The anticipated socio-economic values associated with the proposed project, as provided by the municipality, can be seen in Table 1 below. The development is expected to create approximately 100 employment opportunities, with approximately 85% of that going to previously disadvantaged individuals.

Table 1. Social and Economic Aspect

Anticipated CAPEX value of the project on completion	TBC
What is the expected annual income to be generated by or as a result of the project?	TBC
New skilled employment opportunities created in the construction phase of the project	Construction phase of the project yet to commence. However, it is expected that new skilled employment opportunities will be created for local community during physical construction of infrastructure
New skilled employment opportunities created in the operational phase of the project	None
New un-skilled employment opportunities created in the construction phase of the project	Estimated ±100 employment opportunities
New un-skilled employment opportunities created in the operational phase of the project	None
What is the expected value of the employment opportunities during the operational and construction phase?	± R3 500.00 per employee per month
What percentage of this value that will accrue to previously disadvantaged individuals?	±85%
The expected current value of the employment opportunities during the first 10 years	Unknown at this stage
What percentage of this value that will accrue to previously disadvantaged individuals?	To be confirmed

Although no direct operational job opportunities are expected, indirect (and potential direct) job opportunities may be provided with the provision of business zoned properties as per the Preferred Layout (**Appendix 2D**).

5.8 HERITAGE FEATURES

According to the Heritage Impact Assessment (HIA), eleven incidences of ESA and MSA lithic material (consisting of informal tools, knapping debris, scrapers, blades, retouched flakes, and cores) were recorded across the development footprint. The majority of the lithics are Banded Ironstone Formation (BIF), an abundant raw material within the area, with some cryptocrystalline silicates (CCS) and quartzite pieces. The material was documented as widely dispersed surface scatters but without archaeological context. The resources will be affected negatively by the proposed development however, based on the low significance of the material, the impact was rated as negligible by the Heritage Specialists (**Appendix 6B**).

As per the Heritage Impact Assessment (Appendix 6C), the proposed development footprint is underlain by Quaternary to Recent sediments of the Gordonia Formation (Kalahari Group) as well as underlying Precambrian rocks of the Transvaal Supergroup. According to the SAHRIS PalaeoMap, the Palaeontological Sensitivity of the Kalahari Group is low. The underlying Precambrian Transvaal Supergroup that is of moderate significance are too deep to affect the proposed development (Butler, 2020). Based on the assessment of the potential impact of the development on the identified heritage resources, the following recommendations were made (and considering existing or possible sustainable social and economic benefits):

1. No significant heritage sites or features were identified within the proposed site for development. Cultural material identified during the site assessment was rated as not being conservation worthy. No further mitigation was recommended with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists recommended that the proposed development can continue;
2. The Boegoeberg cemetery (graded as IIIB and is of High Local Significance) is located outside of the proposed site for development. No other graves were identified within the development footprint. No further mitigation is recommended with regards to these resources; and
3. Due to the low palaeontological significance of the area, no further palaeontological studies, ground-truthing, and/or specialist mitigation are required. Therefore, the proposed development was deemed appropriate and feasible as the development of the proposed site would not lead to detrimental impacts on the palaeontological resources of the area.

6. SERVICES

Due to the nature and size of the proposed development, an investigation into the capacities and status of existing bulk services and future bulk services required to supply the development was needed and undertaken. Bvi Consulting Engineer's compiled a Bulk Services Report (**Appendix 4B**), investigating the status of existing services and proposing recommendations relative to the construction and / or upgrade of existing infrastructure to service the proposed housing development.

A brief description of the investigated services are given below.

6.1 WATER

According to the Engineer's Services Report, raw water is supplied to the Boegoeberg community from the canal, where raw water canal pump station pumps 14l/s (when the canal is at least 50% full). However, the weir does not have a sluice gate to control the downstream volume and therefore, does not operate optimally. The existing water treatment works is comprised of:

- An open raw water storage dam;
- A package type water treatment plant;
- A sectional steel storage tank;
- A high lift pump;
- A High level 90 000l sectional steel storage tank on a 10m high stand;
- A new high level 261 000l sectional steel storage tank on a 15m high stand; and
- A 711 000l sectional steel storage tank on dwarf walls.

Once treated, the potable water is subsequently pumped to the water storage reservoir and into an elevated storage tank to provide water to the Brandboom community.

The calculated average daily demand (AADD) is 379.8m³/day (15.8m³/hr). It must be noted that the potable water storage capacity exceeds storage capacity of current infrastructure (187%) where the source pump station capacity, and pipeline flow and raw water storage capacity is currently nearing full capacity at 73% and 71%, respectively. The average daily demand for bulk and connector services is expected to increase from 379.8m³/day to 709.8m³/d. The lifting pump station capacity and pipeline flow between the main storage and elevated tank has been calculated, highlighting the need for upgrading from 194mm diameter (at 106.8m³/hr) to 266mm diameter (at 199.6m³/hr).

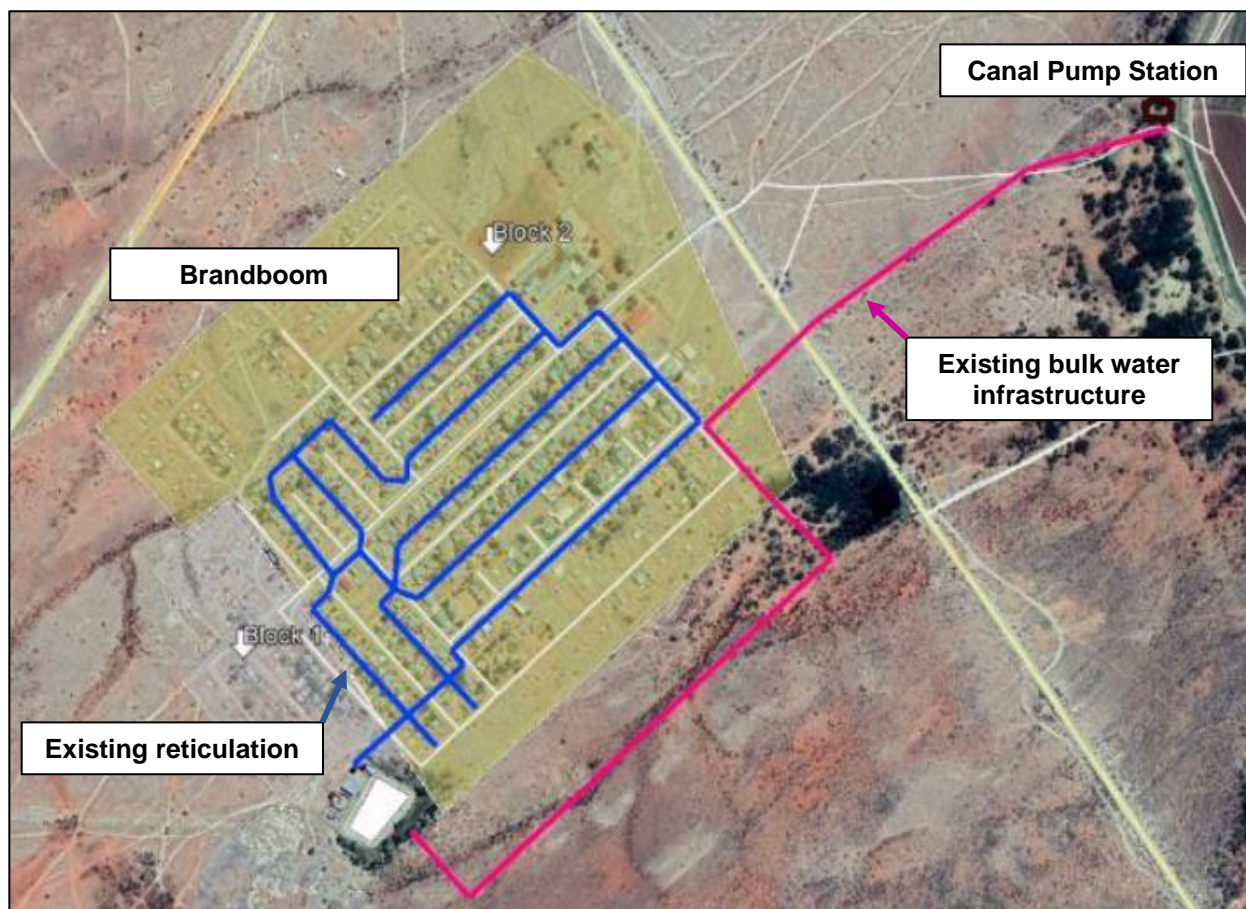


Figure 21. Current bulk water supply and water reticulation.

As per the Engineer's Services Report, the following recommendations were proposed:

- Supply and installation of two (2) new Etanorm 100-080-250 duty and standby pump for the canal pump station;
- Construction of a new 200 mm diameter (Class 9 PVC) pipeline [between the canal pump station and the existing raw water storage reservoir (1610m long)];
- Upgrade of the existing Water Treatment Works to enable the treatment works to deliver a maximum of 76m³/h potable water during summer peak months to the storage facilities.
- The existing raw water pump and filter pump is to be replaced;
- Connection of the newly installed 261m³ sectional steel pressure tower and the existing 90m³ sectional steel pressure towers to the new high lift pump located in the Package Plant;
- Upgrade the existing high lift pump. This includes replacing the existing pump (with a Etanorm 125-100-250) to increase pump capacity to 55.4l/s;
- Construction of a new 250mm Class 9 pipeline between the lifting pump station and the pressure towers; and
- Increasing raw water storage capacity by closing the existing overflow and replacing it with a pipe overflow.

Due to the nature of the proposed development, namely a new housing development (categorized as "Low Risk – Group 4"), no specific provision for firefighting water is required in water storage, or reticulation mains in these areas. Hydrants should, however, be located at convenient points in the area on all mains of 75

mm nominal internal diameter and larger, and in the vicinity of all schools, commercial areas, and public buildings.

6.2 SEWER

As per the Engineer's Services Report, existing bulk sewage services capacity were investigated to determine the needed upgrades to accommodate the proposed housing development as well as required funding to implement the necessary upgrades to the bulk services infrastructure. According to the Engineer's Services Report, the existing sewage infrastructure servicing the Brandboom settlement (Figure 22) includes households which are connected to a bulk sewer - which gravitates to a submersible pump and pumps to an earth dam. The sewer pump station is comprised of a hand rake screen at entry however, no information could be gathered regarding the existing pump station as the station was submersed in sewage and thus, no effective treatment of sewage was observed. The total sewer flow was calculated at 531 050 l/day.



Figure 22. Existing sewage infrastructure servicing the existing Brandboom settlement.

As per the Engineer's Services Report, a new full borne sewerage system is recommended to service the existing Brandboom Settlement and the proposed development. The recommended full borne sewerage system (excluding internal sewer lines) includes;

- Construction of two (2) new sewer pump stations (capable of delivering 26.4 l/s and 15.7 l/s, respectively) directly to the Wastewater Treatment plant;
- Construction of two (2) new Huber screens at both Sewer Pump stations;
- New 250mm diameter pipelines (1610m) – to be located between the Pump Station No. 1 and the Wastewater Treatment Plant;
- New 200mm diameter pipelines (450m) – to be located between the Pump Station No. 2 and the new rising main from Pump Station No. 1; and

6.3 ROADS

Existing access to site is along the N10 where roads off the N10, namely DR03293 and MR00779, are used to access the proposed site for development. As per the Engineer's Services Report, existing gravel roads can be upgraded to interlocking paved streets (with kerbs to allow for adequate surface drainage) – which may result in unskilled job creation for the Brandboom community.

6.4 STORMWATER

No formal stormwater infrastructure is present within the Brandboom settlement where currently, stormwater runoff drains from the centre of the site. According to the Engineer's Services Report, the guiding principle is that the peak stormwater runoff from the site, post construction, should not exceed the full range of storm return periods (1:2 to 1:50) of the site pre-construction. Stormwater infrastructure must be constructed to:

- Accommodate minor storm events (i.e. 1:5 years) in open channels or side drains of streets;
- Accommodate major storm events (i.e. 1:50 year) through controlled overland flows, aboveground attenuation storage, and berms at the higher end of the site; and
- Infrastructure must be constructed to prevent pooling of stormwater runoff;

In addition to parameters stipulated above, a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

6.5 SOLID WASTE (REFUSE) REMOVAL

According to the Integrated Development Plan (IDP), 2019 – 2022, the proportion of households in Kheis whose refuse is removed by a local authority, at least once a week, increased from 48.1% in 1996 to 62.0% in 2016. However, there was an increase in the proportion of households that have no rubbish disposal from 1.6% in 1996 to 7.6% in 2016. The IDP also states that in 2016, 21.1% of households dispose of waste via their own refuse dump. Large amounts of domestic waste were observed as being illegally dumped within the proposed site for development. As per the Engineer's Services Report, a designated spoil site, where illegal dumping has previously occurred, was proposed.

6.6 ELECTRICITY

As per INEP Guidelines, the expected additional load of the proposed development will initially be 660KVA. The proposed site for development falls within the Eskom Distribution area and existing electrified households purchase electricity directly from Eskom. Currently, the bulk connection to the Brandboom settlement is via a 22kV overhead line from the Eskom 10MVA Groblershoop substation – which is in the process of being upgraded to a 20MVA. The existing overhead feeder will only be able to accommodate the future additional 660kVA load once the Groblershoop 10MVA substation has been commissioned. It must be noted that the internal electrical network extension can only be carried out by Eskom after formulation processes have been completed as the area falls under Eskom's jurisdiction.

7. PROCESS TO DATE

The section below outlines the various tasks undertaken to date, the members of the team involved in the project, as well as the Public Participation Process.

6.1 TASKS UNDERTAKEN TO DATE

Table 2. Tasks undertaken in the EIA to date

Date	Action		Responsible Party	Completed
17 th April 2020	Clarification meeting with client and appointment of environmental assessment practitioner (EAP) for EIA and environmental authorisation (EA) application		EnviroAfrica and Macroplan	
7 th May 2020	Appointment of specialists for EIR assessments: - Botanical Specialist (Mr Peet Botes) - Freshwater Specialist (Dr Dirk van Driel) - Archaeological Specialist (Mr Jan Engelbrecht)		Mr Peet Botes Dr Dirk van Driel Mr Jan Engelbrecht	
10-14 th May 2020	Draft Scoping Report compilation		EnviroAfrica	
19 th May 2020	EAP site visit		EnviroAfrica	
19 th May 2020	Public participation (PP): - Letter drops (Adjacent Landowner Notification); - Poster placement (Public notice board at the !Kheis Local Municipality, public notice board of AgriMark (Groblershoop), etc. (Appendix 3) - Advertisement publication (published on 11th June 2020) PP comment period must be a minimum of 60 days ⁸		EnviroAfrica	
18-22 nd May 2020	Specialist site visits	Botanical Assessment	Mr Peet Botes	
18-22 nd May 2020		Freshwater Assessment	Dr Dirk Van Driel	
18-31 st May 2020		Archaeological Assessment	Mr Jan Engelbrecht	
14 th August 2020	Advert comment period ends (<i>60-day comment period as per new directions</i>)			
Application and Scoping Phase				

⁸As per section 4 of the 'Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 Relating to National Environmental Management Permits and Licenses', published on the 5th June 2020 by the Department of Environment, Forestry and Fisheries (DEFF). These new directions state that any notice given after the 5th June 2020 requires an extended 30-day comment period in addition to the legislated 30-day comment period (total of 60-day comment period). If PP was conducted before the 27th March 2020, the formal comment period between 27th March and 5th June 2020 are null and void and therefore, restarted on the 6th June 2020. The initial comment period must be extended by additional 21 days (total of 51 day). Please note that we are still waiting for directives from DEFF on application timelines. These Directives published on the 5th June 2020 apply to Level 3 Lockdown Period and are subject to change. **Please note:** the dates above may be subject to change should the Department of Environmental Affairs, Forestry and Fisheries (DEFF) and the Department of Environment and Nature Conservation (DENC) issue any new directives and legislated timeframes. The final decision (No. 18) may be expedited on request by the applicant.

29/07/2020	Submitted Application Form and Draft Scoping Report (incl. the Plan of Study for EIA) for 60 day comment period.	Enviroafrica	
Comment period ends on 07/10/2020	EAP to notify the registered I&APs (incl. the State departments) of the availability of the draft SR. Commenting period of 30 days + 30days for I&APs and State departments to comment. Ends on 07 October 2020 .	Enviroafrica	
09/10/2020 – 23/11/2020	Submitted Final Scoping Review to DENC for Approval (43 days)	EnviroAfrica / DENC	
TBC	<u>Submit Draft EIR once approval of Final Scoping Report has been received from DENC</u> . Notify I&APs regarding availability of Draft EIR for comment. 30 Day Comment period ended on TBC . *Extension to process and invoicing dates due to (i) DEFF's response to COVID-19 (i.e. requirement to extend EIA timeframes and commenting periods) ¹ and (ii) DENC on leave from 15 th December 2020 – 05 th January 2021 (this period of time has to be excluded from the EIA process) .	EnviroAfrica	
TBC	Submit Final EIR (depending on types of comments received during the Draft EIR phase and degree to which the report must be amended) for Decision Making (107 day period). Decision period ends on TBC . *Extension to process and invoicing dates due to (i) DEFF's response to COVID-19 (i.e. requirement to extend EIA timeframes and commenting periods) ¹ and (ii) DENC on leave from 15 th December 2020 – 05 th January 2021 (this period of time has to be excluded from the EIA process) .	EnviroAfrica / DENC	

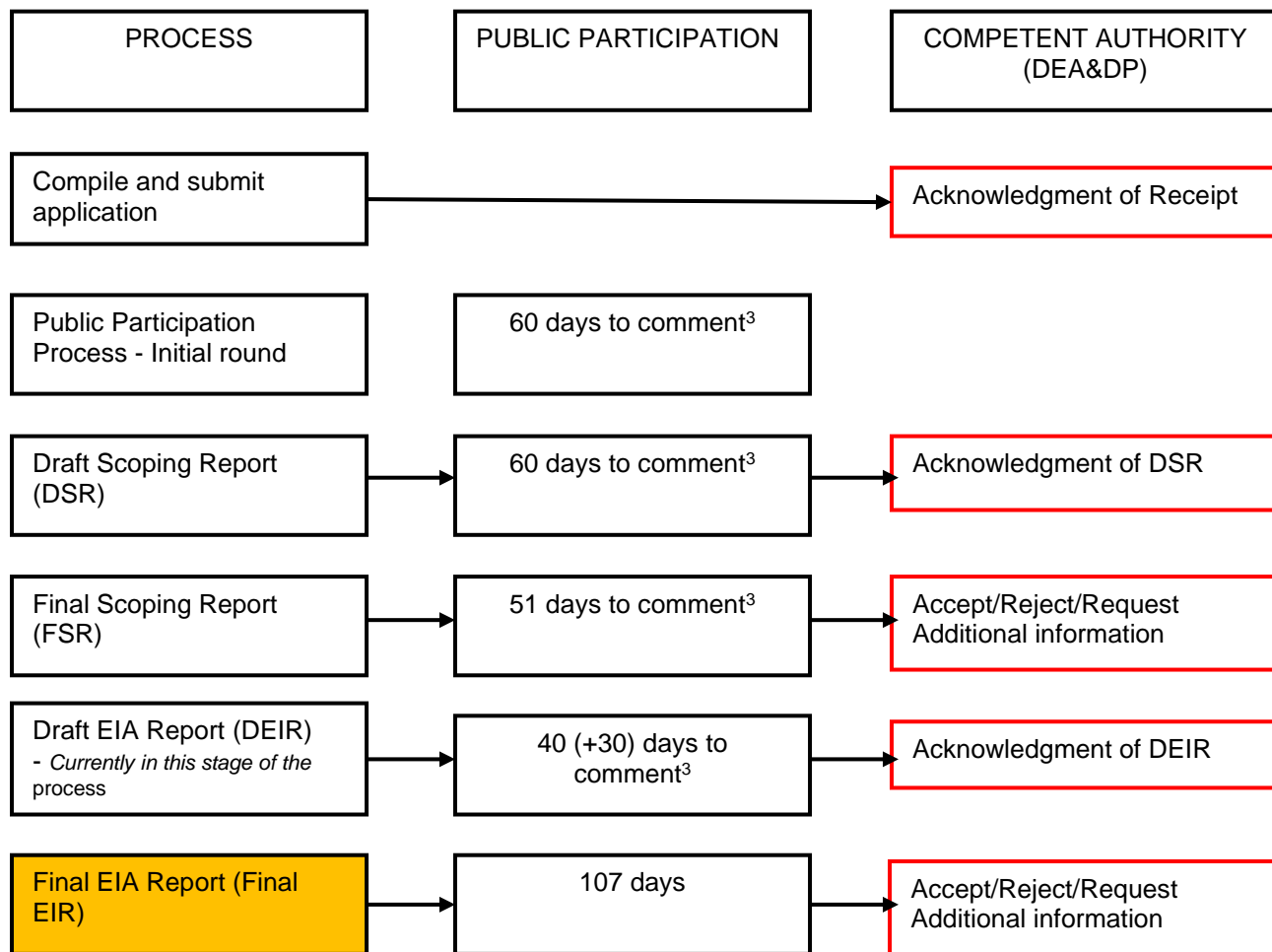


Figure 24. Summary of the EIA process and public participation process. The red indicates the stages where the competent authority have been consulted during the process.

6.2 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE

The following tasks must still be undertaken during the EIA phase of the process:

- Compile Draft Environmental Impact Report (EIR) for public comment based on specialist information;
- Advertise Draft EIR for public comment;
- Distribute and/or make the Draft EIR available for viewing and comment;
- Receive comments on Draft EIR. All comments received and responses to the comments have been incorporated into the Final Environmental Impact Report (EIR) (please refer to Comments and Response Table); and
- Preparation of a FINAL EIR (this report) for submission to DE&NC for consideration and decision-making.

Please refer to Figure 23 and Figure 24 to see where the public participation process is present in the environmental impact assessment. The Interested and Affected Parties (I&APs) will have the opportunity

to view and comment on all the draft reports (namely initial notification, Draft Scoping Report, and Draft EIR) that are submitted. The figures also indicate what timeframes are applicable to what stage in the process. If required, meetings with key stakeholders will be held.

At the end of the comment period for the Draft EIR, the EIR has been revised in response to feedback received from I&APs. All comments received and responses to the comments will be incorporated into the Final EIR which will then be submitted to the DE&NC for consideration and decision-making.

Correspondence with I&APs will be via post, telephone, email, and/ or newspaper advertisements.

Should it be required, this process may be adapted depending on input received during the on-going process and / or as a result of public input. The DE&NC will be informed of any changes in the process.

6.3 PROFESSIONAL TEAM

The following professionals are part of the project team.

Table 3. Members of the professional team

DISCIPLINE	SPECIALIST	ORGANISATION
Environmental Consultants	Anthony Mader / Bernard de Witt	EnviroAfrica
Town Planners	Len Fourie	MacroPlan Town and Regional Planners
Consulting Engineers	Malcolm du Plessis	Bvi Engineers
Botanist	Peet Botes	PB Consult
Heritage	Jan Englebrecht	Ubique Heritage Consultants
Freshwater	Dr Dirk van Driel	Watsan Africa
Geo-technical	F. J. Breytenbach	Cedarland Geotechnical Consult (Pty) Ltd

6.4 PUBLIC PARTICIPATION

A Public Participation Process was undertaken in accordance with the requirements of the NEMA Environmental Impact Assessment Regulations: Guideline and Information Document Series. *Guidelines on Public Participation 2013* and the NEMA EIA Regulations 2014 (amended). Issues and concerns raised during the Scoping phase are dealt within this report. Please note that the proposed public participation processes are in line with the new Directions, published by the Department of Environment, Forestry, and Fisheries (DEFF) on the 5th June 2020⁹.

7.4.1 PUBLIC PARTICIPATION UNDERTAKEN DURING SCOPING PHASE:

Interested and Affected Parties (I&APs) have been and will be identified throughout the process. Landowners adjacent to the proposed site, relevant organs of state, organizations, ward councillors and the Local and District Municipality were added to this database. A complete list of organisations and individual groups identified to date is shown in **Appendix 3**.

Public Participation was conducted for the proposed development in accordance with the requirements outlined in Regulation 41 of the NEMA EIA Regulations 2014. The issues and concerns raised during the scoping phase were addressed with in the EIA phase of this application.

As such each subsection of Regulation 41 contained in Chapter 6 of the NEMA EIA Regulations 2014 will be addressed separately to thereby demonstrate that all potential Interested and Affected Parties (I&AP's) were notified of the proposed development.

R54 (2) (a):

R41 (2) (a) (i): The site notices (A2 and A3 sizes) were placed at different locations around the project site as well as at the municipality office in town. (please refer to **Appendix 3D**). Posters were placed in conspicuous areas such as the entrance to the development and areas receiving the majority of foot traffic.

The posters contained all details as prescribed by R41(3) (a) & (b) and the size of the on-site poster was at least 60cm by 42cm as prescribed by section R41 (4) (a).

R41 (2) (a) (ii): N/A. There is no alternative site.

R41 (2) b):

R41 (2) (b) (i): N/A. The Applicant is the landowner

R41 (2) (b) (ii): The background information document was given to residents adjacent to the proposed site for development via letter drops (**Appendix 3C**).

⁹As per section 4 of the 'Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 Relating to National Environmental Management Permits and Licenses', published on the 5th June 2020 by the Department of Environment, Forestry and Fisheries (DEFF). These new directions state that any notice given after the 5th June 2020 requires an extended 30-day comment period in addition to the legislated 30-day comment period (total of 60-day comment period). If PP was conducted before the 27th March 2020, the formal comment period between 27th March and 5th June 2020 are null and void and therefore, restarted on the 6th June 2020. The initial comment period must be extended by additional 21 days (total of 51 day). Please note that we are still waiting for directives from DEFF on application timelines. These Directives published on the 5th June 2020 apply to Level 3 Lockdown Period and are subject to change.

R41 (2) (b) (iii): An initial notification letter was sent to Mr Silo, the Councillor for Ward 4 (the ward in which the site is situated) (please refer to **Appendix 3C** for proof of notification letters sent). A notification letter, notifying I&APs of the release of the Draft Scoping Report, was sent to Mr Silo as well as Mr Beukes (PR Councillor).

R41 (2) (b) (iv): An initial notification letter was sent to the !Kheis Municipality as the municipality is the Applicant. A notification letter, notifying the I&AP of the release of the Draft Scoping Report, was sent to the Applicant.

R54 (2) (b) (v): Initial notification letter (please refer to **Appendix 3C** for proof of notification letters sent) were sent to the following organs of state having jurisdiction in respect of any aspect of the activity:

- Department of Water and Sanitation
- Department of Agriculture and Land Reform
- Department of Roads and Public Works
- Department of Agriculture, Forestry and Fisheries
- Department of Cooperative Governance, Human Settlements and Traditional Affairs
- SANRAL
- Department of Environment and Nature Conservation
- South African Heritage Resources Agency
- Department of Mineral Resources
- Department of Education
- Department of Defence

A notification letter, notifying the I&AP of the release of the Draft Scoping Report, was sent to the following Registered I&APs:

- Northern Cape Department of Agriculture and Land Reform;
- Department of Cooperative Governance, Human Settlements and Traditional Affairs;
- Department of Roads and Public Works;
- Directorate Forestry Management;
- Department of Water and Sanitation;
- SANRAL;
- South African Heritage Resource Agency;
- Department of Social Development;
- Economic Development and Tourism - Northern Cape;
- Department: Transport, Safety and Liaison;
- Eskom

R41 (2) (c) (i): An advertisement was placed in the local newspaper, Kalahari Bulletin, on the 11th June 2020 (please refer to **Appendix 3B** for proof of advertisement).

R41 (2) (d): N/A

R41 (6):

R41 (6) (a): All relevant facts in respect of the application were made available to potential I&AP's.

R41 (6) (b): I&AP's were given more than a 60-day³ registration and comment period during the first round of public participation.

R42 (a), (b), (c) and R43(2): A register of interested and affected parties was opened, maintained and is available to any person requesting access to the register in writing (please refer to **Appendix 3A** for the list of Interested and Affected Parties).

Please find attached in **Appendix 3:**

- Proof of Notice boards, advertisements and notices that were sent out
- List of registered interested and affected parties
- Summary of issues raised by interested and affected parties

7.4.2 PUBLIC PARTICIPATION UNDERAKEN DURING THE EIA PHASE:

A number of groups and individuals were identified as Interested and Affected Parties during the initial and Scoping Public Participation Process. A complete list of organisations and individual groups identified to date, as well as those I&APs that have registered are shown in **Appendix 3A**.

Full copies (accessible by a link as well as a link to the company's website where the Draft EIR was uploaded to and made available to I&APs for comment) of the EIR was made available to all Registered I&APs, and were notified of the EIR by means of notifications, informing them of the availability of the Draft EIR and were invited to comment. The Draft EIR was made available for a 30-day comment period³.

At the end of the comment period, the EIR was revised in response to feedback received from I&APs. All comments received and responses to the comments were incorporated into the Final Environmental Impact Report (Final EIR – *this report*) in the form of a Comments and Response Table. The Final EIR will then be submitted to D:E&NC for decision.

Should it be required, this process may be adapted depending on input received during the ongoing process and as a result of public input. Both DENC and registered I&APs were informed of any changes in the process.

7.4.3 INTERESTED AND AFFECTED PARTIES

Interested and Affected Parties (I&APs) have been notified by means of advertisements in a local newspapers (Kalahari Bulletin), letters, site notices, smses (WinSMS), and/or emails sent to registered I&APs on the project database.

A list of I&APs is included as **Appendix 3A**.

8. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

Environmental issues were raised through specialist assessments, site visits, as well as informal discussions with the project team, specialists, authorities, and I&APs during the public participation period of the Scoping Report. All issues raised were addressed and assessed in the specialist reports (Appendix 6A-D) and services report (Appendix 4B) and forms part of this EIR. Any additional issues raised on the Draft EIR during the public participation were listed and addressed in the Final Environmental Impact Report.

The following potential issues have been identified and need for specialist assessments:

6.1 BIODIVERSITY

8.1.1 BOTANICAL

Botanical Impact Assessment describes and assesses the botanical sensitivity of the area. The terms of reference for this study required a baseline analysis of the flora present within the proposed site for development, as well as the broad ecological characteristics of the site. Therefore, a Botanical Impact Assessment was conducted and has been appended as **Appendix 6A**.

The botanical assessment includes the following:

- Description of vegetation present on site;
- Potential impacts associated with the proposed site for development;
- The significance of these potential impacts, alternatives, and related activities – with and without mitigation – on biodiversity pattern and ecological functioning at the site, landscape, and regional scales; and
- Recommended actions that should be taken to prevent or, if prevention is not feasible, to mitigate impacts.

8.1.2 FAUNA

Please note that no fauna or avi-fauna screening was done as part of this study and that the following notes are just observations with regards to status of the study area and observations made during the botanical site visit. The proposed site is located adjacent to the existing settlement where current land-uses include illegal dumping and livestock grazing. The vegetation associated can be classified as disturbed due to previous human-induced activities (i.e. trampling, overgrazing, illegal dumping of waste, and transformation of land leading to erosion).

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities, including animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Tilman et al., 1997¹⁰; Chapin et al., 2000)¹¹. Direct impacts are typically associated with urban land expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g. general or sewage) and its

¹⁰ Tilman, D. and Wardle, D.A., 1997. Biodiversity And Ecosystem Properties. *Science*, 278 (5345), pp.1865-1869.

¹¹ Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. and Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, 405(6783), pp.234-242.

management (McDonald *et al.*, 2020)¹². Edge effects have diverse impacts on biodiversity and ecological functioning (Razafindratsima *et al.*, 2018)¹³. Such effects contribute to a disturbance factor, which is likely to have driven most wild animals away from the proposed site for development due to activities associated with the adjacent settlement. It is considered highly unlikely that any large game remains in this area and were not observed within the development footprint during the site visit. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal may have been eradicated by community members in existing settlements in fear of their livestock. Due to long-term impacts associated with human settlements, compounded by the proximity of the proposed development areas to the urban edge, a comprehensive faunal survey is not deemed necessary.

Mammals

The Kgalagadi Transfrontier Park (approximately 250km) and Tswalu Kalahari Reserve (approximately 144km) are the closest protected areas to the proposed site for development. Mammalian species present in these reserves include, but are not limited to the African Striped Weasel, African Wild Cat, African Wild Dog (Painted Wolf) Antbear (Aardvark), Bat-Eared Fox, Black-Backed Jackal, Black-Tailed Tree Rat, Blue Wildebeest, Brant's Whistling Rat, Brown Hyena, Bushveld Elephant-Shrew, Cape Golden Mole, Cape Hare, Cape Serotine Bat, Caracal, Chacma Baboon, Cheetah, Common Mole Rat, Damara Mole Rat, Desert Musk Shrew, Egyptian Free-Tailed Bat, Egyptian Slit-Faced Bat, Eland, Gemsbok, Giraffe, Grass Climbing Mouse, Grey Duiker, Ground Squirrel, Hairy-Footed Gerbil, Highveld Gerbil, Honey Badger, Kudu, Large-Eared Mouse, Leopard, Lion, Namaqua Rock Mouse, Pangolin, Porcupine, Pouched Mouse, Pygmy Mouse, Red Hartebeest Round-Eared Elephant Shrew, Short-Tailed Gerbil, Silver (Cape) Fox, Slender Mongoose, Small Spotted Cat, Small-Spotted Genet, South African Hedgehog, Spotted Hyena, Springbok, Springhare Steenbok, Striped Mouse Striped Polecat, Suricate, Vervet Monkey, Warthog, Woosnam's Desert Rat, and Yellow Mongoose (<https://www.sanparks.org/parks/kgalagadi/conservation/ff/mammals.php>) / (<https://tswalu.com/wp-content/uploads/2019/07/Tswalu-Information-Guide-2019.pdf>). However, the only mammals observed on site include livestock (namely goats, sheep, and / or cows). Moreover, as per the Freshwater Report, no other endangered species, either plant or animal, were observed within or near the drainage line.

Avifauna

Although the Bushmanland Arid Grassland vegetation type potentially attracts a number of bird species, the low vegetation species diversity (associated with the proposed site for development), is likely to result in a low avifaunal diversity, where avifaunal diversity is directly influenced by land cover (i.e. intact vegetation) (Lepczyk *et al.*, 2017)¹⁴. Limited vegetation, present on site, is available to provide a range of avifauna adequate habitat for survival, and therefore, it was not envisaged that a comprehensive avifaunal survey was deemed necessary.

¹² McDonald, R.I., Mansur, A.V., Ascensão, F., Crossman, K., Elmqvist, T., Gonzalez, A., Güneralp, B., Haase, D., Hamann, M., Hillel, O. and Huang, K., 2020. Research gaps in knowledge of the impact of urban growth on biodiversity. *Nature Sustainability*, 3(1), pp.16-24.

¹³ Razafindratsima, O.H., Brown, K.A., Carvalho, F., Johnson, S.E., Wright, P.C. and Dunham, A.E., 2018. Edge effects on components of diversity and above-ground biomass in a tropical rainforest. *Journal of applied ecology*, 55(2), pp.977-985.

¹⁴ Lepczyk, C.A., La Sorte, F.A., Aronson, M.F., Goddard, M.A., MacGregor-Fors, I., Nilon, C.H. and Warren, P.S., 2017. Global patterns and drivers of urban bird diversity. In *Ecology and conservation of birds in urban environments* (pp. 13-33). Springer, Cham.

Reptile & amphibians

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grasslands and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of adequate aquatic and wetland habitat within the proposed footprint.

6.2 HERITAGE

The possible impact on heritage resources (archaeological and palaeontological) has been identified as a possible environmental impact as a result of the proposed construction of the residential development and associated infrastructure. A Heritage Impact Assessment has been conducted as part of this application and has been appended as **Appendix 6B**.

The terms of reference for the heritage and archaeological study are as follows:

- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- an assessment of the impact of the development on heritage resources;
- an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- plans for mitigation of any adverse effects during and after completion of the proposed development.

Also, the HIA should comply with the requirements of NEMA, including providing the assumptions and limitations associated with the study; the details, qualifications, and expertise of the person who prepared the report; and a statement of competency.

6.3 FRESHWATER ASSESSMENT

Freshwater ecosystems were identified on desktop analysis as well as during the initial site visit, and due to the size and nature of the development and the unknown source of standing water within the development site, a Freshwater Impact Assessment was conducted and has been appended as **Appendix 6C**. Any potential impacts to the Orange River will also be investigated.

The terms of reference for the Freshwater assessment are as follows:

- Literature review and assessment of existing information
- Site Assessment of the proposed activities and impact on the associated freshwater systems. This will include an assessment of the freshwater ecological condition, using river health indices such as in-stream and riparian habitat integrity, aquatic macro-invertebrates and riparian vegetation to determine set back lines and geomorphological condition of the streams, which will then determine the overall Ecostatus of the streams and provide data that will inform the Water Use Licence Application of the project.
- Describe ecological characteristics of freshwater systems and compile report based on the data and information collected in the previous two tasks, describe ecological characteristics of the

freshwater systems, comment on the conservation value and importance of the freshwater systems and delineate the outer boundary of the riparian zones/riverine corridors.

- Evaluate the freshwater issues on the site and propose mitigation measures and measures for the rehabilitation of the site as well as setback lines for future development.
- Compilation of the documentation for submission of the Water Use Authorisation application (WULA) to the Department of Water and Sanitation (if deemed necessary).

6.4 GEO-TECHNICAL ASSESSMENT

A Geo-technical assessment was required to provide information related to the geology, soil types, soil potential, soil stability, subsoil structure, suitability of the area to support the proposed structures and recommendation for foundations. Thus, a Geo-technical assessment was conducted and has been appended as **Appendix 6D**.

6.5 VISUAL IMPACT

The potential impact on the sense of place of the proposed residential development has also been considered. However, due to the nature of the activity, the surrounding land-uses and the proximity to other existing residential area (namely the existing Brandboom Settlement), and that the sense of place is not expected to be significantly altered by the proposed residential development, no further studies were suggested.

6.6 Traffic Impact Assessment

A letter was submitted to the Department of Roads & Public Works (DRPW) (Appendix 3E.2.1). The objectives of the letter were to:

1. To notify DRPW of the proposed township establishment project;
2. To obtain a no-objection for the land use changes (subdivision and rezoning), in terms of the Spatial Planning Land
3. Use Management Act (Act 16 of 2013), that need to be followed for the planned township establishment;
4. To obtain approval in terms of the Advertising on Roads and Ribbon Development Act, 21 of 1940; and
5. To obtain approval for the proposed access points.

In response (26th October 2020), the DRPW stated that they do not object to the proposed development however, a Traffic Impact Assessment (compliant with TMH16) and detailed designs of the accesses (compliant with TRH 17) must be submitted for review by the DRPW. The DRPW also relaxed the building line to 30m from centreline.

Therefore, a Traffic Impact Assessment must be made a condition on granting the Environmental Authorisation.

6.7 OTHER ISSUES AND IMPACTS

The proposed Boegoeberg Housing Development has the following additional impacts:

6.7.1 ENERGY REQUIREMENTS

Construction energy requirements:

The proposed development involves the construction of approximately 550 erven. Subsequently, the initial energy requirements of the project would be limited to the use of small power tools, plant such as mixers etc. typically to be powered by portable on-site generators.

Operational phase energy requirements:

According to the Engineer's Services Report, although the existing feeder can service the future additional 660kVA load, this can only be carried out once the 10MVA Groblershoop substation has been upgraded to a 20MVA substation by Eskom (to be commissioned in December 2020).

6.1.2. WATER REQUIREMENTS

Construction water requirements:

Water required during the construction phase are unknown at this stage, but it is estimated that a maximum amount in the order of 100 - 150 kiloliter per day will be required for construction purposes, depending on phasing of construction.

Operational phase water requirements:

According to Engineer's Services Report, the Annual Average Daily Demand will be 709.8m³/day. Recommendations, as per the Engineer's Services Report (Appendix 4B), required to service the proposed development, have been proposed.

6.1.3. NATURE AND QUANTITY OF RAW MATERIALS

This project comprises the construction of approximately 550 residential and other structures. Subsequently several thousand cubic meters of crushed stone, sand, and cement may be utilized together with reinforcing steel, wood and other material used in the construction of residential units, schools, businesses, etc., as input materials during construction. Exact quantities can only be determined once detailed designs of the structures have been completed. This development is not expected to utilize any raw materials during the operational phase, besides water usage.

6.1.1 WASTE TYPES, QUANTITIES AND DISPOSAL METHODS

Construction Phase

As this is a "greenfields" project, there are no existing structures to be demolished. It is therefore envisaged that very little building rubble and waste will be generated during construction. Typically, losses of raw materials due to transport, stockpiling on site and conveyance losses amount to approximately 5% of the volumes required. It is not known how much solid waste will be generated during the construction period. This waste will however typically be builder's rubble, concrete debris, timber from used shutters, etc. The waste will be stockpiled on site and periodically disposed of at the nearest licensed landfill site by the contractor. A designated spoil site must be investigated for stockpiling of material.

The large amounts of litter presently on site will also need to be consolidated, removed from site and disposed of at the nearest approved municipal waste disposal site.

Operational Phase

Since the development is generally a residential development, general residential household waste will be generated. Refuse removal should be via the Municipal waste stream and disposed of at the nearest municipal bulk solid waste disposal site.

6.1.2 EMPLOYMENT OPPORTUNITIES

Please refer to Section 5.7 and Table 1 for the anticipated employment opportunities expected from the proposed development.

9. SPECIALIST STUDIES

Based on the issues raised by the I&APs and the project team, specialist studies were undertaken to provide information to address the concerns and assess the impacts of the proposed development alternatives on the environment.

The specialists are provided with set criteria for undertaking their assessments, to allow for comparative assessment of all issues. These criteria are detailed in the Terms of Reference to each specialist and summarised below.

7.1 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS

These criteria are based on the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989.

These criteria include:

- **Nature of the impact**
This is an appraisal of the type of effect the construction, operation and maintenance of a development would have on the affected environment. This description should include what is to be affected and how.
- **Extent of the impact**
Describe whether the impact will be: local extending only as far as the development site area; or limited to the site and its immediate surroundings; or will have an impact on the region, or will have an impact on a national scale or across international borders.
- **Duration of the impact**
The specialist should indicate whether the lifespan of the impact would be short term (0-5 years), medium term (5-15 years), long terms (16-30 years) or permanent.
- **Intensity**
The specialist should establish whether the impact is destructive or benign and should be qualified as low, medium or high. The specialist study must attempt to quantify the magnitude of the impacts and outline the rationale used.
- **Probability of occurrence**
The specialist should describe the probability of the impact actually occurring and should be described as improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of any prevention measures).

The impacts should also be assessed in terms of the following aspects:

- **Status of the impact**
The specialist should determine whether the impacts are negative, positive or neutral ("cost – benefit" analysis). The impacts are to be assessed in terms of their effect on the project and the environment. For example, an impact that is positive for the proposed development may be negative for the environment. It is important that this distinction is made in the analysis.
- **Accumulative impact**
Consideration must be given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts must be evaluated with an assessment of similar

developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

- **Degree of confidence in predictions**

The specialist should state what degree of confidence (low, medium or high) is there in the predictions based on the available information and level of knowledge and expertise.

Based on a synthesis of the information contained in the above-described procedure, the specialist is required to assess the potential impacts in terms of the following significance criteria:

- **No significance:** the impacts do not influence the proposed development and/or environment in any way.
- **Low significance:** the impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance:** the impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance:** the impacts will have a major influence on the proposed development and/or environment.

The final impact assessment report should at least include the following sections:

- Executive Summary
- Introduction and Description of Study
- Methodology
- Results
- Assessment of Impacts (including mitigation measures to reduce negative impacts and measures to enhance positive impacts and the completion of impact tables)
- Discussion
- Recommendations (Pre-Construction, Construction and Operational Phases)
- Conclusion

9.2 BRIEFS FOR SPECIALIST STUDIES TO BE UNDERTAKEN AS PART OF THE EIA

9.2.1 BOTANICAL ASSESSMENT

Peet Botes (PB Consult) was appointed and undertook the Botanical Assessment on the proposed site – **Appendix 6A.**

The terms of reference for this study include the following:

- Evaluate the proposed site(s) in order to determine whether any significant botanical features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species) that should be avoided or that may require “search & rescue” intervention.
- Locate and record sensitive areas from a botanical perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required

- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

9.2.2 HERITAGE IMPACT ASSESSMENT

Jan Engelbrecht of the Ubique Heritage Consultants was appointed to compile the Heritage Impact Assessment (HIA) – **Appendix 6B**.

The terms of reference for the heritage impact study were:

- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- an assessment of the impact of the development on heritage resources;
- an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- plans for mitigation of any adverse effects during and after completion of the proposed development.

Also, the HIA/AIA should comply with the requirements of NEMA, including providing the assumptions and limitations associated with the study; the details, qualifications and expertise of the person who prepared the report; and a statement of competency.

9.2.3 FRESHWATER ASSESSMENT

Dr Dirk van Driel (Watsan Africa) has been appointed to undertake the Freshwater Assessment for the proposed development – **Appendix 6C**.

The terms of reference for the Freshwater assessment are as follows:

- Literature review and assessment of existing information
- Site Assessment of the proposed activities and impact on the associated freshwater systems. This will include an assessment of the freshwater ecological condition, using river health indices such as in-stream and riparian habitat integrity, aquatic macro-invertebrates and riparian vegetation to determine set back lines and geomorphological condition of the streams, which will then determine the overall Ecostatus of the streams and provide data that will inform the Water Use Licence Application of the project.
- Describe ecological characteristics of freshwater systems and compile report based on the data and information collected in the previous two tasks, describe ecological characteristics of the freshwater systems, comment on the conservation value and importance of the freshwater systems and delineate the outer boundary of the riparian zones/riverine corridors.
- Evaluate the freshwater issues on the site and propose mitigation measures and measures for the rehabilitation of the site as well as setback lines for future development.
- Compilation of the documentation for submission of the water use authorisation application (WULA) to the Department of Water and Sanitation (if deemed necessary).

9.2.4 GEO-TECHNICAL ASSESSMENT

Cedarland Geotechnical Consult (Pty) Ltd was appointed to conduct the Geo-technical Assessment of the proposed site - **Appendix 6D**.

The primary objective of this study is to provide information related to the soil types, soil potential, soil stability, subsoil structure, suitability of the area to support the proposed structures and recommendation for foundations.

10. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The specialist studies detailed in Section 8 were undertaken to determine significance of the impacts that may arise from the proposed development. The findings of the specialist studies are summarised here. Full copies of the studies are included in **Appendices 6A – 6E**.

The following specialist studies were undertaken:

10.1 BOTANICAL ASSESSMENT

Peet Botes (PB Consult) was appointed and undertook the Botanical Assessment on the proposed site – The Botanical Impact Assessment is included as **Appendix 6A**.

10.1.1 KEY FINDINGS

According to the Botanical Impact Assessment (Appendix 6A), due to the size of the proposed project (49ha), the proposed development will result in the significant loss of vegetation of which approximately 60-70% (29.4 – 34.3ha) is still covered by indigenous vegetation. The site is located within the Bushmanland Arid Grassland vegetation type, a vegetation type which typically does not support high plant diversity. Plant species diversity, associated with the proposed site for development, was notably low. According to the Northern Cape CBA maps the proposed site falls within a CBA area however, the site will not impact on any recognised centre of endemism. According to the Botanical Specialist, the proposed Boegoeberg development is likely to result in a Low impact, which can be further reduced with the implementation of proposed mitigation measures and effective environmental control during the construction phase. Portions of the proposed development footprint are heavily disturbed due to various anthropogenic activities including illegal dumping, status of wastewater treatment works (i.e. old ponds in a non-operational state), physical disturbances (such as excavations), and land mismanagement (e.g. overgrazing) (Figure 25).

The vegetation structure of the northern and north-eastern corner of the site (nearest to the existing Brandboom Settlement) was covered by a low, dispersed shrubland. The northern portion of the footprint, which supported the lowest plant species diversity, was expected due to the areas close proximity to the Brandboom Settlement (and associated anthropogenic activities). In the southern section of the site, low open shrubland dominated by *Tetraena decumbens* in combination with *Justicia australis* (=Monechma) and *Tetraena microcarpa* with *Senegalia mellifera* scattered through the landscape. *Aloe claviflora* were also very prominent. The *B. albitrunca* individuals of conservational value (in terms of the NFA) are located at the following GPS co-ordinates:

S28° 55' 17.5" E22° 07' 27.1"

S28° 55' 26.5" E22° 07' 32.5"

S28° 55' 40.0" E22° 07' 10.8"

As mentioned the species diversity was especially low, but the following plants were also observed scattered throughout the site: *Aizoon burchellii*, *Aloe gariepensis* (only one individual observed), *Aptosimum spinescens*, *Blepharis mitrata*, *Euphorbia braunsii*, *Euphorbia spinea*, *Geigeria ornativa*, *Kleinia longiflora*, *Lycium cinereum*, *Rhigozum trichotomum* and *Salsola zeyheri*. The alien invasive *Prosopis* tree was also occasionally observed but was more prominent in the vicinity of the livestock pens (where seeds may have been distributed by the livestock).



Figure 25. Overview of the site, showing most significant disturbed areas (Source: Botanical Impact Assessment, Appendix 6A)

A plant species list, listing plants identified by the Botanical Specialist are tabulated as per Table 4 below. The particular plant species' protection status, relative to the NFA (Figure 26) and / or NCNCA, must be considered. Permits, in terms of the NFA and / or NCNCA, must be obtained prior to the removal of any protected plant species.

Table 4. List of the plant species identified during the botanical assessment

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
1.	<i>Aizoon burchellii</i>	AIZOACEAE	Not evaluated NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
2.	<i>Aloe claviflora</i>	ASPODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
3.	<i>Aloe gariepensis</i>	ASPODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	Apply for a NCNCA Flora permit (DENC)
4.	<i>Aptosimum spinescens</i>	SCROPHULARIACEAE	LC	
5.	<i>Blepharis mitrata</i>	ACANTHACEAE	LC	
6.	<i>Asparagus</i> species	ASPARAGACEAE	LC	
7.	<i>Boscia albitrunca</i>	BRASSICACEAE (CAPPARACEAE)	LC NFA protected species NCNCA, Schedule 2 Protected (all species of <i>Boscia</i>)	Apply for a NFA Tree permit (DAFF) Apply for a NCNCA Flora permit (DENC)

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
8.	<i>Euphorbia braunsii</i>	EUPHORBIACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	Apply for a NCNCA Flora permit (DENC)
9.	<i>Euphorbia spinea</i>	EUPHORBIACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	Apply for a NCNCA Flora permit (DENC)
10.	<i>Geigeria ornativa</i>	ASTERACEAE	LC	
11.	<i>Justicia australis</i> (= <i>Monechma genistifolium</i>)	ACANTHACEAE	LC	
12.	<i>Kleinia longiflora</i>	ASTERACEAE	LC	
13.	<i>Lycium cinereum</i>	SOLANACEAE	LC	
14.	<i>Phaeoptilum spinosum</i>	NYCTAGINACEAE	LC	
15.	<i>Prosopis</i> species	FABACEAE	Alien invasive plant species	
16.	<i>Rhigozum trichotomum</i>	BIGONACEAE	LC	
17.	<i>Salsola zeyheri</i>	AMARANTHACEAE	LC	
18.	<i>Senegalia mellifera</i> (= <i>Acacia mellifera</i>)	FABACEAE	LC	
19.	<i>Tapinanthus oleifolius</i>	LORANTHACEAE	LC	
20.	<i>Tetraena decumbens</i> (= <i>Zygophyllum decumbens</i>)	ZYGOPHYLLACEAE	LC	
21.	<i>Tetraena microcarpa</i> (= <i>Zygophyllum microcarpum</i>)	ZYGOPHYLLACEAE	LC	
22.	<i>Tetraena rigida</i> (= <i>Zygophyllum rigidum</i>)	ZYGOPHYLLACEAE	LC	
23.	<i>Ziziphus mucronata</i>	RHAMNACEAE	LC	

According to the Botanical Impact Assessment (**Appendix 6A**):

- No red-listed plant species were observed;
- No plant species in terms of the NEM:BA protected species were observed;
- Six plant species, protected in terms of the Northern Cape Nature Conservation Act 9 of 2009 (NCNCA), were recorded during the Botanical Assessment (Table 4);
- Only one plant species, namely the *Boscia albitrunca* (commonly known as the Sheperd's Tree or Witgat), protected in terms of the National Forests Act (NFA) of 1998 (Act 84 of 1998) was recorded during the site assessment.



Figure 26. Locations of *Boscia albitrunca* individuals.

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities. Such activities include, but are not limited to, animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Chapin *et al.*, 2000¹⁵). Although smaller mammals, such as genet and mice, are still expected to occur within the proposed site – apart from livestock (namely goats), none of these faunal species were observed (not even traces of their presence – e.g. droppings). It is also considered highly unlikely that game (small and large mammals) occur within the proposed development footprint due to its proximity to the settlement and the scarcity of natural hiding (i.e. vegetation structure pertinent to the site). With regards to avi-fauna, although smaller, common birds were observed during the site visit, no larger birds were observed. Because of the location (next to the existing settlement) the proposed footprint enlargement is not expected to have any significant impact on the surrounding bird populations, especially if larger trees next to the seasonal drainage lines are protected. No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for various reptile species however, these species are likely to be terrestrial species adapted to the dry Nama-Karoo environmental conditions. Amphibian species are unlikely to occur within the proposed drainage lines due to the ephemeral nature of the watercourses and degree of contamination associated with the pre-existing oxidation ponds.

Please note that no fauna or avi-fauna screening was done as part of this study and that the following notes are just observations with regards to status of the study area and observations made during the botanical site visit. The proposed site is located adjacent to the existing settlement where current land-uses include illegal dumping and livestock grazing. The vegetation associated can be classified as disturbed due to previous human-induced activities (i.e. trampling, overgrazing, illegal dumping of waste, and transformation of land leading to erosion).

¹⁵ Chapin III, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavelle, S., Sala, O.E., Hobbie, S.E. & Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, 405(6783), pp.234-242.

Faunal diversity changes through space and time and are directly influenced by anthropogenic activities, including animal husbandry (i.e. overgrazing by livestock) and human settlements (e.g. transformation of land) (Tilman et al., 1997¹⁶; Chapin et al., 2000)¹⁷. Direct impacts are typically associated with urban land expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g. general or sewage) and its management (McDonald *et al.*, 2020)¹⁸. Edge effects have diverse impacts on biodiversity and ecological functioning (Razafindratsima *et al.*, 2018)¹⁹. Such effects contribute to a disturbance factor, which is likely to have driven most wild animals away from the proposed site for development due to activities associated with the adjacent settlement. It is considered highly unlikely that any large game remains in this area and were not observed within the development footprint during the site visit. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal may have been eradicated by community members in existing settlements in fear of their livestock. Due to long-term impacts associated with human settlements, compounded by the proximity of the proposed development areas to the urban edge, a comprehensive faunal survey is not deemed necessary.

Mammals

The Kgalagadi Transfrontier Park (approximately 250km) and Tswalu Kalahari Reserve (approximately 144km) are the closest protected areas to the proposed site for development. Mammalian species present in these reserves include, but are not limited to the African Striped Weasel, African Wild Cat, African Wild Dog (Painted Wolf) Antbear (Aardvark), Bat-Eared Fox, Black-Backed Jackal, Black-Tailed Tree Rat, Blue Wildebeest, Brant's Whistling Rat, Brown Hyena, Bushveld Elephant-Shrew, Cape Golden Mole, Cape Hare, Cape Serotine Bat, Caracal, Chacma Baboon, Cheetah, Common Mole Rat, Damara Mole Rat, Desert Musk Shrew, Egyptian Free-Tailed Bat, Egyptian Slit-Faced Bat, Eland, Gemsbok, Giraffe, Grass Climbing Mouse, Grey Duiker, Ground Squirrel, Hairy-Footed Gerbil, Highveld Gerbil, Honey Badger, Kudu, Large-Eared Mouse, Leopard, Lion, Namaqua Rock Mouse, Pangolin, Porcupine, Pouched Mouse, Pygmy Mouse, Red Hartebeest Round-Eared Elephant Shrew, Short-Tailed Gerbil, Silver (Cape) Fox, Slender Mongoose, Small Spotted Cat, Small-Spotted Genet, South African Hedgehog, Spotted Hyena, Springbok, Springhare Steenbok, Striped Mouse Striped Polecat, Suricate, Vervet Monkey, Warthog, Woosnam's Desert Rat, and Yellow Mongoose (<https://www.sanparks.org/parks/kgalagadi/conservation/ff/mammals.php>) / (<https://tswalu.com/wp-content/uploads/2019/07/Tswalu-Information-Guide-2019.pdf>). However, the only mammals observed on site include livestock (namely goats, sheep, and / or cows). Moreover, as per the Freshwater Report, no other endangered species, either plant or animal, were observed within or near the drainage line.

Avifauna

Although the Bushmanland Arid Grassland vegetation type potentially attracts a number of bird species, the low vegetation species diversity (associated with the proposed site for development), is likely to result

¹⁶ Tilman, D. and Wardle, D.A., 1997. Biodiversity And Ecosystem Properties. *Science*, 278 (5345), pp.1865-1869.

¹⁷ Chapin Iii, F.S., Zavaleta, E.S., Eviner, V.T., Naylor, R.L., Vitousek, P.M., Reynolds, H.L., Hooper, D.U., Lavorel, S., Sala, O.E., Hobbie, S.E. and Mack, M.C., 2000. Consequences of changing biodiversity. *Nature*, 405(6783), pp.234-242.

¹⁸ McDonald, R.I., Mansur, A.V., Ascensão, F., Crossman, K., Elmqvist, T., Gonzalez, A., Güneralp, B., Haase, D., Hamann, M., Hillel, O. and Huang, K., 2020. Research gaps in knowledge of the impact of urban growth on biodiversity. *Nature Sustainability*, 3(1), pp.16-24.

¹⁹ Razafindratsima, O.H., Brown, K.A., Carvalho, F., Johnson, S.E., Wright, P.C. and Dunham, A.E., 2018. Edge effects on components of diversity and above-ground biomass in a tropical rainforest. *Journal of applied ecology*, 55(2), pp.977-985.

in a low avifaunal diversity, where avifaunal diversity is directly influenced by land cover (i.e. intact vegetation) (Lepczyk *et al.*, 2017)²⁰. Limited vegetation, present on site, is available to provide a range of avifauna adequate habitat for survival, and therefore, it was not envisaged that a comprehensive avifaunal survey was deemed necessary.

Reptile & amphibians

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grasslands and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of adequate aquatic and wetland habitat within the proposed footprint.

10.1.2 IMPACT ASSESSMENT

Direct impacts

According to the Botanical Impact Assessment (**Appendix 6A**), the main impacts associated with the proposed development will be:

- The transformation of 49ha of indigenous vegetation within a CBA; and
- The potential impact on numerous nationally protected trees and provincially protected plant species.

10.1.3 MITIGATION MEASURES

The following mitigation measures are recommended by the Botanical Impact Assessment:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- **Before any work is done** protected tree species must be marked and demarcated (Refer to **Error! Reference source not found.** of the Botanical Impact Assessment).
- **Before any work is done** search & rescue as discussed in **Error! Reference source not found.** the Botanical Impact Assessment must be completed.
- Lay-down areas or construction sites must be located within the construction footprint.
- No clearing of any area outside of the construction footprint may be allowed.
- All waste that had been illegally dumped within the footprint must be removed to a Municipal approved waste disposal site.
- An integrated waste management approach must be implemented during construction.
 - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.

²⁰ Lepczyk, C.A., La Sorte, F.A., Aronson, M.F., Goddard, M.A., MacGregor-Fors, I., Nilon, C.H. and Warren, P.S., 2017. Global patterns and drivers of urban bird diversity. In *Ecology and conservation of birds in urban environments* (pp. 13-33). Springer, Cham.

- Alien invasive *Prosopis* plants within the footprint (and immediate surroundings) must be removed in a responsible way (to ensure against regrowth).

10.1.4 CONCLUSION

The proposed development footprint is located on Municipal property, adjacent to existing town developments. The activity is expected to result in a permanent transformation of approximately 49 ha of land, of which approximately 60 - 70% is still covered by indigenous vegetation in good condition. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). In addition, 14 protected Sheppard trees (*Boscia albitrunca*), and numerous Northern Cape Nature Conservation Act, protected species were observed within the footprint.

According to the impact assessment given in Table 6 of the Botanical Assessment, the development is likely to result in a relative **Low impact**, which can be **further reduced with mitigation and good environmental control during construction**.

With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

As per the Botanical Specialist, "with the available information, it is recommended that project be approved, with the proposed mitigation actions."

10.2 HERITAGE IMPACT ASSESSMENT

Jan Engelbrecht of the Ubique Heritage Consultants was appointed to undertake a Heritage Impact Assessment (HIA) of the proposed site. The HIA is included as **Appendix 6B**.

10.2.1 KEY FINDINGS

According to the Heritage Impact Assessment (**Appendix 6B**), eleven (11) incidences of ESA and MSA lithic material (comprised of informal tools, knapping debris, scrapers, blades, retouched flakes and cores) were recorded across the development footprint (Figure 27). The majority of the lithics are Banded Ironstone Formation (BIF), an abundant raw material within the area, with some cryptocrystalline silicates (CCS) and quartzite pieces. The material was documented as widely dispersed surface scatters and did not have an archaeological context. The resources will be affected negatively by the proposed development, but due to the low significance of the material, the impact is negligible.

The development footprint is underlain by Quaternary to Recent sediments of the Gordonia Formation (Kalahari Group) as well as underlying Precambrian rocks of the Transvaal Supergroup. According to the SAHRIS PalaeoMap, the Palaeontological Sensitivity of the Kalahari Group is low. The underlying Precambrian Transvaal Supergroup that is of moderate significance are too deep to affect the proposed development (Butler 2020).

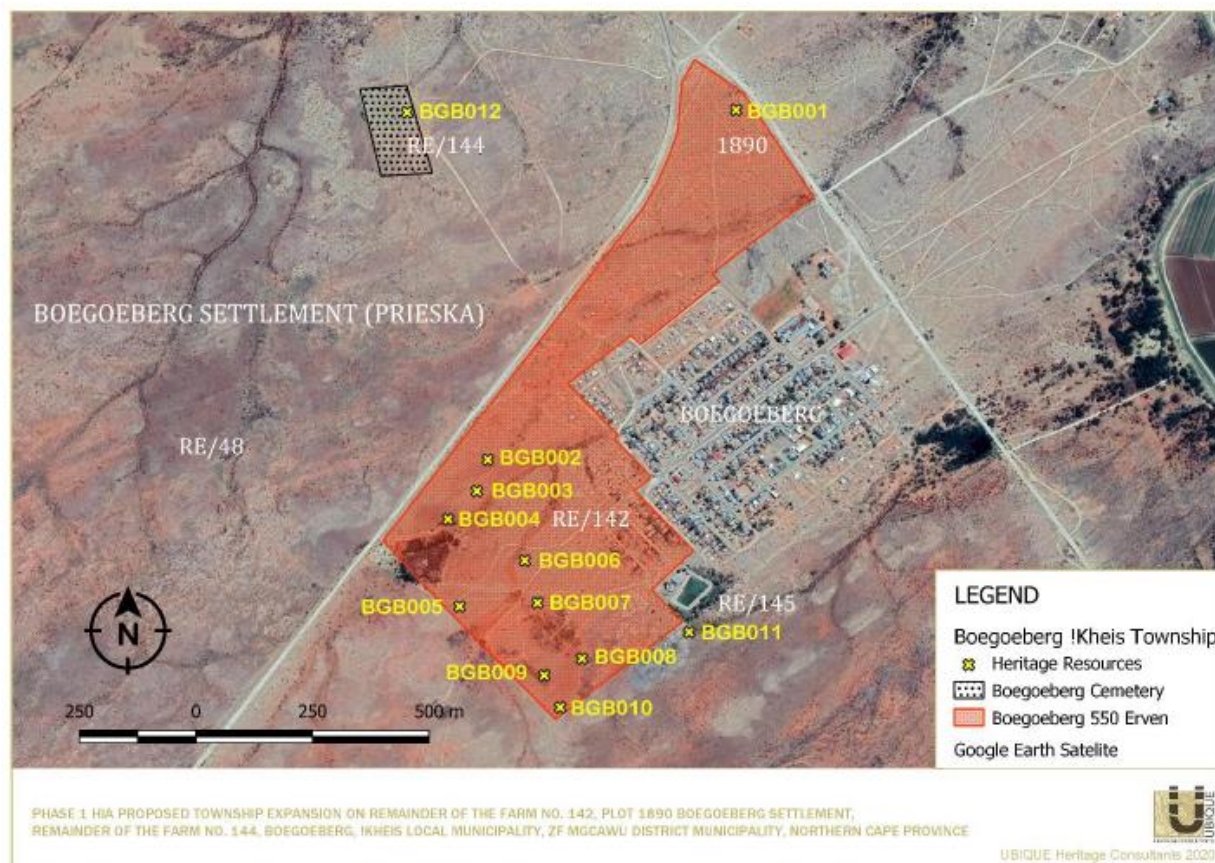


Figure 27: Recorded heritage within the proposed site for the Boegoeberg Housing Development.
Source: *Figure 9 of the Heritage Impact Assessment - Appendix 6B*, Ubique Heritage Consultants.

10.2.2 IMPACT ASSESSMENT

According to the Heritage Impact Assessment (**Appendix 6B**), the impact on Archaeological and Historical resources is considered to be Low as no significant heritage sites or features were identified / observed within the proposed development footprint. The probability of the development impacting on palaeontological heritage during the construction phase is regarded as minimal, and the significance of the impact occurring was rated as being low. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

10.2.3 MITIGATION MEASURES

According to the Heritage Impact Assessment (**Appendix 6B**), based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

- No significant heritage sites or features were identified within the proposed site for development.

The cultural material, identified during the Heritage Assessment, was not conservation worthy. No further mitigation is recommended with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists recommended that the proposed development could continue.

- The Boegoeberg cemetery (graded as IIIB and is of High Local Significance) is located outside the development footprint. No further mitigation is recommended with regards to these resources. No other graves were identified on the development footprint.
- If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol (Appendix A/11) must be implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected, and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carried out by a palaeontologist (Butler 2020).
- If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

10.2.4 CONCLUSION

As per the Heritage Impact Assessment (**Appendix 6B**), no significant heritage sites or features were identified within the proposed site for development. The ESA / MSA cultural material identified during the Heritage Assessment is not conservation worthy. No further mitigation is recommended with regards to these resources. Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Therefore, from a heritage point of view, the Heritage Specialists recommended that the proposed development can continue.

10.3 FRESHWATER ASSESSMENT

Dr Dirk van Driel (Watsan Africa) was appointed to undertake the Freshwater Assessment for the proposed development. The Freshwater Impact Assessment is included as **Appendix 6C**.

10.3.1 KEY FINDINGS

According to the Freshwater Assessment (**Appendix 6C**), watercourses (namely drainage lines) were identified within the proposed development footprint. These watercourses are non-perennial drainage lines

which are mostly dry but may have some water in them during summer rainfall events. The sub-catchment associated with the larger drainage line is approximately 156ha in extent whereas the smaller drainage line has a sub-catchment of approximately 54ha (Figure 28). These drainage lines have riparian zones overgrown with *Senegalia mellifera* (swarthaak). The Present Ecological State (PES) of the riparian and instream components of the drainage lines were both categorized as Class D (Largely modified - a significant loss of natural habitat, biota and ecosystem function). As no fish species were present due to the non-perennial nature of the drainage lines, the drainage lines were not classified as ecologically important (EI). The drainage lines within the proposed site for development is Ecologically Sensitive. No other endangered species, either plant or animal, were detected in or near the drainage line. In accordance with the Resources Economic Footprint, the drainage lines have a small economic footprint.

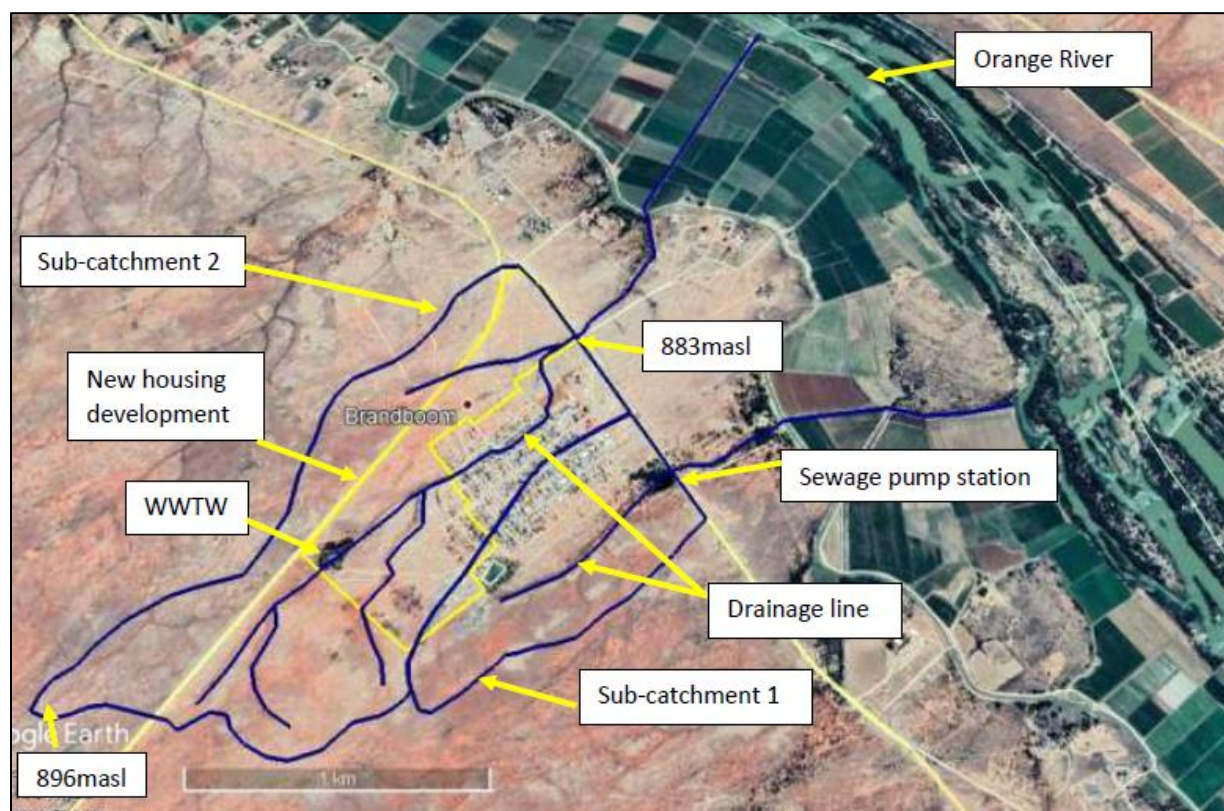


Figure 28. Sub-catchments associated with the Boegoeberg Housing Development. Source: Freshwater Report, Dr van Driel.

Sewage treatment works

As per the Specialist report, the dried-out sludge on and around the intake works, the WWTWs initially has been used, but soon thereafter fell into disrepair. It lies idle at this point in time, with scores of children playing in its dried-out ponds. There is another patch of dense vegetation on the other side of town, along the dirt road, in the smaller drainage line, downstream. At this point a sewage pump station was observed. The pump station was overflowing and raw sewage in substantial quantities was running down the drainage line. Further down the drainage line the sewage formed a pond. Scores of children were playing around this locality.

As per the Freshwater Assessment, biomonitoring was conducted at eleven (11) sampling points along the Lower Orange River, namely Augrabies Lair trust, Groblershoop, Kakamas Triple D, Hopetown Sewer, Hopetown Sewer, Keimoes Housing, Upington Erf 323, Upington Affinity, Styerkraal, Grootdrink Bridge, and Turksvy Dam. These sites were sampled based on elucidating the combined impact of the proposed developments on the Orange River, and was carried out according to Dickens and Graham, (2002). The PES of the Orange River (for both riparian and instream zones) were categorized as Class C (Moderately modified - a loss and change of the natural habitat and biota, but the ecosystem function is predominantly unchanged), and is an Ecologically Important system (as classified by the Freshwater Specialist). Furthermore, the Orange River is Ecologically Sensitive.

10.3.2 IMPACT ASSESSMENT

As per the Freshwater Assessment (Figure 6C), the main impacts associated with the proposed development on aquatic features includes;

- Construction of households in close proximity to the watercourses;
- Destruction of the drainage line;
- Change the drainage line into a stormwater canal; and
- Cumulative impact of sewage and solid waste ending up in the drainage line and Orange River.

10.3.3 MITIGATION MEASURES

Apart from leaving a strip of land around the drainage line in the proposed development, no mitigation measures are proposed. The significant combined impact of the various developments stem from the sewage and waste issues must be addressed. Adequate municipal services should resume which would include the compilation and implementation of a waste management plan to address the sewage and solid waste issues.

- **Construction of dwellings around the drainage line. Destruction of the drainage line. Change the drainage line into a storm water canal:** Leave a strip of land 50m wide around the drainage line. The identified impacts of the proposed development were rated as High which can be reduced to Low should proposed mitigation measures be implemented.
- **Cumulative impact of sewage and solid waste ending up in the drainage line and Orange River:** Construction only during the dry season, limit the footprint, vegetate disturbed areas. The identified impacts of the proposed development were rated as Medium which can be reduced to Low should proposed mitigation measures be implemented.

10.3.4 CONCLUSION

As per the Freshwater Assessment (**Appendix 6C**), an anthropogenic activity can impact on any of the ecosystem drivers or responses and this can have a knock-on effect on all of the other drivers and responses, consequently impacting ecosystem services. The driver of the drainage lines is the occasional flood that follows sudden and intense rainfall events. This is followed by prolonged droughts and intense summer heat that prevents the development of any viable aquatic habitat. This is apart from shallow ground water that explains the growth of a somewhat more prolific vegetation along the drainage lines. The identified impacts can be reduced to a Low Significance Rating should proposed mitigation measures be

implemented. The current sewage and solid waste situation are threats to the success of the project as authorities may insist that issues associated with sewage and solid waste removal be resolved before a General Authorization is approved.

10.4 GEO-TECHNICAL ASSESSMENT

Cedarland Geotechnical Consult (Pty) Ltd was appointed to undertake the Geo-technical Assessment as part of the EIA process, and is included as **Appendix 6D**.

10.4.1 KEY FINDINGS

According to the Geo-technical Assessment, the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S. The following are the main conclusions that have been made:

- **Geology:**

The site for the proposed development is located between the lithology of the Kaapvaal Craton and Namaqua-Natal mobile belt where the remaining, original geology is comprised of Kaaieen Terrane whereas the site is located on the Groblershoop Formation of the Brulpan Group. The bedrock associated with the site comprises of quartz-sericite schist and quartzite.

- **Soil Profile:**

The soil profile of the site is comprised of river terrace gravels (horizon varies between 100-800mm), alluvium (horizon extends to maximum depth of 800mm), calcrete of the Mokalanen Formation, Kalahari Group (extending to depths of 100 – 900mm where refusal of excavation occurred), residual quartzite (extended depth of 300mm) and fill (stockpiled material, where surface rubble were distributed widely over the site).

- **Hydrology:**

No perched groundwater was encountered on site during the geotechnical investigation (and is not anticipated to be problematic on site. Groundwater is expected to occur at depths less than 15m within compact, argillaceous strata. Successful drilling for water within the proposed site for development is expected to be between 40 – 60% whereas the drilling for a borehole yielding at least 2l/s ranges between 10 – 20%.

- **Geotechnical Classification:**

The site is divided into seven separate geotechnical zones. An additional zoning map was supplied indicating other problems encountered on site that are not necessarily of a geotechnical origin.

Geotechnical Zone I

Zone classed as R (founding is stable and expected soil movement is negligible) comprises 48% of the total site. Slope across the site ranges between 2 - 6%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations (more viable option) or (ii) slab-on-the-ground foundations which require additional work in the form of the construction of an engineered fill or cutting to establish a level platform for construction.

Geotechnical Zone II

Zone classed as R (founding is stable and expected soil movement is negligible) comprises 50% of the total site. Slope is less than 2%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations placed directly on bedrock or very dense pedocrete.

Geotechnical Zone III

Zone classed as S (horizon for founding is slightly compressible and rapid settlement less than 10mm is expected), comprises 2% of the total site. Slope across the site is less than 2%. Two foundation design alternatives are applicable, namely (i) conventional strip foundations or (ii) slab-on-the-ground foundations placed directly on medium dense terrace gravels.

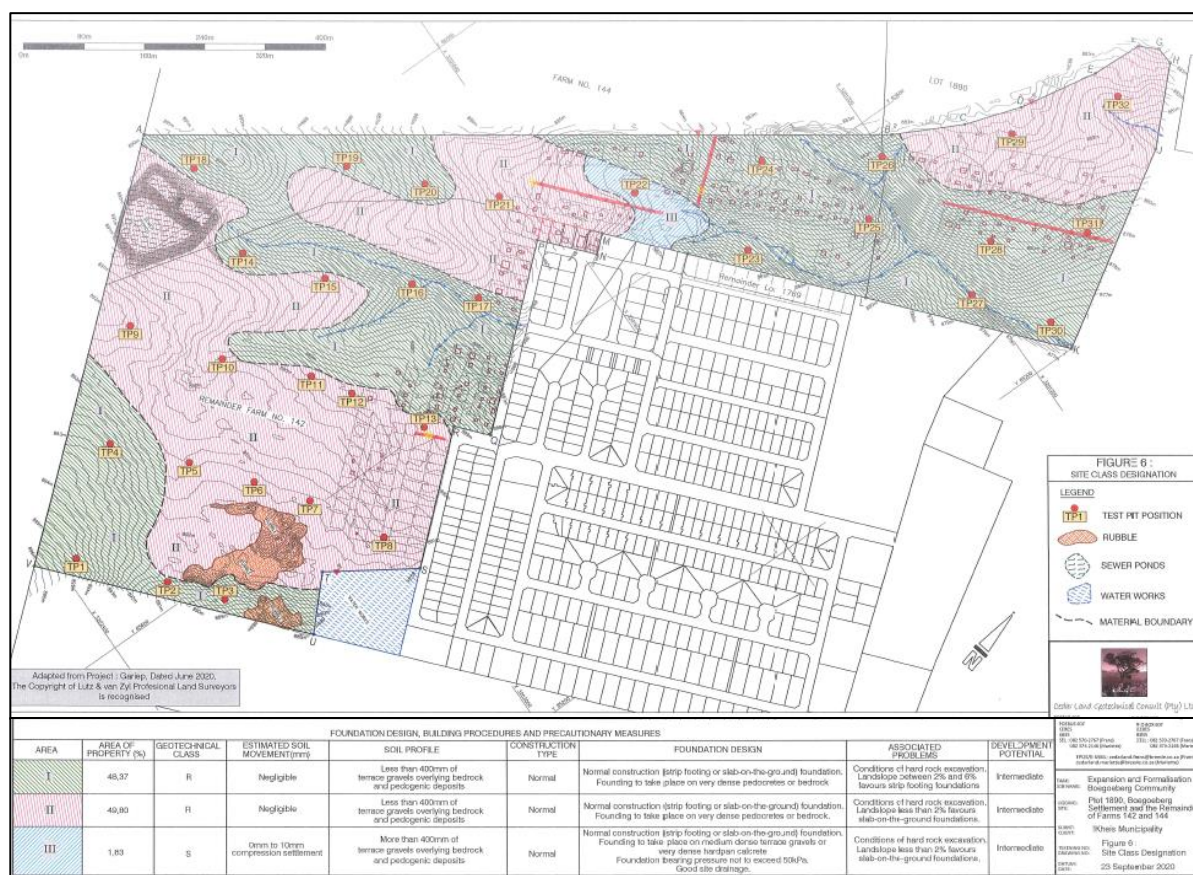


Figure 29. Geotechnical investigation and classified zoning of the site proposed for the Boegoeberg Housing Development. Source: Geotechnical Investigation (Appendix 6D).

- Undermining:

Area is not subject to undermining.

- Soil Corrosivity:

All soil materials can be considered corrosive due to high soluble salt concentrations whereas *in situ* soils and pedocrete are not corrosive due to acidic properties.

- Seismicity:

A low risk for the development of earth tremors therefore exists due to the peak ground acceleration expected in 50 years is 0.10g.

10.4.2 RECOMMENDATIONS

According to the Geo-technical Assessment, the following recommendations are given per geotechnical zone (**Appendix 6D, page 40**). According to the Geo-technical Assessment, the following recommendations are given per geotechnical zone. As the geotechnical site conditions favours the use of two foundation design alternatives, the selection of a particular foundation design must be based on practical and financial considerations. Service trenches must not be excavated parallel to buildings within 1500mm of the building perimeter.

Geotechnical Zone I

- Strip foundations are the preferred founding alternative where foundations of 400mm wide strip footings placed directly on the dense hardpan calcrete. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m² foundations for internal non-loadbearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- Due to the slope associated with this zone, additional work will be required should slab-on-the ground founding be used resulting in financial implications.

Geotechnical Zone II

- Strip foundations are the preferred founding option which includes foundations of 400mm wide being placed directly on the very dense hardpan calcrete. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m² foundations for internal load-bearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- Slab-on-the-ground foundations is the preferred option due to the land slope but may only be utilized for dwellings less than 200m².

Geotechnical Zone III

- Strip foundations of 400mm wide must be placed directly on the very dense hardpan calcrete or on medium dense *in situ* soil can be used. Walls may consist of thickened floor slabs in areas where proposed dwellings do not exceed 200m² foundations for internal non-loadbearing walls. Should strip foundations be used, floor slabs must be reinforced with steel mesh.
- The Slab-on-the ground is preferred method of founding. Edge beams must be placed directly on the hardpan calcrete or on medium dense *in situ* soil can be used. Foundations for internal non-loadbearing walls must consist of thickened floor slabs. Foundations must not contain any changes in surface levels with steps exceeding 400mm and do not support chimneys or walls which support concrete roofs.

According to the Geotechnical Investigation, the non-perennial watercourses require no precautionary measures to ensure safety of the community against flooding. Infrastructure must be established at a safe distance from the drainage lines. The slope may result in problems associated with the design of stormwater and sewage disposal systems.

Concerns were raised by the Engineer over potential soil and water contamination (due to obsolete oxidation dams) on site which need to be resolved prior to residential development. Although the relative absence of groundwater close to the surface, along with the impermeable barrier formed by calcrete and bedrock), it is unlikely that groundwater contamination may have taken place however, surface water (as well as soil contamination with bacteria) may have been contaminated. Should sewage dumping, present on site, be stopped, the site could be rehabilitated and the entire area can be developed accordingly. It was

recommended that facilities be upgraded and residential developments must be maintained as per legal requirements and comply with recommendations stipulated in the Geotechnical Investigation.

In terms of general measures, the following recommendations were made:

- **Founding:** The development must take place according to the SANS 10400H and NHBRC Home Owner's Manual Guidelines (published in 2015).
- **Trench backfill:** only aeolian sand can be regarded as suitable for selected fill or pipe bedding whereas all material (except for hardpan calcrete) can be used for normal backfill.
- **Layer works:** Hardpan calcrete and colluvium are of G6 quality and are suitable for the construction of layer works up to sub- and base- course level for lightly trafficked roads.
- **Wearing course for gravel roads:** no material present on site are 100% suitable for gravel wearing course.
- **Excavation conditions:** Due to the consistency and composition of the soil present on site, the use of such soil is not economically viable. Excavation of soils would require a TLB (rated at 55kW minimum) or a 30 ton excavator will be required for the excavation of the very dense hardpan calcrete which needs to be removed and thus, adequate financial provision must be made for hard rock excavation. Sidewalls of excavations may be susceptible to collapse. Precautionary measures must be provided to protect workmen in these excavations - these measures may include shoring the excavations or sloping the sides to flatter than 1(V):2(H).
- **Land slope:** Average slope across 52% of the site is less than 2% - thus, the proposed site is regarded as being of an intermediate suitability for urban development only.
- **Presence of Wastewater Facilities:** future development must comply with legal requirements to mitigate negative impact of these facilities on the receiving environment and proposed residential development.

7. SUMMARY OF IMPACTS

Please refer to Appendix 7 for a summary of the project impact assessment and significance, including a summary of mitigation measures.

Table 5 is a summary of all the impacts assessed in the specialists reports that are associated with the construction and operational phase for the preferred alternative.

Table 5. Summary of all impacts

Study	Impact	Significance No Mitigation	Significance With Mitigation
Botanical	Geology & soils: Potential impact on special habitats	Insignificant (Negative impact)	Insignificant (Negative impact)
	Land-use and cover: Potential impact on socio-economic activities.	Low (Negative impact)	Insignificant (Negative impact)
	Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Low (Negative impact)	Insignificant (Negative impact)
	Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Low (Negative impact)	Insignificant (Negative impact)
	Connectivity: Potential loss of ecological migration corridors.	Low (Negative impact)	Insignificant (Negative impact)
	Protected & endangered plant species: Potential impact on threatened or protected plant species.	Low (Negative impact)	Insignificant (Negative impact)
	Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Low (Negative impact)	Insignificant (Negative impact)
	Veld fire risk: Potential risk of veld fires as a result of the activities.	Insignificant (Negative impact)	Insignificant (Negative impact)
	Cumulative impacts: Cumulative impact associated with proposed activity.	Low (Negative impact)	Insignificant (Negative impact)
	The "No-Go" option: Potential impact associated with the No-Go alternative.	Low (Negative impact)	0
Heritage	The eleven occurrences of ESA and MSA surface scatters across the development footprint.	Low (No mitigation required)	

	The formal Boegoeberg town cemetery, situated outside of the development footprint.	Low (No mitigation required)	
Palaeontology	Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required.	N/A	N/A
Freshwater	Construction of dwellings around the drainage line. Destruction of the drainage line. Change the drainage line into a storm water canal.	High	Low
	Cumulative impact of sewage and solid waste ending up in the drainage line and Orange River	Medium	Low
	Urban solid waste: waste ending up in the river and polluting these rivers.	Low	Low
Socio-economic	Job Creation – Construction phase	Medium (Positive impact)	Medium (Positive impact)
Visual	Potential visual impact on the area	Low (Negative impact)	Low (Negative impact)
Dust	Potential impact of dust from construction activities	Low (Positive impact)	Low (Positive impact)

8. RECOMMENDATIONS

The following mitigation measures must be enforced if the proposed development were approved. These are also included in the Environmental Management Programme (**Appendix 9**).

Construction Phase:

According to the Botanical Assessment (**Appendix 6A**), the following mitigation actions are recommended:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Before any work is done protected tree species must be marked and demarcated (Refer to Table 2 – Appendix 6A). If any of these plants are to be removed a permit must be obtained before the plant may be removed.
- Before any work is done search & rescue as discussed in Table 3 must be completed. If any of these plants are to be removed a permit must be obtained before the plant may be removed.
- Lay-down areas or construction sites must be located within the construction footprint.
- No clearing of any area outside of the construction footprint may be allowed.
- All waste that had been illegally dumped within the footprint must be removed to a Municipal approved waste disposal site.
- An integrated waste management approach must be implemented during construction.
 - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
- Alien invasive Prosopis plants within the footprint (and immediate surroundings) must be removed in a responsible way (to ensure against regrowth).

According to the Heritage Impact Assessment (**Appendix 6B**), based on the assessment of the potential impact of the development on the identified heritage, the following recommendations are made, taking into consideration any existing or potential sustainable social and economic benefits:

- No significant heritage sites or features were identified within the surveyed sections of the proposed Boegoeberg township expansion, Remainder of the Farm No. 142, Remainder of the Farm, No. 144, and Plot 1890 Boegoeberg Settlement (Prieska). The Early and Middle Stone Age cultural material identified is not conservation worthy. No further mitigation is recommended with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists recommended that the proposed development can continue.
- The Boegoeberg cemetery is situated well outside the development footprint. This site is graded as IIIB and is of High Local Significance. No further mitigation is recommended with regards to these resources. No other graves were identified on the development footprint.
- Due to the low palaeontological significance of the area, no further palaeontological heritage studies, ground-truthing and/or specialist mitigation are required. It is considered that the development of the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol [Appendix A/11 of Heritage Impact Assessment (Appendix 6C)] must be

implemented by the Environmental Control Officer (ECO) in charge of these developments. These discoveries ought to be protected, and the ECO must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carried out by a palaeontologist (Butler 2020).

- Although all possible care has been taken to identify sites of cultural importance during the investigation of study areas, it is always possible that hidden or sub-surface sites could be overlooked during the assessment. If during construction, any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA. UBIQUE Heritage Consultants and its personnel will not be held liable for such oversights or costs incurred as a result of such oversights.

Operational Phase:

According to the Freshwater Assessment, the lack of functional wastewater treatment works and illegal dumping remains a cause of concern. Raw sewage is dumped in drainage lines. Likewise, several sewage pump stations are dysfunctional, overflowing, with large quantities of raw sewage flowing down drainage lines. Household solid waste is not collected and removed according to standard municipal operating procedures. Very large quantities of waste accumulate in the townships and the streets. Large quantities of waste end up in the drainage lines as well. These two aspects are crucial to the WULA and environmental authorisation of any further urban development. If these malpractices are allowed to continue and if the normal municipal services continue to be absent, this untenable situation will become worse when these townships expand. Therefore, a proper municipal waste management system is necessary

9. CONCLUSIONS

The following specialist studies were undertaken as part of this Environmental Impact Assessment:

- Botanical Impact Assessment (**Appendix 6A**)
- Heritage Impact Assessment (**Appendix 6B**)
- Freshwater Assessment (**Appendix 6C**)
- Geo-technical Assessment (**Appendix 6D**)

The specialist studies and the information provided within the EIA Report, indicates that the proposed Boegoeberg Housing development does not pose any significant impacts should the proposed mitigation measures be implemented. However, as per the specialist assessments, site visits, and comments received from registered I&APs, the failure of the wastewater treatment works and illegal dumping, especially in drainage lines, remain a key issue which must be addressed with the implementation of a proper waste management plan. The proposed project will increase the pressure placed on existing municipal services and therefore, if a waste management plan is not effectively implemented, the current lack of sewage and solid waste management may negatively impact the environment and socioeconomic development in the Boegoeberg area.

According to the Botanical Specialist (**Appendix 6A**), “with the available information it is recommended that project be approved, with the proposed mitigation actions”. According to the Heritage Impact Assessment (**Appendix 6B**). No significant heritage sites or features were identified within the proposed development footprint. No further mitigation measures were required with regards to these resources. Therefore, from a heritage point of view, the Heritage Specialists concluded that the proposed development can continue. The Boegoeberg cemetery is located outside of the proposed site for development and thus, no further mitigation measures were recommended with regards to these resources. No other graves were identified within the development footprint. The proposed site for development is located within an area of low palaeontological significance. Thus, no further palaeontological heritage studies, ground-truthing, and/or specialist mitigation are required. As per the Freshwater Impact Assessment (**Appendix 6C**), the Freshwater Specialist concluded that identified impacts will have a Medium impact on the freshwater features of the site which can be reduced to a Low impact should proposed mitigation measures be implemented. Impacts associated with the condition of the sewage and solid waste management infrastructure are threats to the Water Use Authorisation (WUA) and authorities may insist that these issues be resolved prior to the approval of the WUA (General Authorisation). According to the Geotechnical Investigation (**Appendix 6D**), the proposed site for development was regarded as being of intermediate suitability for the proposed residential development where founding conditions were designated as R and S.

In terms of the need and desirability of the proposed residential development, housing is a national need, including in the !Kheis Local Municipality. The proposed development represents a significant step towards service delivery and housing objectives within the municipality and broader area. The development will not only meet the pressing needs of adequate housing within the municipality but will also be in line to support of the municipal IDP and SDF objectives, namely to provide housing for the poor and decrease the Municipality's housing backlog as well as fulfil the Constitutional mandate to provide adequate housing and basic services to citizens.

The proposed location is considered to be a viable option. The proposed site is adjacent to the existing residential area of Brandboom, allowing accessibility and linking to the existing services infrastructure. The surrounding land use, namely the existing Brandboom settlement, is in line with the proposed development, which is part of the reasons why this location was selected by the local authority for the purposes of this

project. The site is located along the N10 and therefore can be accessed using the existing road networks in the area.

There are no physical characteristics of these properties or environmental constraints which would exclude the site from development. However, as per the Botanical Assessment, numerous nationally and provincially protected plant species are present within the development footprint (refer to Table 3). Prior to any of these plant species being disturbed, damaged, removed, relocated, or destroyed, a permit from the relevant authority is required and must be applied for.

In terms of alternatives, **Alternative 4** is the preferred alternative. This alternative is considered a viable option and is also the Municipality's preferred layout since it provides the optimal number of erven and housing opportunities (high and lower density), as well as providing for Municipal and Government land use opportunities, and more Open Space. There are no environmental or heritage limitations to this layout.

The "no-go" option, which is the option of not developing the proposed housing development. Currently, the area earmarked for development is disturbed, with numerous cases of illegal dumping. Although the no-go development might result in no potential negative environmental impacts, especially on the vegetation on the development site, the direct and indirect socio-economic benefits of not constructing the residential development will not be realised. The need for additional housing opportunities in the area will not be realised.

Considering all the information, it is envisaged that this proposed Boegoeberg Housing Development will have a low negative impact on the environment, and the socio-economic benefits are expected to greatly outweigh any negative impacts. The mitigation measures, as recommended by the various specialists and detailed in the EMPr (Appendix H) must be implemented. It must be noted that a proper waste management plan, addressing the functioning of the wastewater treatment works and solid waste removal to service the proposed development (i.e. existing and increased demand for these services), must be added as a condition to the granting of the environmental authorisation. This waste management plan must be implemented to address the expected increase in pressure on existing services – as per recommendations proposed and addressed in the Engineer's Services Report (Appendix 4B). In addition to parameters stipulated in the Engineer's Services Report (Appendix 4B), a Stormwater Management Plan (SWMP) must be designed and compiled to address concerns raised by the I&AP - namely the potential flow of sewage- and/or solid waste-contaminated stormwater runoff from the development into the drainage lines and subsequently the Orange River. Therefore, it is recommended that the proposed development be supported/ authorized subject to the compilation of a SWMP which includes required engineering parameters (Appendix 4B) and the management of potentially sewage- and/or solid waste-contaminated stormwater runoff.

It is therefore recommended that the proposed Boegoeberg Housing Development (**Alternative 4**) **be supported and be authorised with the necessary conditions of approval**, namely the compilation of a stormwater management plan, waste management plan (addressing sewage and solid waste management), and the undertaking of a traffic impact assessment, along with the implementation of recommendations / mitigation measures proposed by Specialists (Appendices 6A-D) and included in the EMPr (Appendix 9).

10. DETAILS AND EXPERTISE OF THE EAP

Details of Environmental Assessment Practitioner, expertise and Curriculum Vitae

This Final Environmental Impact Report was Report compiled by Anthony Mader -

Qualifications:

Anthony Mader: BSc, BSc (Hons), PhD (currently completing) at the University of the Witwatersrand, Johannesburg, South Africa.

Expertise:

Anthony has over three years of experience within environmental consulting and has worked on private and government projects throughout the country, including Western Cape, Northern Cape, KwaZulu-Natal, and the Eastern Cape. Anthony has facilitated Environmental (EA) and Water Use (WUA) applications whereas other duties included auditing of various types of construction types to ensure environmental compliance with the EA. The variety of projects Anthony has worked on include, but are not limited to;

- Housing developments;
- Civil engineering infrastructure projects such as water supply schemes, roads, culverts, bridges, warehouses, and a substation; and
- Auditing of water supply schemes, housing developments, warehouses, roads, bridges, and reservoirs

Anthony Mader joined EnviroAfrica CC in March 2020 and is employed as an Environmental Assessment Practitioner (EAP), working on various private and government projects throughout the Western Cape and Northern Cape.

Employment:

Previous employment as an Environmental Consultant	: EnviroPro Environmental Consultants (2017 – 2020)
Current employment as Environmental Assessment Practitioner	: EnviroAfrica cc (2020 – present).

Report reviewed and supervised by Bernard de Witt – The whole process and report was supervised by Bernard de Witt who has more than 30 years' experience in environmental management and environmental impact assessments. Bernard de Witt: B.Sc. Forestry (Stellenbosch); B.A. (Hons) Public Administration (Stellenbosch); National Diploma in Parks and Recreation Management; EIA Short course (UCT); ISO 14001 Auditors course (SABS)

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