

Free State Botanical Gardens. As a result of the urban catchment the amount of runoff is increased substantially. This alters the flow regime of the stream to a large degree, i.e. the stream would naturally only have flowed during summer after heavy rainfall but due to increased runoff the flow is now almost perennial. Furthermore, several dams occur in the stream and although they capture runoff and floods they provide a constant water flow and so also sustain a perennial flow. Despite being modified the stream is still considered to be a highly sensitive system and provides several vital services. In addition, the stream is also listed as a National Freshwater Ecosystems Priority Area (NFEPA): Upstream System and as a result this even further increases the value of this system. The stream and its catchment should therefore be regarded as having a very high level of sensitivity.

## **6.2 Botshabelo Urban Area (Appendix A: Map 2)**

Botshabelo is located 55 km east from Bloemfontein. The urban extent of this town is approximately 6180 hectares. Being situated more toward the eastern half of the province, large hills ridges and even mountains become prominent. A prominent feature is the Klein-Modder River flowing through the urban area. Although heavily impacted by the urban area it is still natural to a large extent as it remains largely uncanalised with limited development encroachment into the floodplain. The area is dominated by low-income housing. Owing to high-density urban development the urban area is also generally heavily modified.

The Botshabelo urban area it is quite extensive, but less so than Bloemfontein, and therefore still has a variety of habitats and topographical units. The Botshabelo MOSS consists almost exclusively of the surrounding hills and mountains and these still consist to a large degree of natural vegetation though impacts around the urban area does cause significant degradation, decreasing in magnitude further away from the urban area.

The on-site and desktop surveys indicated that the MOSS comprises almost exclusively of hills, ridges and mountainous areas with almost all consisting of Basotho Montane Shrubland. Small portions on top of the Thaba Nchu Mountain and portions of the hills to the north of Thaba Nchu consist respectively of Eastern Free State Clay Grassland and Winburg Grassy Shrubland. These will however be included under the discussion of the Basotho Montane Shrubland since the species composition does not differ markedly from it and access could not be provided to areas of these vegetation types located on private property. Only small portions of the plains are situated within the MOSS to the West of Botshabelo and to the east of the Thaba Nchu Mountain. Where access could be obtained to these areas they also exhibited high levels of overgrazing by domestic livestock.

The survey has indicated that almost the entire MOSS still consists of natural vegetation but that overgrazing and urban impacts cause substantial degradation. The level of disturbance was noted to be highest around the urban areas and decreasing substantially in the portions of the MOSS located further away from urban areas. In-field surveys were confined to areas of municipal or communal properties while previous field surveys and desktop information were utilised for private properties, as well as other inaccessible areas such as communal farming operations.

From the description of the remaining natural vegetation in the Botshabelo urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- Both vegetation types contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- The Botshabelo MOSS is largely intact with only small portions having been transformed from the natural condition. Despite being transformed these areas still form part of the MOSS and function in terms of ecological corridors and as a result they are still considered to have a moderate level of Sensitivity.
- The majority of the Botshabelo MOSS is situated within municipal and communal areas and access could easily be obtained. However, access could not be provided for areas located on private property such as the Thaba Nchu Mountain and assessment is therefore based on surrounding areas. Delineation of sensitive areas may therefore contain inaccurate delineation and therefore additional studies should be conducted for any site specific areas within the MOSS.
- The portion of Central Free State Grassland to the west of Botshabelo is degraded as a result of heavy overgrazing and consequently this portion is regarded as having a moderate level of sensitivity.
- The portion of Central Free State Grassland to the east of the Thaba Nchu Mountain could not be assessed though seems to be in a good condition and is therefore assigned a default sensitivity rating of High.
- The Basotho Montane Shrubland dominated the MOSS and consists of hills, ridges and mountainous areas. The survey has indicated that the majority of the vegetation type within the MOSS is still intact and though overgrazing does cause disturbance it retains a high species diversity and many protected and rare or uncommon species. The combination of the above provides this vegetation type with at least a High level of sensitivity where it occurs in the MOSS and which should be regarded as Very High where this also coincides with CBA areas and NPAES Focus Areas.
- Both vegetation types contain numerous protected species which should also be taken into account in the sensitivity of remaining natural vegetation.
- Areas listed as CBA areas such as occurs in and around the Rustfontein Dam Nature Reserve, Maria Maroka Nature Reserve and Thaba Nchu Mountain should be regarded as having a very high level of sensitivity and remains important irrespective of occurring within the reserve or not.
- Large portions of NPAES Focus Areas occur to the west of Botshabelo. These areas also aim to increase the conservation area of the Rustfontein Nature Reserve. A large NPAES Focus Area also occur to the east of Botshabelo and coincide with the Thaba Nchu Mountain and to some extent with CBA areas and aim to formalise the protection of the Thaba Nchu Mountain. Only the NPAES Focus Area to the east occur within the MOSS. However, spatial planning should aim to avoid all NPAES Focus Areas, irrespective of if they fall within the MOSS or not.
- Survey of the MOSS indicate that overgrazing by domestic livestock is high in most areas and leads to substantial disturbance of the natural areas. Consultation with the local community should aim to improve grazing practises and alleviate the pressure on natural areas.

**Klein-Modder River (Appendix A: Map 3 - 4):** A significant portion of the Klein-Modder River flows through the centre of the town and is also included within the MOSS. The Klein -Modder River is severely degraded by several significant impacts. The Klein-Modder is naturally an ephemeral system flowing only after heavy rainfall events. However, due to increased runoff from urban areas it has now become perennial. This is considered a severe alteration to the flow and flood regime. It flows through the urban centre of Botshabelo which contribute highly polluted

runoff. This leads to high levels of pollution within the river. High nutrient levels also promote dominance by exotic weeds and invaders. The river itself is still largely intact in terms of morphology but several of its tributaries has been affected by channel straightening and canalisation. High levels of rubbish dumping take place within the catchment and in the river and this further degrades the condition. Existing road crossings also cause significant impacts. These act as flow barriers retarding flow and in so doing altering the flow and flooding regime. Concentrated livestock farming is noted along the banks of the watercourses and this will also contribute impacts in the form of decreasing the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. This study has determined that the Klein-Modder River and its associated tributaries has a PES of Category E: Seriously Modified (Appendix C). Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and management of the MOSS should rather attempt to improve the condition however unlikely that may be.

### **6.3 Thaba Nchu Urban Area (Appendix A: Map 3)**

Thaba Nchu are located 67 km east from Bloemfontein and has a more scattered development pattern with 37 villages surrounding the urban centre, some as far as 35 kilometres from the closest urban centre. 4 of these villages have recently been formalised. The area is characterised by vast stretches of communal grazing areas that surround the urban centre. The area has also two industrial areas. The urban extent of this town is approximately 3490 hectares. Being situated more toward the eastern half of the province, large hills ridges and even mountains become prominent. A prominent feature is the Sepane River flowing through the urban area. It flows directly through the CBD which leads to high levels of degradation and encroachment into the floodplain of the river. The area is dominated by low-income housing. Owing to high-density urban development the urban area is also generally heavily modified. Being situated almost adjacent to Botshabelo, Thaba Nchu will have much the same description and will share much of the same information and data.

The Thaba Nchu urban area it is still a large area though smaller than Botshabelo, even smaller than Bloemfontein, and it has a somewhat lower habitat diversity than Botshabelo. The Thaba Nchu Mountain significantly increases diversity but does not form part of the urban area itself and access to it could also not be provided. The Thaba Nchu MOSS consists almost exclusively of the surrounding hills and mountains and these still consist to a large degree of natural vegetation though impacts around the urban area does cause significant degradation, decreasing in magnitude further away from the urban area.

The on-site and desktop surveys indicated that the MOSS comprises almost exclusively of hills, ridges and mountainous areas consisting of Basotho Montane Shrubland and Winburg Grassy Shrubland. Small portions on top of the Thaba Nchu Mountain consist of Eastern Free State Clay Grassland. These will however all be included under the discussion of the Basotho Montane Shrubland since the species composition does not differ markedly from it and access could not be provided to areas of these vegetation types located on private property. The MOSS around Thaba Nchu does not contain any of the plains areas and are confined to hills, ridges and mountainous areas and the Central Free State Grassland is therefore absent from the MOSS.

The survey has indicated that almost the entire MOSS still consists of natural vegetation but that overgrazing and urban impacts cause substantial degradation. The level of disturbance was noted to be highest around the urban areas and decreasing substantially in the portions of the

MOSS located further away from urban areas. In-field surveys were confined to areas of municipal or communal properties while previous field surveys and desktop information were utilised for private properties, as well as other inaccessible areas such as communal farming operations.

From the description of the remaining natural vegetation in the Thaba Nchu urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- Both vegetation types contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- The Thaba Nchu MOSS is largely intact with almost all portions of the MOSS remaining untransformed from the natural condition. Irrespective of the condition of degraded areas they all form part of the MOSS and function in terms of ecological corridors and as a result they will retain a significant level of sensitivity.
- The majority of the Thaba Nchu MOSS is situated within municipal and communal areas and access could easily be obtained. However, access could not be provided for areas located within communal farming operations and assessment is therefore based on surrounding areas. Delineation of sensitive areas may therefore contain inaccurate delineation and therefore additional studies should be conducted for any site specific areas within the MOSS.
- The Thaba Nchu MOSS consists exclusively of hill, ridges and mountainous areas and therefore does not contain plains areas. Vegetation is therefore dominated by Basotho Montane Shrubland and Winburg Grassy Shrubland.
- These areas are largely intact and though overgrazing does cause disturbance it retains a high species diversity and many protected and rare or uncommon species. The combination of the above provides this vegetation type with at least a High level of sensitivity where it occurs in the MOSS and which should be regarded as Very High where this also coincides with CBA areas and NPAES Focus Areas.
- Both vegetation types contain numerous protected species which should also be taken into account in the sensitivity of remaining natural vegetation.
- Large areas listed as CBA areas occur to the east and south of Thaba Nchu. Though these do not occur within the MOSS they should still be regarded as having a high conservation value and taken into account in spatial planning.
- Though no NPAES Focus Areas occur within the Thaba Nchu MOSS (Appendix A: Map 6) such areas do occur to the east of Botshabelo and are associated with the Thaba Nchu Mountain (Appendix A: Map 4) and are then considered to have a very high level of sensitivity.
- Survey of the MOSS indicate that overgrazing by domestic livestock is high in most areas and leads to substantial disturbance of the natural areas. Consultation with the local community should aim to improve grazing practises and alleviate the pressure on natural areas.

**Sepane River (Appendix A: Map 5 - 6):** A large portion of the Sepane River flows through the urban area of Thaba Nchu but is not included within the MOSS. Only a small section of the river passes through the MOSS to the west of the urban area. However, since it is one of the larger watercourses in the area it is nonetheless included in this discussion. Several impacts on the Sepane River has caused significant modification and degradation of these watercourses. The Sepane River is naturally a seasonal system flowing only after heavy rainfall events. However,

due to the significant increase in runoff from the Thaba Nchu urban area it has now become almost perennial. This is considered a severe alteration to the flow and flood regime. The urban area also contributes high values of pollutants to the system. High levels of rubbish dumping takes place within the river as well as the surrounding catchment and further degrades it. High nutrient levels also promote dominance by exotic weeds and invaders. Concentrated livestock farming was noted along the banks of the watercourses and this will also contribute impacts in the form of decreasing the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. This study has calculated the Sepane River as having a PES of Category D: Largely Modified. A large loss of natural habitat, biota and basic ecosystem function has occurred. Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive.

#### **6.4 Soutpan Urban Area (Appendix A: Map 7)**

Soutpan is a very small town that was established due to the existence of salt in the immediate surroundings of the town. The town is still producing a large amount of salt and the current inhabitants of Soutpan are employed by the salt production industry. The urban extent of the town is approximately 80 hectares and should also clearly indicate the small extent of the town. No prominent watercourses are present although the large pan system, also a depression wetland area, is a prominent feature of the town. The town forms part of a mostly natural area although the urban areas and salt mining operations do cause some degradation of the area.

The area has a small extent but nonetheless contains several topographical elements which will translate to different habitats and vegetation types. The area is dominated by natural areas and it is evident that although several significant impacts are present these are not extensive and consequently the remaining natural vegetation is still in a relatively good condition.

From the description of the remaining natural vegetation in the Soutpan/Ikgomotseng urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- All three vegetation types contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- Overall the dominating plains consisting of the Western Free State Clay Grassland vegetation type does not contain elements of high sensitivity, a high species diversity or species of high conservation value and does not contain any unique habitats. As a result, overall, it is considered to have a moderate level of sensitivity.
- The sandy grassland vegetation unit constituting the remaining Vaal-Vet Sandy Grassland, an Endangered (EN) vegetation type, does not contain a significant species diversity or species of high conservation value. However, the habitat and species composition is unique and it is also under severe transformation pressures for crop cultivation. This is also clear when looking to the south of the urban area. As a result, although this remaining portion of grassland does not contain a high species diversity or species of conservation importance, and is also situated within an ecotone or transition, it must still be regarded as having at least a high level of sensitivity.
- The dolerite hill and ridges to the north of Soutpan consisting of Vaalbos Rocky Shrubland has a significant habitat diversity, species diversity, presence of numerous

protected species and relatively good condition and as a result the vegetation unit is regarded to have a high level of sensitivity.

- The area contains numerous protected species. Although all the vegetation units and vegetation types contain some protected species the rocky hill and ridge system to the north and east of the urban area contain a proportionally much higher number of protected species. This further warrants this area being regarded as having a high sensitivity.
- The portion indicated as a CBA 1 to the south of the urban area consists of Vaal-Vet Sandy Grassland (EN) and also substantiates this portion being regarded as having a high level of sensitivity. However, on-site observations indicates a much more accurate delineation of this area (Appendix A: Map 8).

**Soutpan – Depression wetland/pan system (Appendix A: Map 7-8):** The large pan system or depression wetland forms the main feature of the urban area of Soutpan/Ikgomotseng. The pan itself is being degraded by several impacts of the historical and current salt mining operations is most significant. This includes the abstraction of groundwater, excavation of evaporation ponds and removal of salt. This will most likely impact on the hydrology of the pan, impacting to some degree its functioning and has clearly also caused significant modification of the species composition. The pan is being fed by several watercourses, none of which are large but most which consist of extensive wetland conditions. Any impacts on these streams will also affect the pan and as such it should be regarded as one system and managed as such. Numerous impacts affect the large depression wetland or pan in Soutpan and this causes significant modification of it. However, thus far its functioning still seems to be intact and it still provides extensive wetland habitat. Its conservation value should therefore be regarded as having a very high sensitivity.

### **6.5 Dewetsdorp Urban Area (Appendix A: Map 9 - 10)**

Dewetsdorp is a small town located 75 km south-east of Bloemfontein on the R702. The urban extent of the town is approximately 600 hectares and should also clearly indicate the small extent of the town. A few prominent watercourses have their origin near the town and the Modder River also flows past the town to the east of the urban area. The town forms part of a mostly natural area although the urban areas and surrounding agricultural operations do cause some degradation of the area.

The area has a small extent, however, a diverse topography and habitats, dominated by undulating grassland, significantly increases the species and habitat diversity. The area is dominated by natural areas, however, significant impacts, including widespread overgrazing does notably degrade the condition of natural areas.

From the description of the remaining natural vegetation in the Dewetsdorp urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- All three vegetation types or units identified during the survey contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- The undulating plains consisting of Central Free State Grassland is still largely natural though modified somewhat by overgrazing. The grass layer is dominated by a few species leading to a moderate species diversity. Coupled with this, habitat diversity is also relatively uniform. As a result, elements of high conservation value is largely absent.

However, several geophytic species are present with a few being listed as protected species and this does contribute to the conservation value of this vegetation unit. Overall, this vegetation type or unit is considered to have a moderate level of sensitivity.

- The portions consisting of Aliwal North Dry Grassland and shallow soils with sandstone outcrops is still largely natural. However, the north eastern portion has been heavily affected by overgrazing and this has decreased its conservation value to moderate.
- Other smaller portions of total transformation, including the old borrow pits and quarries and the current landfill site must be regarded as having a low level of sensitivity.
- The portion of Aliwal North Dry Grassland to the west of the town is least degraded, contains a moderate habitat diversity, significant species diversity and the presence of several protected species are considered to lend a high level of sensitivity to the area. This area also forms the origin of a prominent stream and wetland system which also further substantiates a high level of sensitivity.
- The prominent ridge system to the west of the town consisting of Besemkaree Koppies Shrubland is considered largely natural, it contains a quite high species and habitat diversity with many being listed as protected or being uncommon. This ridges system also gives rise to several drainage lines and stream systems. As a result of the combination of the above the ridge system and watercourses associated with it is regarded as having a very high level of sensitivity.
- The prominent sandstone hill to the east of the town would normally also have been regarded as having a very high conservation value. However, it is being degraded, mostly due to overgrazing by domestic livestock, and consequently it is only regarded as having a high sensitivity level.
- The areas to the south and east of the town being listed as a Critical Biodiversity Area 1 (CBA 1) should be regarded as having a high level of sensitivity. Though the reasons for this area being considered a CBA is not clearly apparent the on-site survey indicates that this may be coupled to the origins of stream systems in the area (Appendix A: Map 10).
- The survey indicated that overgrazing by domestic livestock in the communal grazing areas area quite high in many areas, leading to degradation of the grassland. Management of municipal area should therefore also take this into consideration.

**Dewetsdorp Modder River (Appendix A: Map 9-10):** The Modder River is heavily degraded but mostly modified in terms of its functioning by the upstream Novo Transfer Scheme. The town of Dewetsdorp is situated quite close to the origin of the river (Approximately 5 km to the south), yet the flow at the survey site was noted to be perennial with a fast flow rate. Under natural conditions the river at the site would at best have been seasonal and only have active flow after large rainfall events. This therefore indicates a large modification in terms of the flow and flooding regime. Concentrated livestock farming was noted along the banks of the river and this will also contribute impacts in the form of decreasing the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. In addition, manure will increase the nutrient load within the river. A large stream system also originates in Dewetsdorp and forms a direct tributary of the Modder River downstream of the urban area. Any impacts on it will therefore also affect the river. Pollution within the stream was notable, especially where it flows through the urban area. A few small impoundments will have a limited impact in terms of its flow regime. The WWTW of Dewetsdorp also discharges into this stream and this is likely to also have a significant impact in terms of the nutrient load and increased flow volumes. The entire system should still be considered as sensitive and management of the MOSS should rather attempt to improve the condition however unlikely that may be.

## 6.6 Wepener Urban Area (Appendix A: Map 11 - 12)

Wepener is located 120km south east of Bloemfontein and was founded in 1867 on the banks of Jammersbergspruit, a tributary of the Caledon River. The Caledon River is situated along the western border of the town and is a large and significant watercourse. The urban extent of the town is approximately 840 hectares and should also clearly indicate the small extent of the town. The town forms part of a mostly natural area although the urban areas and surrounding agricultural operations do cause some degradation of the area.

Although the town has a small extent it contains a diversity of topographical elements and habitats which will also considerably increase species diversity. The area is dominated by natural areas, however, significant impacts, including widespread overgrazing does notably degrade the condition of natural areas.

From the description of the remaining natural vegetation in the Wepener urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- All three vegetation types contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- Smaller portions around the town which were clearly transformed by amongst others a disused quarry and landfill to the east and west of the town, the old disused golfcourse, scattered, small woodlots and windrows of exotic trees, the current and old WWTW's and cemeteries are considered to be of low sensitivity.
- The undulating plains consisting of Aliwal North Dry Grassland is still largely natural though modified somewhat by overgrazing. The grass layer is dominated by a few species leading to a moderate species diversity. Coupled with this, habitat diversity is also relatively uniform. As a result, elements of high conservation value is largely absent. However, a few protected species are present and this does contribute to the conservation value of this vegetation unit. Overall, this vegetation type or unit is considered to have a moderate level of sensitivity.
- The ridges, hills and slopes consisting of Basotho Montane Shrubland is largely natural though it was noted that overgrazing by livestock, especially in the areas closest to urban development is quite high and does lead to significant erosion. This significantly decreases the condition of this vegetation type. However, it was also quite evident that it contains a high diversity of species and growth forms with many being listed as protected or being uncommon. Numerous drainage lines, ravines, streams and associated wetlands also occur along the slopes. As a result of a combination of the above the vegetation type should as a whole be regarded as having a high level of sensitivity. Furthermore, it is quite evident that the vegetation type is vulnerable to overgrazing and trampling and this also further substantiates that it be regarded as having a high level of sensitivity.
- The plateau of the mountainous areas to the east and north of the town consisting of Eastern Free State Clay Grassland is considered largely natural although overgrazing by domestic livestock causes significant degradation and especially erosion. It is evident that the vegetation unit contains a high diversity of species and growth forms with many being listed as protected or being uncommon. A high amount of seepage wetlands also form on the plateau. As a result of the combination of the above, including high species



diversity and protected species but also as a result of the vegetation type being listed as Vulnerable (VU), it is regarded as having a high level of sensitivity.

- Although the municipal area of Wepener does not contain any Critical Biodiversity Areas (CBA) it does border on such areas to the east, associated with Eastern Free State Clay Grassland, and although it is therefore unlikely to impact on these areas it should still be taken into consideration by the urban planning of the town (Appendix A: Map 12).
- The survey indicated that overgrazing by domestic livestock in the communal grazing areas area quite high in many areas, leading to degradation of the grassland and where slopes and wetlands are affected, this also leads to high levels of erosion. Management of municipal areas should therefore also take this into consideration.

**Wepener Caledon River (Appendix A: Map 11-12):** The hydrology of the river is impacted on by several factors. Extensive human settlement occurs in the catchment of the river and in close proximity to the river. These settlements include Wepener, Mabotse, Chere and Sekameng. These settlements all contribute to increased runoff, pollutants and sediment. Industrial pollutants are an emerging but serious problem and most discharges from industry flows into the Caledon River. It is known that the water in the Caledon (Mohokare) River is naturally of high turbidity and carries a concerning high sediment load. However, poor management practises result in high sediment yields. The slope as well as the erodability of the soils in the upper Caledon catchment leads to increased sediment deposition. Severe soil erosion, especially in the Caledon system, is a contributing factor. This amount of sediment that is mobilised due to poor range management is also exacerbated by many factors such as land use, topography, climate, erodability of soil, rainfall and runoff (ORASECOM 2007 & 2008). Therefore it must be clear that although the river has a naturally high sediment load the poor management of the catchment rangeland has significantly exacerbated the sediment impact on the Caledon River. Despite the heavily modified system it should still be regarded as sensitive with a high conservation value.

**Wepener Sandspruit (Appendix A: Map 11-12):** The catchment has been utilised for extensive dryland crop cultivation. A large number of these crop fields are barren and no longer cultivated. This will contribute significant amounts of sediment to the system. The area and at the origin of the river is subjected to high levels of domestic stock grazing. The overgrazing and destruction of vegetation also decreases the vegetation cover and together with trampling also increase sediment load within the river. Wepener and the Sandspruit is located near the Lesotho border and consequently a large portion of the catchment of the river is situated in rural village and urban areas especially the upper reaches of the river. The urban area of Mefeteng is situated in the upper catchment of the river and will undoubtedly also contribute significant impacts on the river in the form of increased storm water runoff, increased sediment and refuse and pollutants associated with urban areas. The town of Wepener itself is also visibly contributing significantly toward these urban impacts as well and algal blooms in the river are indicative of high volumes of nutrients entering the river. The Sandspruit is a tributary of the Caledon River and confluences with it immediately west of the town of Wepener. It is also considered a significant contributor of sediment to this system. Despite the heavily modified system it should still be regarded as sensitive with a high conservation value.

## **6.7 Vanstadensrus Urban Area (Appendix A: Map 13-14)**

The town of Van Stadensrus is located 160km south east of Bloemfontein and is one of the frontier towns on the border of South Africa and Lesotho. It is in close proximity to the Egmont and Van Stadensrus Dams, and is on the Anglo-Boer War Route. The urban extent of the town

is approximately 190 hectares and should also clearly indicate the small extent of the town. A few small but still prominent stream systems occur, including the Witspruit, and flows past the existing urban area of the town. The town forms part of a mostly natural area although the urban areas and surrounding agricultural operations do cause some degradation of the area.

The area has a small extent with a relatively uniform landscape but with some variation in the topography including rocky outcrops, low hills and ridges and numerous small watercourses. This also contributes to some diversity in terms of habitat and vegetation types. The area is dominated by natural areas, however, significant impacts, including widespread overgrazing does notably degrade the condition of natural areas.

From the description of the remaining natural vegetation in the Vanstadensrus urban area and by using available data sets the following elements of ecological importance should be taken into account in the MOSS:

- Both vegetation types contain elements of conservation value and consequently, where natural portions of these vegetation types remain they should be regarded as having a significant conservation value.
- Portions of the vegetation around the town has clearly been transformed by amongst others old cropfields, a disused quarry to the east of town and a landfill, graveyard and WWTW to the west of the town.
- The undulating plains consisting of Aliwal North Dry Grassland is considered significantly modified from the natural condition, is dominated by pioneer species and overall the species diversity is considered as quite low. Coupled with this, habitat diversity is also relatively uniform and considered low. The vegetation type or unit around the town is therefore considered as having a relatively low level of sensitivity.
- However, the low ridge in the south west does still contain a protected species, *Euphorbia clavaroides*, and contains a somewhat higher species diversity. It is therefore considered as having a moderate level of sensitivity.
- The ridge system consisting of Basotho Montane Shrubland is considered largely natural although overgrazing by domestic livestock causes significant degradation and especially erosion. The vegetation unit contains a significant diversity of species and growth forms with a few being listed as protected or being uncommon. As a result of the combination of the above, it is regarded as having a high level of sensitivity.
- An extensive Critical Biodiversity Area 1 (CBA 1) occurs to the east and south of the town, but is not located near the town or the surrounding municipal area and it is unlikely to be affected by it (Appendix A: Map 14).
- The survey indicated that overgrazing by domestic livestock in the communal grazing areas area quite high in many areas, leading to degradation of the grassland and where slopes and wetlands are affected, this also leads to high levels of erosion. Management of municipal areas should therefore also take this into consideration.

**Vanstadensrus Witspruit (Appendix A: Map 13-14):** A small but prominent stream system flows through the town of Vanstadensrus. It is a direct tributary of the Witspruit flowing into it adjacent and to the west of the town. An overall description of the impacts on the Witspruit with a focus on the affected tributary should therefore provide an adequate description of the condition of this system located within the MOSS of Vanstadensrus. The hydrology of the stream is affected by several significant impacts. The Vanstadensrus and Egmont Dams are quite large and situated a short distance upstream. These will have a significant impact on the flow and flooding regime. Where this stream would have been strictly seasonal this now results in a low

and slow baseflow which results in a modification from seasonal to perennial. The area and at the origin of the Witspruit is subjected to high levels of domestic stock grazing. The overgrazing and destruction of vegetation also decreases the vegetation cover and together with trampling also increase sediment load within the river. Despite this, the system should still be regarded as sensitive with a high conservation value.

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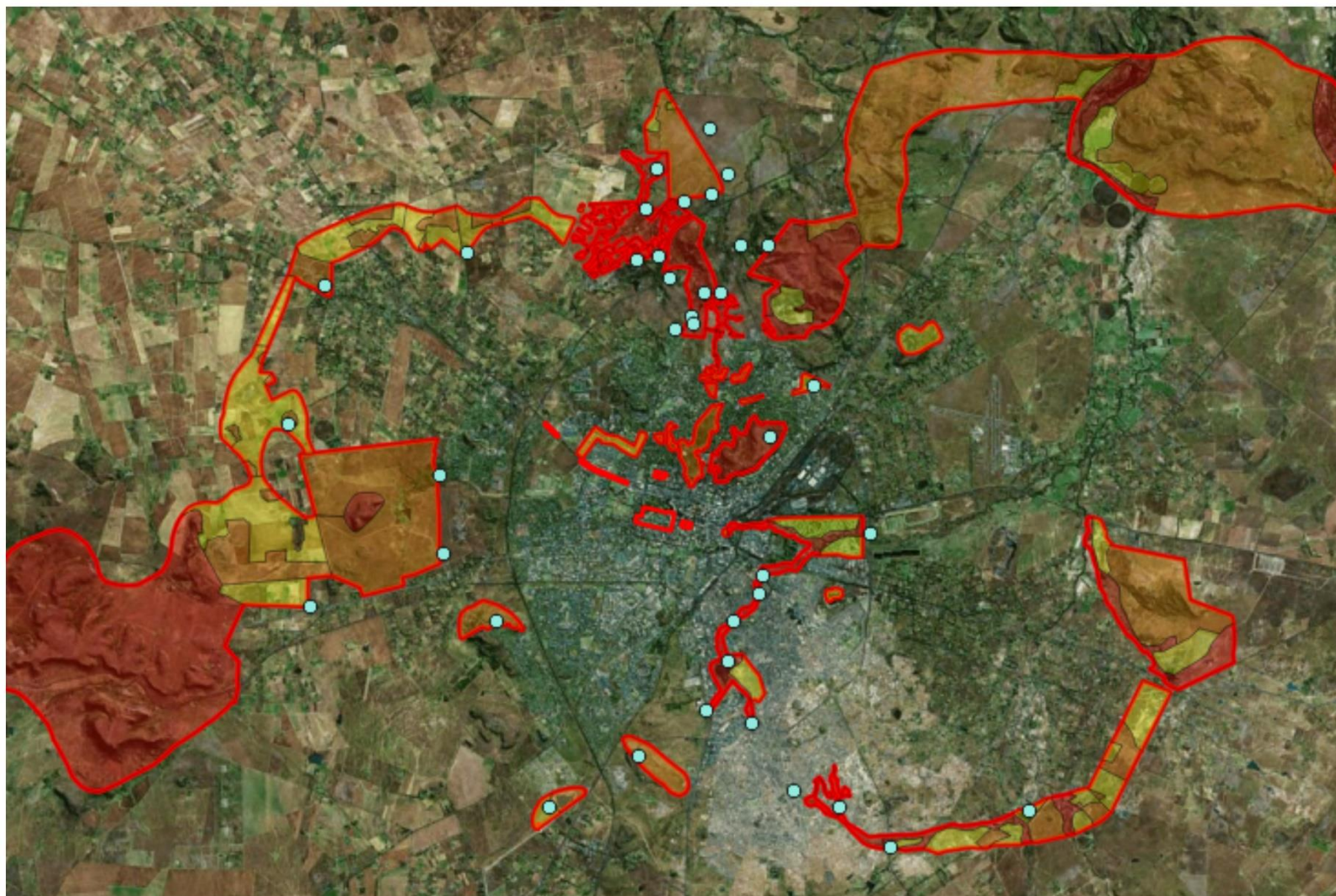
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## **Annexure A: Maps**



## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Bloemfontein, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites
- MOSS

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:220 000

DPR Ecologists

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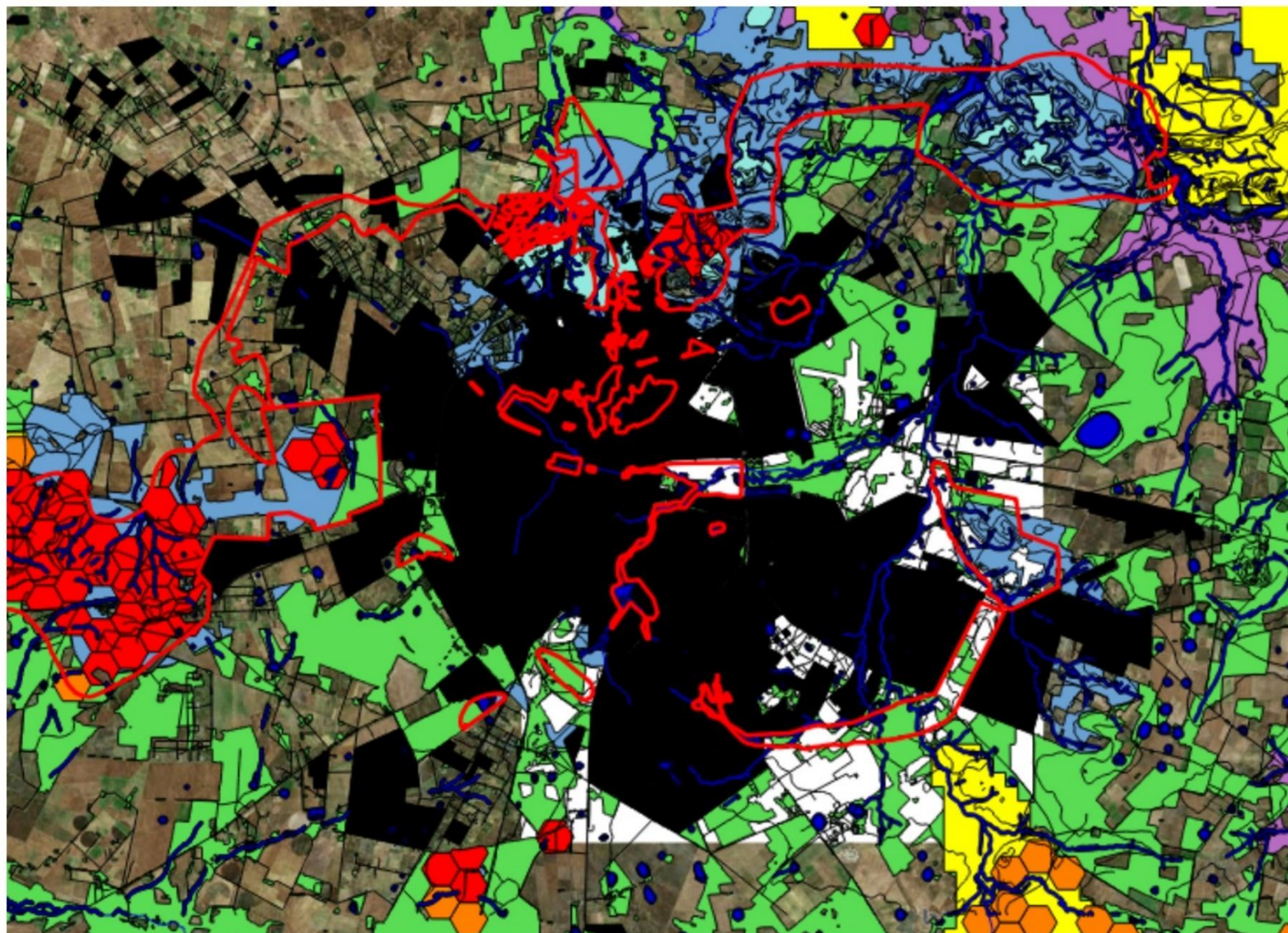


Map 1: Sensitivity map and sample survey points for the MOSS within and around the Bloemfontein urban area. Note that limited surveys were conducted and mostly confined to areas of municipal properties. Delineation was based on current and previous surveys and desktop data and where more accurate and site specific detail is required, additional in-field surveys should be conducted. Areas identified with a very high sensitivity are mostly confined to watercourses and wetlands as well as hills and ridges which also fall within Critical Biodiversity Areas. Areas of high sensitivity include all intact hills and ridges as well as portions of largely natural grassland and areas of moderate sensitivity include all those portions of the MOSS considered to be largely transformed and includes urban development, agricultural croplands or similar transformation activities such as rock quarries, WWTW and golf courses. Since the function of the MOSS is to preserve natural areas and provide corridors between them these transformed are nonetheless considered to be of moderate sensitivity and as a result, areas of low sensitivity are not included within the MOSS.





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Bloemfontein, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- MOSS
- Winburg Grassy Shrubland
- BFN Karroid Shrubland
- Highveld Alluvial Vegetation
- Bloemfontein Dry Grassland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:220 000

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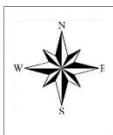
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Map 2: General ecology map of the Bloemfontein urban area. Note the extensive urban development and the large-scale transformation of natural areas. Areas of apparent conservation value include intact and CBA 1 areas to the west with smaller CBA areas also to the north, south and east. Note also a few, but large watercourses within the urban area and also a multitude of smaller streams in the northern uneven, hill terrain.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Botshabelo, Free State Province.



### Prepared for:

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Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites
- MOSS

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:175 000

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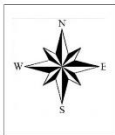
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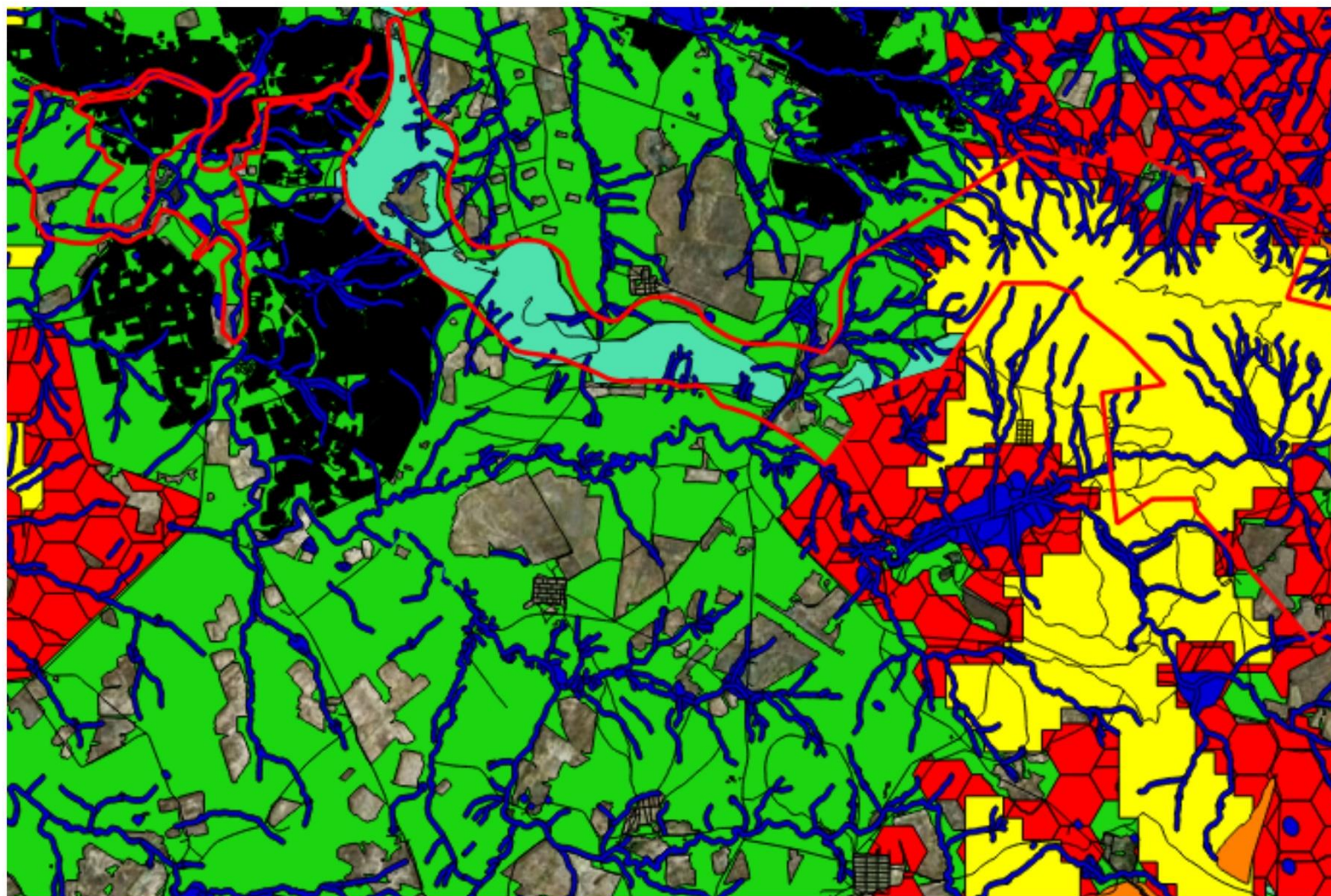


Map 3: Sensitivity map and sample survey points for the MOSS within and around the Botshabelo urban area. Note that surveys were focused on the western portion of the MOSS consisting of communal areas. Delineation was based on current and previous surveys and desktop data and where more accurate and site specific detail is required, additional in-field surveys should be conducted. Areas identified with a very high sensitivity are mostly confined to watercourses and wetlands associated with the Klein-Modder and Sepane Rivers as well as areas which fall within Critical Biodiversity Areas or NPAES Focus Areas. Areas of high sensitivity include all the hills, ridges and mountainous areas in the MOSS and areas of moderate sensitivity include all the degraded areas including urban transformation, rock quarries, WWTW, reservoirs and old cropfields. Since the function of the MOSS is to preserve natural areas and provide corridors between them these transformed areas are nonetheless considered to be of moderate sensitivity and as a result, areas of low sensitivity are not included within the MOSS.





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Botshabelo, Free State Province.



### Prepared for:

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Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- MOSS
- Central Free State Grassland
- Basotho Montane Shrubland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:175 000

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Map 4: General ecology map of the Botshabelo urban area. Note the extensive urban development although large portions of natural vegetation still remain. Areas of significance include the mountainous terrain associated with Basotho Montane Shrubland, the Rustfontein Nature Reserve and associated CBA 1 areas and NPAES Focus Areas to the east and the high number of watercourses and wetlands, including the Klein-Modder River.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Thaba Nchu, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites
- MOSS

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:175 000

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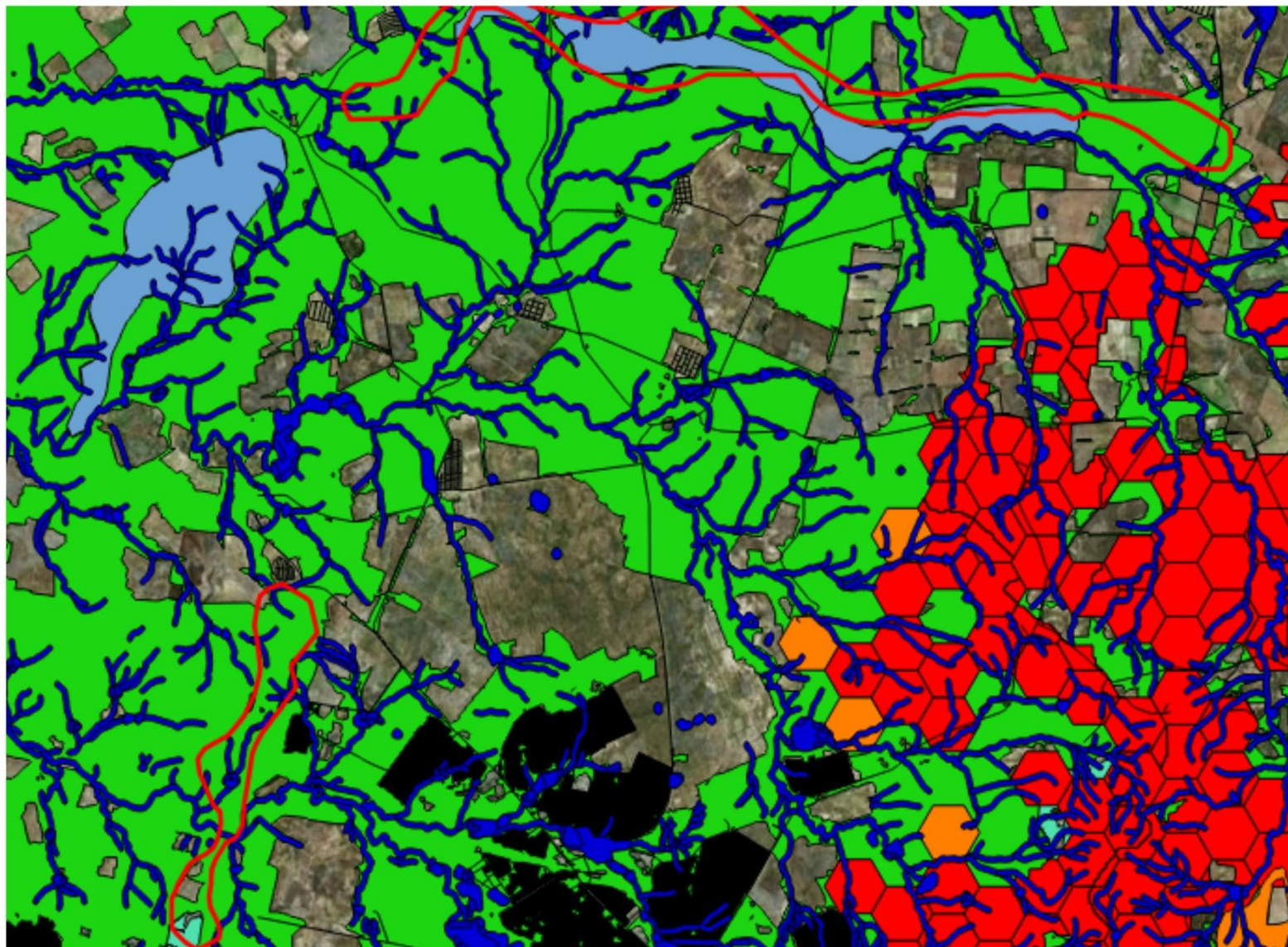


Map 5: Sensitivity map and sample survey points for the MOSS within and around the Thaba Nchu urban area. Note that surveys were conducted in areas where access was possible. Delineation was based on current and previous surveys and desktop data and where more accurate and site specific detail is required, additional in-field surveys should be conducted. Areas identified with a very high sensitivity are mostly confined to the Sepane River. Areas of high sensitivity include all the hills, ridges and mountainous areas in the MOSS. Note that almost the entire MOSS around Thaba Nchu consists of natural areas without any significant transformation and confined to hills, ridges and mountainous areas.





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Thaba Nchu, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- MOSS
- Central Free State Grassland
- Basotho Montane Shrubland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:175 000

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Map 6: General ecology map of the Thaba Nchu urban area. Note the extensive urban development although large portions of natural vegetation still remain. Areas of significance include the mountainous terrain and also the extensive portions of CBA 1 to the east of the urban area. Note also the relatively high amount of wetlands and watercourses, including the Sepane River flowing through the urban area.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Soutpan/Ikgomotseng, Free State Province.



### **Prepared for:**

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### **Legend:**

■ Very High Sensitivity  
■ High Sensitivity  
■ Moderate Sensitivity  
■ Low Sensitivity

● Sample survey sites

### **Map Information**

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:45 000

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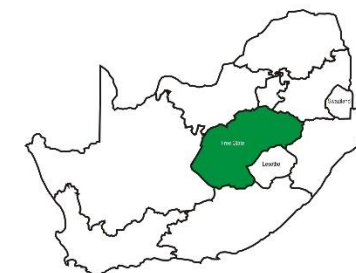
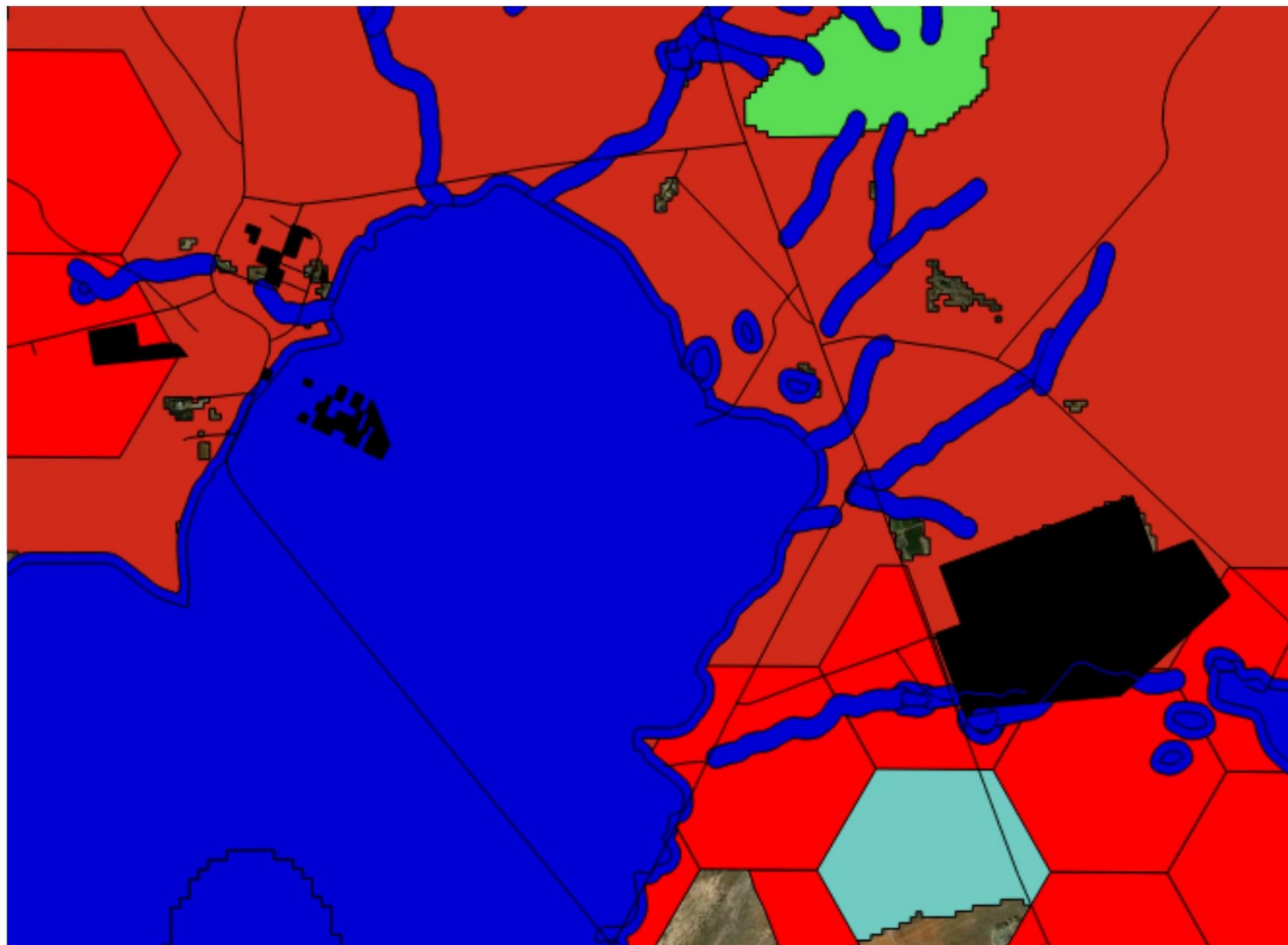


Map 7: Sensitivity map and survey sample points for the Soutpan/Ikgomotseng urban area and immediate surroundings. Note that though the delineated borders are considered relatively accurate they should be refined in-field where highly accurate delineation is required. Areas identified with a very high sensitivity include the pan system and larger watercourses containing wetland conditions. Areas with a high sensitivity include the portions of remaining Vaal-Vet Sandy Grassland, the rocky hills and ridges to the north east and smaller drainage lines devoid of wetland conditions. Areas of moderate sensitivity consist of the dominating Western Free State Clay Grassland. Areas of low sensitivity are confined the urban developments and surrounding areas degraded by development.





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Soutpan/Ikgomotseng, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- Vaalbos Rocky Shrubland
- Sand-Vet Sandy Grassland
- Western FS Clay Grassland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:45 000

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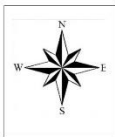
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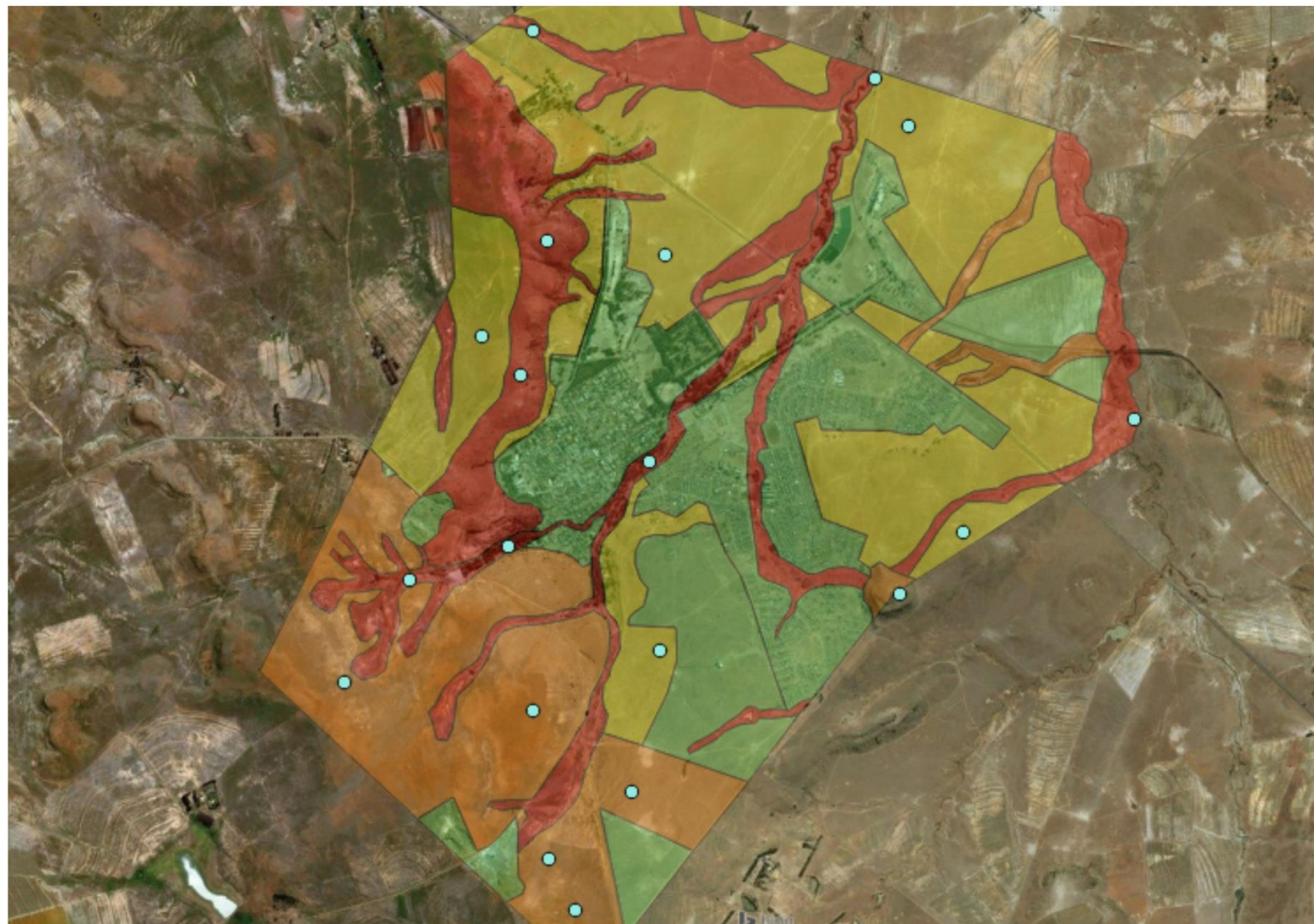


Map 8: General ecology map of the Soutpan/Ikgomotseng urban area. Note the small extent of urban areas though some transformation of natural vegetation is still evident. Areas which may have a significant conservation value include the uneven terrain consisting of Vaalbos Rocky Shrubland, CBA areas to the west and south as well as the numerous small watercourses and the large salt pan, forming a depression wetland.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Dewetsdorp, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:55 000

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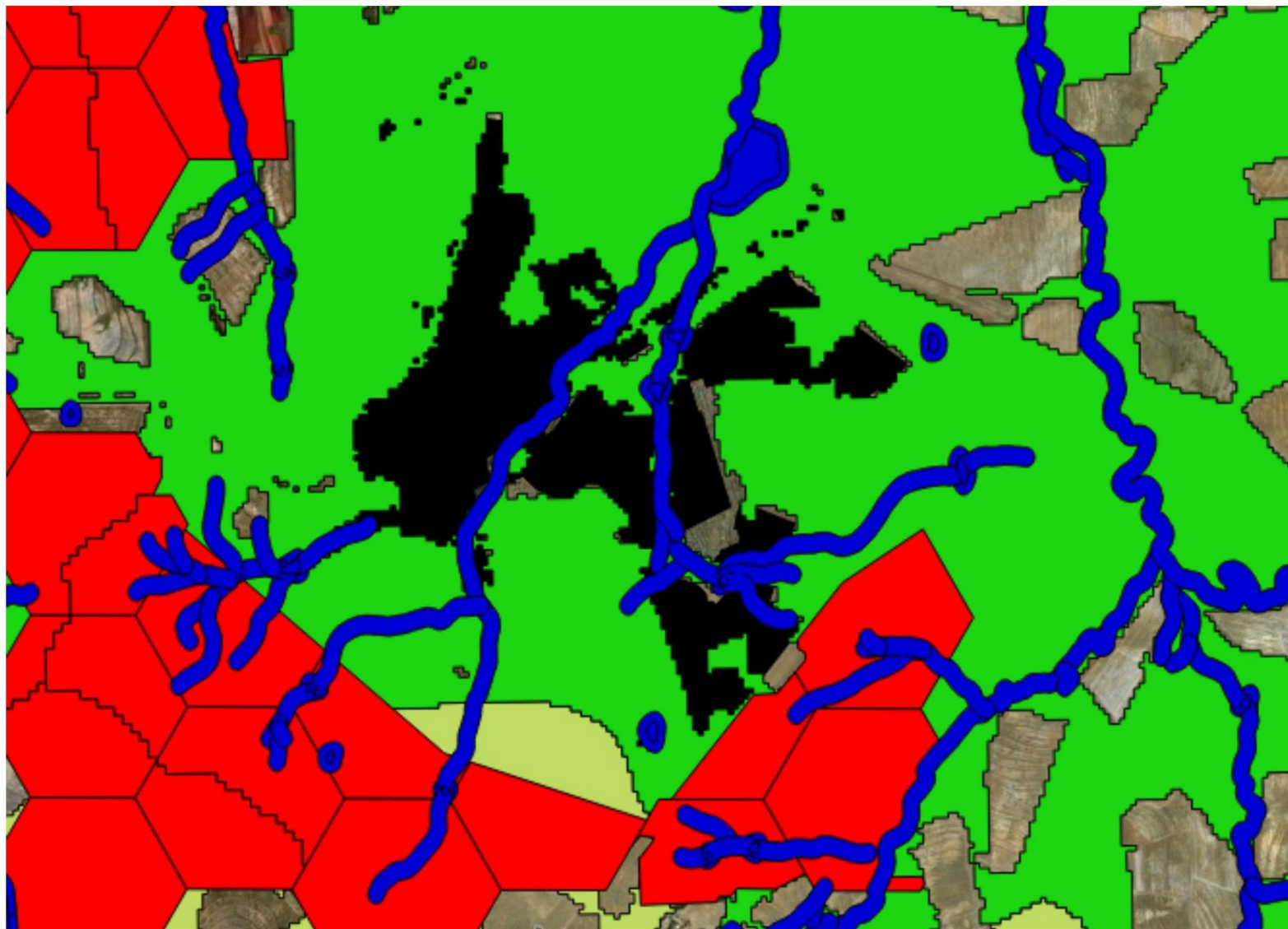


Map 9: Sensitivity map and sample survey points for the Dewetsdorp urban area and immediate surroundings. Note that though the delineated borders are considered relatively accurate they should be refined in-field where highly accurate delineation is required. Areas identified with a very high sensitivity include the ridge system along the west and all watercourses and wetlands, with the exception of those originating within the urban area and are a result of storm water runoff and pipeline leakages. Areas with a high sensitivity include the sandstone outcrops to the south west, the isolated hill along the eastern border and also portions along the south being listed as CBA1 areas. Areas of moderate sensitivity are mostly confined to the undulating grassland plains and those of low sensitivity include all urban areas and areas of transformation which includes the current landfill site, disused borrow pits and quarries, historical croplands, a granary and Waste Water Treatment Works (WWTW).





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Dewetsdorp, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- Central Free State Grassland
- Aliwal North Dry Grassland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:40 000

DPR Ecologists

**Contact Darius van Rensburg at:**

darius@dprecologists.co.za

P.O. Box 12726, Brandhof, 9324

Tel: 083 410 0770

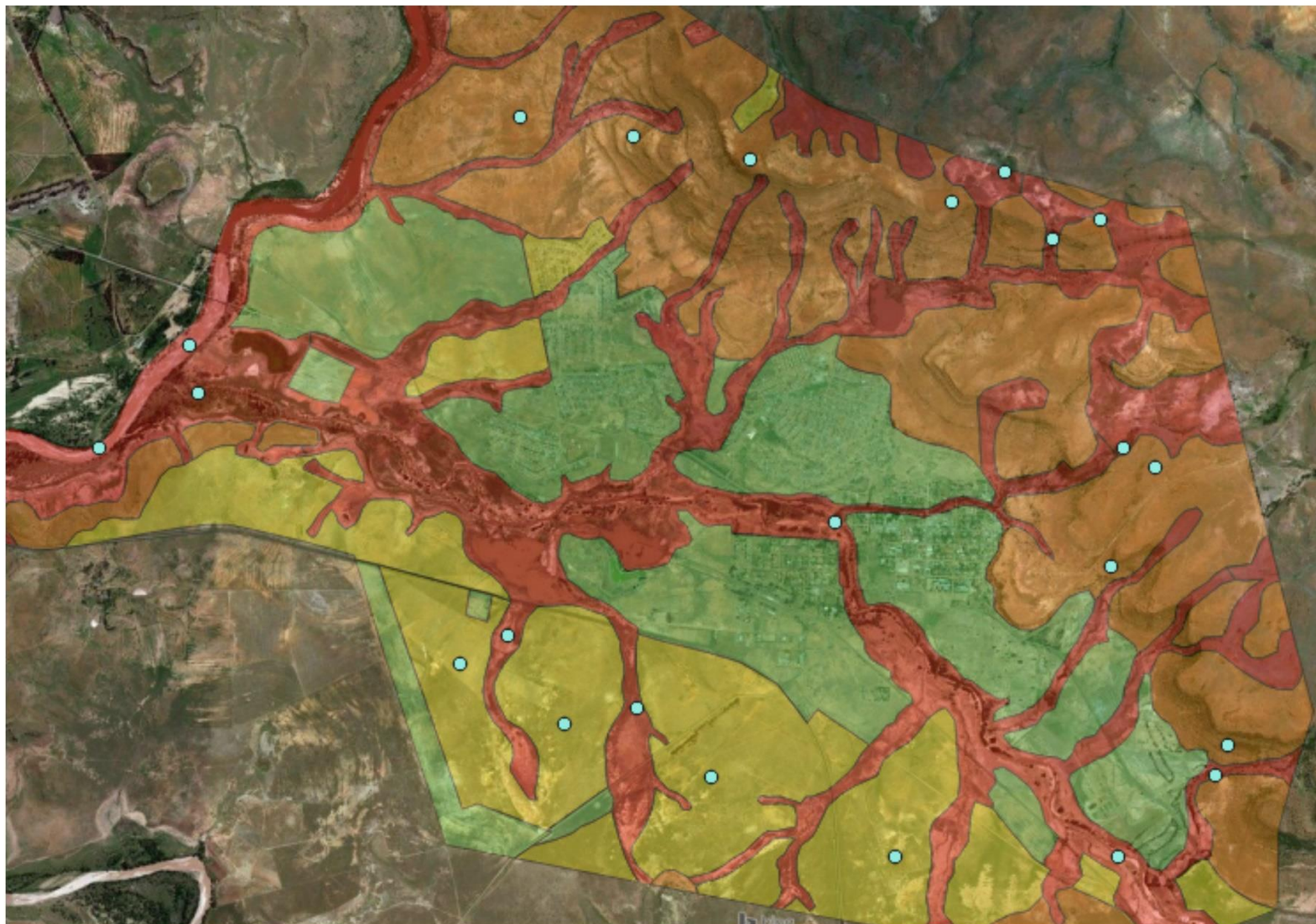


Map 10: General ecology map of the Dewetsdorp urban area. Note the small extent of urban areas though some transformation of natural vegetation is still evident. Areas which may have a significant conservation value include the uneven terrain along the western border of the urban area, extensive CBA areas to the west and south as well as numerous watercourses of which a few flow through the urban area and the Modder River flows past the eastern border of the area.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Wepener, Free State Province.



### **Prepared for:**

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### **Legend:**

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites

### **Map Information**

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:55 000

DPR Ecologists

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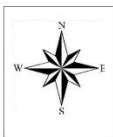
P.O. Box 12726, Brandhof, 9324

Tel: 083 410 0770

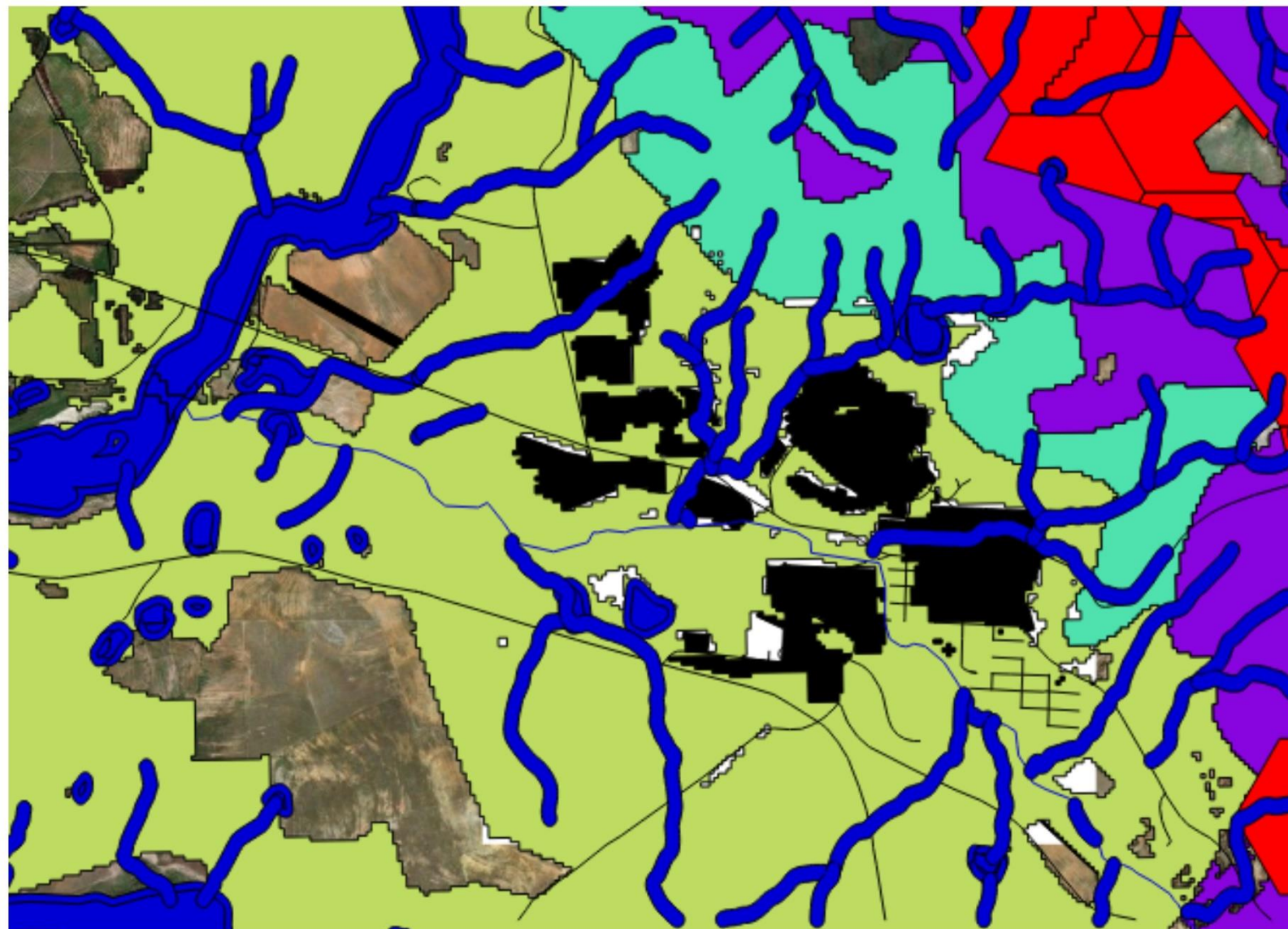


Map 11: Sensitivity map and sample survey points for the Wepener urban area and immediate surroundings. Note that though the delineated borders are considered relatively accurate they should be refined in-field where highly accurate delineation is required. Areas identified with a very high sensitivity consists of all watercourses and wetlands including the Sandspruit and Caledon Rivers. Areas with a high sensitivity include the mountainous terrain including slopes and plateau to the north and east as well as other smaller ridges and hills. Areas of moderate sensitivity are mostly confined to the undulating grassland plains and those of low sensitivity include all urban areas and areas of transformation which includes the current landfill site, disused borrow pits and quarries, historical croplands, a disused golfcourse and Waste Water Treatment Works (WWTW).





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Wepener, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- Basotho Montane Shrubland
- Aliwal North Dry Grassland
- Eastern FS Clay Grassland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:45 000

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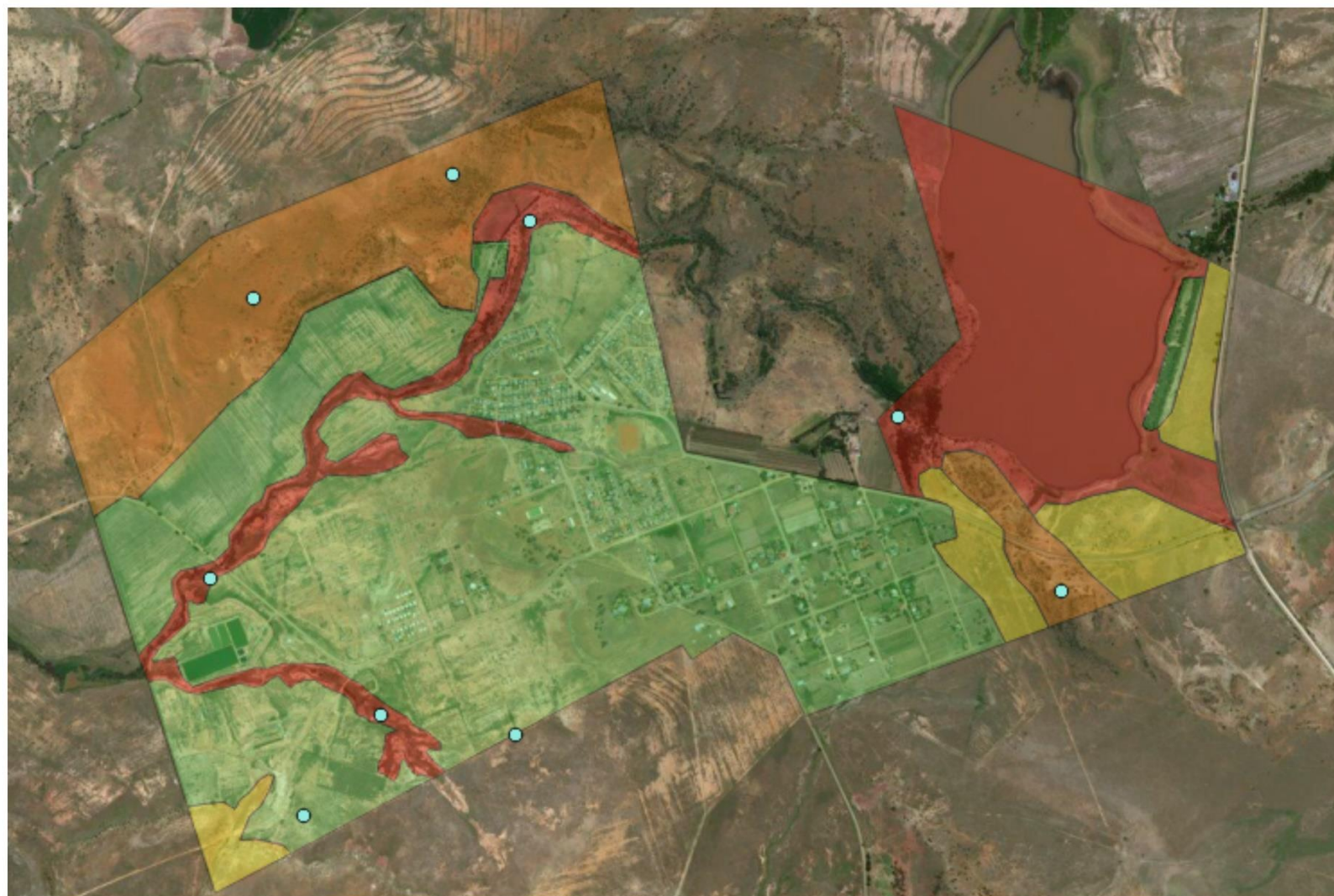


Map 12: General ecology map of the Wepener urban area. Note the small extent of urban areas though some transformation of natural vegetation is still evident. Areas which may have a significant conservation value include the mountainous terrain consisting of Basotho Montane Shrubland and Eastern Free State Clay Grassland to the north and east of the urban area and the numerous watercourses including the large Caledon River to the east.





## Survey and sensitivity map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Vanstadensrus, Free State Province.



### **Prepared for:**

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### **Legend:**

- Very High Sensitivity
- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Sample survey sites

### **Map Information**

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:25 000

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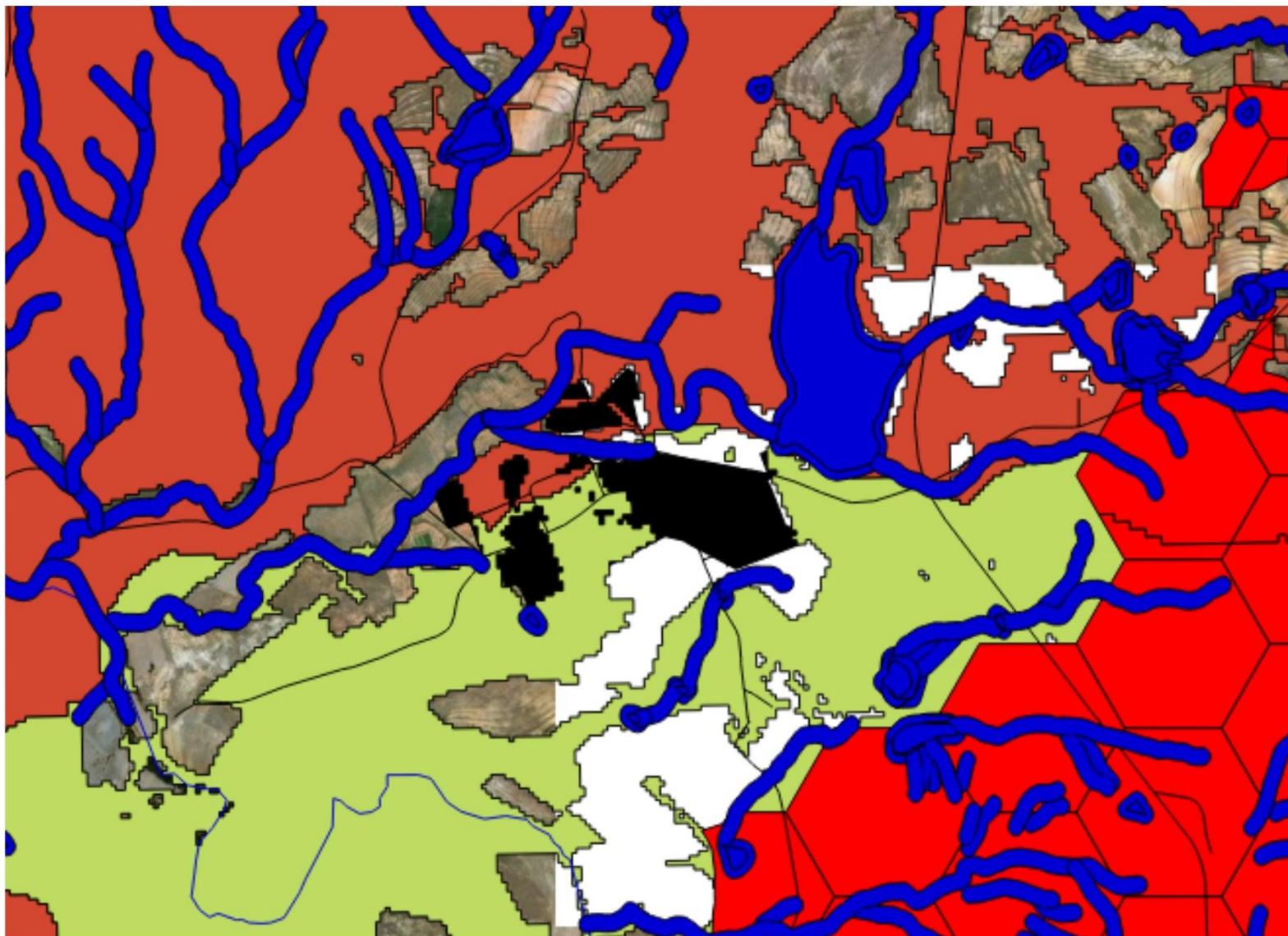


Map 10: Sensitivity map and sample survey points for the Vanstadensrus urban area and immediate surroundings. Note that though the delineated borders are considered relatively accurate they should be refined in-field where highly accurate delineation is required. Areas identified with a very high sensitivity consists of all watercourses and wetlands including the Witspruit tributary. Areas with a high sensitivity consists of the ridge system to the north and east of the town. Areas of moderate sensitivity are mostly confined to rocky outcrops and grassland considered to still be largely natural and areas of low sensitivity consists areas of degraded grassland and all urban areas and areas of transformation which includes the landfill site, historical cropfields, cemetery and Waste Water Treatment Works (WWTW).





## General ecology map for the Mangaung Metropolitan Open Space System (MOSS) for the urban area of Vanstadensrus, Free State Province.



### Prepared for:

Dipabala Engineers JV SDPI  
Suite 7, Westdene Park  
Bloemfontein  
9301

### Legend:

- Urban area
- Road network
- Watercourses
- Wetlands and impoundments
- Basotho Montane Shrubland
- Aliwal North Dry Grassland
- Critical Biodiversity Area 1
- Critical Biodiversity Area 2
- NPAES Focus Areas

### Map Information

**Spheroid:** WGS 84

Quantum GIS

**Scale:** 1:55 000

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Map 14: General ecology map of the Vanstadensrus urban area. Note the small extent of urban areas though some transformation of natural vegetation is still evident. Areas which may have a significant conservation value include the uneven rocky terrain consisting of Besemkaree Koppies Shrubland to the north and extensive CBA areas to the south east. Note also numerous small watercourses and wetlands occurring in the area.



## Appendix B: Species list

Species indicated with an \* are exotic.

Protected species are coloured orange and Red Listed species red.

Bloemfontein	
Species	Growth form
* <i>Acacia baileyana</i>	Tree
* <i>Achyranthes aspera</i>	Herb
* <i>Agave americana</i>	Succulent
* <i>Albizia julibrissin</i>	Tree
* <i>Alianthus altissima</i>	Tree
* <i>Alternanthera pungens</i>	Herb
* <i>Amaranthus hybridus</i>	Herb
* <i>Argemone ochroleuca</i>	Herb
* <i>Arundo donax</i>	Reed
* <i>Azolla filiculoides</i>	Floating aquatic herb
* <i>Bidens bipinnata</i>	Herb
* <i>Bidens pilosa</i>	Herb
* <i>Boerhavia diffusa</i>	Herb
* <i>Bromus catharticus</i>	Grass
* <i>Cereus hildmannianus</i>	Succulent
* <i>Cereus jamacaru</i>	Succulent
* <i>Cestrum laevigatum</i>	Shrub
* <i>Chenopodium album</i>	Herb
* <i>Chenopodium carrinatum</i>	Herb
* <i>Ciclospermum leptophyllum</i>	Herb
* <i>Cirsium vulgare</i>	Herb
* <i>Conyza bonariensis</i>	Herb
* <i>Cotoneaster franchetii</i>	Shrub
* <i>Cuscutta campestris</i>	Parasite
* <i>Cyllindropuntia imbricata</i>	Succulent
* <i>Cyperus eragrostis</i>	Sedge
* <i>Datura ferox</i>	Herb
* <i>Datura stramonium</i>	Herb
* <i>Dichondra repens</i>	Herb
* <i>Echinopsis scickendantzii</i>	Succulent
* <i>Eucalyptus camaldulensis</i>	Tree
* <i>Eucalyptus sideroxylon</i>	Tree
* <i>Fraxinus americana</i>	Tree
* <i>Galinsoga parviflora</i>	Herb
* <i>Gleditsia triacanthos</i>	Tree
* <i>Harissia martinii</i>	Succulent
* <i>Hordeum stenostachys</i>	Grass
* <i>Malva parviflora</i>	Herb
* <i>Medicago lacineata</i>	Herb

* <i>Melia azedarach</i>	Tree
* <i>Nicotiana glauca</i>	Shrub
* <i>Oenothera indecora</i>	Herb
* <i>Oenothera rosea</i>	Herb
* <i>Opuntia engelmannii</i>	Succulent
* <i>Opuntia ficus-indica</i>	Succulent
* <i>Opuntia lindheimeri</i>	Succulent
* <i>Opuntia robusta</i>	Succulent
* <i>Papaver aculeatum</i>	Herb
* <i>Pennisetum clandestinum</i>	Grass
* <i>Persicaria lapathifolia</i>	Herb
* <i>Phyla nodiflora</i>	Herb
* <i>Pinus pinaster</i>	Tree
* <i>Plantago lanceolata</i>	Herb
* <i>Polygonum aviculare</i>	Herb
* <i>Populus x canescens</i>	Tree
* <i>Portulacca oleracea</i>	Succulent
* <i>Prosopis glandulosa</i>	Tree
* <i>Punicea granatum</i>	Tree
* <i>Pyracanthus angustifolia</i>	Shrub
* <i>Pyrus sp.</i>	Tree
* <i>Robinia pseudoacacia</i>	Tree
* <i>Rosa rubiginosa</i>	Shrub
* <i>Salix babylonica</i>	Tree
* <i>Salsola kali</i>	Herb
* <i>Schinus molle</i>	Tree
* <i>Schkuhria pinata</i>	Herb
* <i>Schkuhria pinnata</i>	Herb
* <i>Sesbania punicea</i>	Shrub
* <i>Solanum eleagnifolium</i>	Herb
* <i>Sorghum halepense</i>	Grass
* <i>Sphaeralcea bonariensis</i>	Shrub
* <i>Tagetes minuta</i>	Herb
* <i>Tamarix ramosissima</i>	Tree
* <i>Trifolium repens</i>	Herb
* <i>Urtica urens</i>	Herb
* <i>Verbena bonariensis</i>	Herb
* <i>Verbena officinale</i>	Herb
* <i>Verbena tenuisecta</i>	Herb
* <i>Veronica anagalis-aquatica</i>	Herb
* <i>Xanthium spinosum</i>	Herb
* <i>Xanthium strumarium</i>	Herb
* <i>Zinnia peruviana</i>	Herb
<i>Acrotome inflata</i>	Herb
<i>Adromischus tryginus</i>	Succulent
<i>Agrostis lachnantha</i>	Grass

<i>Albuca cooperi</i>	Geophyte
<i>Albuca setosa</i>	Geophyte
<i>Albuca virens</i>	Bulb
<i>Aloe grandidentata</i>	Succulent
<i>Aloe jeppeae</i>	Succulent
<i>Alternanthera sessilis</i>	Herb
<i>Ammorcharis coranica</i>	Geophyte
<i>Amphiglossa triflora</i>	Dwarf shrub
<i>Anacampseros filamentosa</i>	Succulent
<i>Anacampseros rufescens</i>	Succulent
<i>Androcymbium longipes</i>	Geophyte
<i>Andropogon eucomus</i>	Grass
<i>Anthepphora pubescens</i>	Grass
<i>Aptosimum indivisum</i>	Herb
<i>Arctotis arctotheca</i>	Herb
<i>Arctotis venusta</i>	Herb
<i>Aristida bipartita</i>	Grass
<i>Aristida congesta</i>	Grass
<i>Aristida diffusa</i>	Grass
<i>Aristida junceiformis</i>	Grass
<i>Aristida canescens</i>	Grass
<i>Artemisia afra</i>	Shrub
<i>Asparagus larcinus</i>	Shrub/Climber
<i>Atriplex semibaccatta</i>	Herb
<i>Avonia ustulata</i>	Succulent
<i>Barleria macrostegia</i>	Herb
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Berkheya sp.</i>	Herb
<i>Berula erecta</i>	Aquatic herb
<i>Bonatea antennifera</i>	Geophyte
<i>Boophone distichia</i>	Geophyte
<i>Brachiaria eruciformis</i>	Grass
<i>Brachiaria serrata</i>	Grass
<i>Brunsvigia radulosa</i>	Geophyte
<i>Buddleja saligna</i>	Tree
<i>Bulbine abyssinica</i>	Succulent
<i>Bulbine fruticosa</i>	Geophyte
<i>Bulbine narcissifolia</i>	Geophyte
<i>Carex glomerabilis</i>	Sedge
<i>Celtis africana</i>	Tree
<i>Chamaecrista biensis</i>	Herb
<i>Chascanum pinnatifidum</i>	Herb
<i>Chasmatophyllum mustellinum</i>	Succulent
<i>Cheilanthes eckloniana</i>	Fern
<i>Cheilanthes hirta</i>	Fern

<i>Chloris virgata</i>	Grass
<i>Chlorophytum fasciculatum</i>	Geophyte
<i>Chrysocoma ciliata</i>	Dwarf shrub
<i>Citrillus lanatus</i>	Creeper
<i>Cleome monophylla</i>	Herb
<i>Cleome rubella</i>	Herb
<i>Clutia pulchella</i>	Shrub
<i>Colchicum longipes</i>	Geophyte
<i>Commelina africana</i>	Herb
<i>Commelina eckloniana</i>	Herb
<i>Conyza podocephala</i>	Herb
<i>Cotyledon orbiculata</i>	Succulent
<i>Crabbea acaulis</i>	Herb
<i>Crassula capitella</i>	Succulent
<i>Crassula carollina</i>	Succulent
<i>Crassula lanceolata</i>	Succulent
<i>Crassula nudicaulis</i>	Succulent
<i>Crinum bulbispermum</i>	Geophyte
<i>Cucumis myriocarpus</i>	Climber
<i>Curio radicans</i>	Succulent
<i>Cussonia paniculata</i>	Tree
<i>Cymbopogon pospischillii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus bellus</i>	Sedge
<i>Cyperus difformis</i>	Sedge
<i>Cyperus eragrostis</i>	Sedge
<i>Cyperus esculentus</i>	Sedge
<i>Cyperus laevigatus</i>	Sedge
<i>Cyperus longus</i>	Sedge
<i>Cyperus marginatus</i>	Sedge
<i>Cyperus sp.</i>	Sedge
<i>Cyperus usitatus</i>	Sedge
<i>Delosperma potsii</i>	Succulent
<i>Delosperma sp.</i>	Succulent
<i>Dichondria micrantha</i>	Herb
<i>Dicoma macrocephala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Digitaria monodactyla</i>	Grass
<i>Dimorphotheca zeyheri</i>	Herb
<i>Diospyros austro-africana</i>	Shrub
<i>Diospyros lycioides</i>	Shrub
<i>Dipcadi ciliare</i>	Geophyte
<i>Dipcadi viride</i>	Geophyte
<i>Diplachne fusca</i>	Grass
<i>Drimia elata</i>	Geophyte
<i>Duvalia corderoyi</i>	Succulent

<i>Ehretia rigida</i>	Shrub
<i>Eleocharis limosa</i>	Sedge
<i>Elephantorrhiza elephantina</i>	Suffrutex
<i>Elionurus muticus</i>	Grass
<i>Enneapogon cenchroides</i>	Grass
<i>Enneapogon scoparius</i>	Grass
<i>Eragrostis chloromelas</i>	Grass
<i>Eragrostis curvula</i>	Grass
<i>Eragrostis echinochloidea</i>	Grass
<i>Eragrostis gummiflua</i>	Grass
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis nindensis</i>	Grass
<i>Eragrostis obtusa</i>	Grass
<i>Eragrostis superba</i>	Grass
<i>Eriocephalus ericoides</i>	Dwarf shrub
<i>Eriocephalus spinescens</i>	Dwarf shrub
<i>Eriospermum corymbosum</i>	Geophyte
<i>Eriospermum prophyrium</i>	Geophyte
<i>Eriospermum</i> sp.	Geophyte
<i>Euclea crispa</i> subsp. <i>ovata</i>	Shrub
<i>Eucomis autumnalis</i>	Geophyte
<i>Euphorbia mauritanica</i>	Succulent
<i>Euphorbia rhombifolia</i>	Succulent
<i>Euryops empterifolius</i>	Dwarf shrub
<i>Euryops subcarnosus</i>	Dwarf shrub
<i>Eustachys paspaloides</i>	Grass
<i>Felicia fillifolia</i>	Dwarf shrub
<i>Felicia muricata</i>	Dwarf shrub
<i>Ficinia cimamomea</i>	Sedge
<i>Fingerhuthia africana</i>	Grass
<i>Garuleum pinnatifidum</i>	Herb
<i>Gazania krebsiana</i>	Herb
<i>Geigeria burkei</i>	Herb
<i>Geigeria fillifolia</i>	Herb
<i>Gladiolus permeabilis</i>	Geophyte
<i>Gnidia podocephala</i>	Dwarf shrub
<i>Gomphocarpus fruticosus</i>	Herb
<i>Gomphrena celosioides</i>	Herb
<i>Grewia occidentalis</i>	Shrub
<i>Gymnosporia buxiifolia</i>	Shrub
<i>Haemanthus humilis</i> subsp. <i>humilis</i>	Geophyte
<i>Haemanthus montanus</i>	Geophyte
<i>Helichrysum argyrosphaerum</i>	Herb
<i>Helichrysum dregeanum</i>	Dwarf shrub
<i>Helichrysum zeyheri</i>	Dwarf shrub
<i>Helictotrichon turgidulum</i>	Grass

<i>Heliophila suavisissima</i>	Herb
<i>Hereroa glenensis</i>	Succulent
<i>Hermannia coccocarpa</i>	Herb
<i>Hermannia comosa</i>	Herb
<i>Hermannia depressa</i>	Herb
<i>Hertia pallens</i>	Shrub
<i>Heteromorpha arborescens</i>	Tree
<i>Heteropogon contortus</i>	Grass
<i>Hibiscus pusillus</i>	Herb
<i>Hibiscus trionum</i>	Herb
<i>Hyparrhenia hirta</i>	Grass
<i>Hyparrhenia tamba</i>	Grass
<i>Hypoxis angustifolia</i>	Geophyte
<i>Hypoxis argentea</i>	Geophyte
<i>Hypoxis hemerocallidea</i>	Geophyte
<i>Imperata cylindrica</i>	Grass
<i>Indigofera laternans</i>	Herb
<i>Indigofera alternans</i>	Herb
<i>Indigofera daleoides</i>	Herb
<i>Ipomoea crassipes</i>	Groundcover
<i>Ipomoea oblonga</i>	Herb
<i>Ipomoea oenotheroides</i>	Herb
<i>Jamesbrittenia atropurpurea</i>	Herb
<i>Jamesbrittenia aurantiaca</i>	Herb
<i>Jamesbrittenia pinatifidum</i>	Herb
<i>Juncus rigidus</i>	Rush
<i>Kalanchoe paniculata</i>	Succulent
<i>Kleinia longiflora</i>	Succulent
<i>Kohautia amatymbica</i>	Herb
<i>Kyllinga alba</i>	Sedge
<i>Lactuca inermis</i>	Herb
<i>Lantana rugosa</i>	Dwarf shrub
<i>Ledebouria luteola</i>	Geophyte
<i>Ledebouria marginata</i>	Geophyte
<i>Lemna gibba</i>	Floating aquatic herb
<i>Lepidium sp.</i>	Herb
<i>Leptochloa fusca</i>	Grass
<i>Lessertia annularis</i>	Herb
<i>Lessertia sp.</i>	Herb
<i>Limeum aethiopicum</i>	Herb
<i>Lobelia erinus</i>	Herb
<i>Lobelia thermalis</i>	Herb
<i>Lotononis listii</i>	Herb
<i>Lycium hirsutum</i>	Shrub
<i>Lycium horridum</i>	Dwarf shrub
<i>Manulea plurirosulata</i>	Herb

<i>Marsilea</i> sp.	Fern
<i>Massonia echinata</i>	Geophyte
<i>Melinis nerviglumis</i>	Grass
<i>Melinis repens</i>	Grass
<i>Melolobium candicans</i>	Dwarf shrub
<i>Menodora africana</i>	Herb
<i>Microchloa caffra</i>	Grass
<i>Mohria vestita</i>	Fern
<i>Monsonia angustifolia</i>	Herb
<i>Moraea pallida</i>	Geophyte
<i>Moraea simulans</i>	Geophyte
<i>Nemesia fruticans</i>	Herb
<i>Nenax microphylla</i>	Dwarf shrub
<i>Nerine laticoma</i>	Geophyte
<i>Nidorella resedifolia</i>	Herb
<i>Nolletia ciliaris</i>	Dwarf shrub
<i>Nolletia jeanettae</i>	Dwarf shrub
<i>Olea europaea</i> subsp. <i>africana</i>	Tree
<i>Ophioglossum polyphyllum</i>	Fern
<i>Orbea lutea</i> subsp. <i>lutea</i>	Succulent
<i>Ornithogalum tenuifolium</i>	Geophyte
<i>Oropetium capense</i>	Grass
<i>Osteospermum muricatum</i>	Herb
<i>Osteospermum scarriosum</i>	Herb
<i>Osyris lanceolata</i>	Shrub
<i>Othonna protecta</i>	Succulent
<i>Oxalis obliquifolia</i>	Geophyte
<i>Pachypodium succulentum</i>	Succulent
<i>Panicum coloratum</i>	Grass
<i>Paspalum dilatatum</i>	Grass
<i>Paspalum distichum</i>	Grass
<i>Pavonia burchellii</i>	Shrub
<i>Pegolettia retrofracta</i>	Dwarf shrub
<i>Pellaea calomelanos</i>	Fern
<i>Pennisetum sphacelatum</i>	Grass
<i>Pentameris basutorum</i>	Grass
<i>Pentzia incana</i>	Dwarf shrub
<i>Pentzia quinquefida</i>	Dwarf shrub
<i>Persicaria lapathifolia</i>	Herb
<i>Phragmites australis</i>	Reed
<i>Phyllanthus maderaspatensis</i>	Herb
<i>Phyllanthus parvulus</i>	Herb
<i>Plinthus sericeus</i>	Dwarf shrub
<i>Pogonarthria squarrosa</i>	Grass
<i>Pollichia campestris</i>	Herb
<i>Portulaca oleracea</i>	Succulent

<i>Pseudognaphalium luteo-album</i>	Herb
<i>Psilocaulon granulicaule</i>	Succulent
<i>Pterodiscus speciosus</i>	Geophyte
<i>Pupalia lappacea</i>	Herb
<i>Pycneus mundtii</i>	Sedge
<i>Pycneus sp.</i>	Sedge
<i>Rabiea albipuncta</i>	Succulent
<i>Ranunculus multifidus</i>	Herb
<i>Raphionacme dyeri</i>	Geophyte
<i>Raphionacme hirsuta</i>	Geophyte
<i>Rhigozum obovatum</i>	Shrub
<i>Rhynchosia sp.</i>	Herb
<i>Rosenia humilis</i>	Dwarf shrub
<i>Rumex lanceolata</i>	Grass
<i>Ruschia hamata</i>	Dwarf shrub
<i>Ruschia intricata</i>	Succulent
<i>Ruschia unidens</i>	Succulent
<i>Salsola rabieana</i>	Dwarf shrub
<i>Salvia verbenaca</i>	Herb
<i>Sarcostemma veminale</i>	Succulent
<i>Scabiosa columbaria</i>	Herb
<i>Scirpoides burkei</i>	Sedge
<i>Scirpoides dioecus</i>	Sedge
<i>Searsia burchellii</i>	Shrub
<i>Searsia ciliata</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Searsia pyroides</i>	Shrub
<i>Sebaea pentandra</i>	Herb
<i>Seddera capensis</i>	Herb
<i>Selago albida</i>	Herb
<i>Selago densiflora</i>	Herb
<i>Selago saxatilis</i>	Herb
<i>Senecio consanguineus</i>	Herb
<i>Senecio inaequidens</i>	Herb
<i>Senecio sp.</i>	Herb
<i>Sesamum triphyllum</i>	Herb
<i>Setaria incrassata</i>	Grass
<i>Setaria pallide-fusca</i>	Grass
<i>Setaria sphacelata</i>	Grass
<i>Setaria verticillata</i>	Grass
<i>Solanum incanum</i>	Herb
<i>Solanum retroflexum</i>	Herb
<i>Solanum supinum</i>	Herb
<i>Solanum tomentosum</i>	Herb
<i>Sonchus oleraceus</i>	Herb
<i>Sporobolus fimbriatus</i>	Grass



<i>Stachys hyssopoides</i>	Herb
<i>Stapelia grandiflora</i> var. <i>grandiflora</i>	Succulent
<i>Stomatium bolusiaae</i>	Succulent
<i>Strumaria tenella</i> subsp. <i>orientalis</i>	Geophyte
<i>Sutera caerulea</i>	Herb
<i>Tallinum cafferum</i>	Geophyte
<i>Teucrium trifidum</i>	Herb
<i>Themeda triandra</i>	Grass
<i>Trachyandra saltii</i>	Geophyte
<i>Tragus berteronianus</i>	Grass
<i>Tragus koelerioides</i>	Grass
<i>Trachyandra saltii</i>	Geophyte
<i>Trianthema triquetra</i>	Herb
<i>Tribulus terrestris</i>	Herb
<i>Trichodiadema barbatum</i>	Succulent
<i>Trichodiadema pomeridianum</i>	Succulent
<i>Triraphis andropogonoides</i>	Grass
<i>Tulbaghia acutiloba</i>	Geophyte
<i>Tulbaghia</i> sp.	Geophyte
<i>Typha capensis</i>	Bulrush
<i>Urochloa panicoides</i>	Grass
<i>Vachellia hebeclada</i>	Dwarf shrub
<i>Vachellia karroo</i>	Tree
<i>Vahlia capensis</i>	Herb
<i>Vernonia oligocephala</i>	Herb
<i>Viscum rotundifolium</i>	Holoparasite
<i>Wahlenbergia androsaceae</i>	Herb
<i>Wahlenbergia denticulata</i>	Herb
<i>Wahlenbergia nodosa</i>	Dwarf shrub
<i>Ziziphus mucronata</i>	Tree

Botshabelo & Thaba Nchu	
Species	Growth form
* <i>Agave americana</i>	Succulent
* <i>Alternanthera pungens</i>	Herb
* <i>Argemone ochroleuca</i>	Herb
* <i>Bidens bipinnata</i>	Herb
* <i>Cirsium vulgare</i>	Herb
* <i>Cyllindropuntia imbricata</i>	Succulent
* <i>Datura stramonium</i>	Herb
* <i>Flaveria bidentis</i>	Herb
* <i>Gleditsia triacanthos</i>	Tree
* <i>Ipomoea purpurea</i>	Climber
* <i>Malva parviflora</i>	Herb

<i>*Nasturtium officinale</i>	Herb
<i>*Oenothera rosea</i>	Herb
<i>*Opuntia ficus-indica</i>	Succulent
<i>*Pennisetum clandestinum</i>	Grass
<i>*Persicaria lapathifolia</i>	Herb
<i>*Plantago lanceolata</i>	Herb
<i>*Pseudognaphalium luteo-album</i>	Herb
<i>*Salix fragilis</i>	Tree
<i>*Schkuhria pinata</i>	Herb
<i>*Sesbania punicea</i>	Shrub
<i>*Sphaeralcea bonariensis</i>	Shrub
<i>*Tagetes minuta</i>	Herb
<i>*Trifolium repens</i>	Herb
<i>*Verbena officinalis</i>	Herb
<i>*Verbena tenuisecta</i>	Herb
<i>*Xanthium spinosum</i>	Herb
<i>*Xanthium strumarium</i>	Herb
<i>Acrotome inflata</i>	Herb
<i>Albuca setosa</i>	Geophyte
<i>Aloe broomii</i>	Succulent
<i>Aloe grandidentata</i>	Succulent
<i>Aloe x broomii</i>	Succulent
<i>Anacampseros rufescens</i>	Succulent
<i>Androcymbium longipes</i>	Geophyte
<i>Aptosimum procumbens</i>	Herb
<i>Arctotis arctotoides</i>	Herb
<i>Aristida congesta</i>	Grass
<i>Aristida diffusa</i>	Grass
<i>Aristida junciformis</i>	Grass
<i>Artemisia afra</i>	Shrub
<i>Asparagus denudatus</i>	Shrub
<i>Asparagus larcinus</i>	Shrub
<i>Atriplex semibaccata</i>	Herb
<i>Barleria macrostegia</i>	Herb
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Berkheya setifera</i>	Herb
<i>Berkheya sp.</i>	Herb
<i>Berula erecta</i>	Herb
<i>Buddleja saligna</i>	Shrub
<i>Celtis africana</i>	Tree
<i>Chascanum pinnatifidum</i>	Herb
<i>Chasmatophyllum muscullinum</i>	Succulent
<i>Chielanthes eckloniana</i>	Fern
<i>Chloris virgata</i>	Grass
<i>Chrysocoma ciliata</i>	Dwarf shrub

<i>Cinneria lyrata</i>	Herb
<i>Clematis brachiata</i>	Climber
<i>Cluttia pulchella</i>	Dwarf shrub
<i>Convolvulus sp.</i>	Climber
<i>Cotula sp.</i>	Herb
<i>Cotyledon orbiculata</i> var. <i>oblonga</i>	Succulent
<i>Crassula capitella</i>	Succulent
<i>Crassula dependens</i>	Succulent
<i>Crassula lanceolata</i>	Succulent
<i>Crassula nudicaulis</i>	Succulent
<i>Cussonia paniculata</i>	Tree
<i>Cymbopogon excavatus</i>	Grass
<i>Cymbopogon pospischillii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus eragrostis</i>	Sedge
<i>Cyperus fastigiatus</i>	Sedge
<i>Cyperus longus</i>	Sedge
<i>Cyperus marginatus</i>	Sedge
<i>Cyperus sp.</i>	Sedge
<i>Delosperma sp.</i>	Succulent
<i>Dicoma anomala</i>	Herb
<i>Dicoma macrocephala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Dimorphotheca zeyheri</i>	Herb
<i>Diospyros austro-africana</i>	Shrub
<i>Diospyros lycioides</i>	Shrub
<i>Dipcadi sp.</i>	Geophyte
<i>Ehretia rigida</i>	Shrub
<i>Enneapogon cenchroides</i>	Grass
<i>Eragrostis capensis</i>	Grass
<i>Eragrostis chloromelas</i>	Grass
<i>Eragrostis curvula</i>	Grass
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis superba</i>	Grass
<i>Eriospermum porphyrium</i>	Geophyte
<i>Euclea crispa</i> subsp. <i>crispa</i>	Shrub
<i>Euphorbia clavaroides</i>	Succulent
<i>Euphorbia pulvinata</i>	Succulent
<i>Euryops empetrifolius</i>	Dwarf shrub
<i>Eustachys paspaloides</i>	Grass
<i>Felicia fillifolia</i>	Dwarf shrub
<i>Felicia muricata</i>	Dwarf shrub
<i>Gazania krebsiana</i>	Herb
<i>Gerbera piloselloides</i>	Herb
<i>Gladiolus permeabilis</i>	Geophyte
<i>Gladiolus sp.</i>	Geophyte

<i>Gomphocarpus fruticosus</i>	Herb
<i>Grewia occidentalis</i>	Shrub
<i>Gymnosporia buxiifolia</i>	Shrub
<i>Gymnosporia heterophylla</i>	Shrub
<i>Helichrysum nudifolium</i>	Herb
<i>Helichrysum rugulosum</i>	Herb
<i>Hermannia coccocarpa</i>	Herb
<i>Hermannia cuneifolia</i>	Dwarf shrub
<i>Hermannia depressa</i>	Herb
<i>Hertia pallens</i>	Dwarf shrub
<i>Heteromorpha arborescens</i>	Shrub
<i>Heteropogon contortus</i>	Grass
<i>Hilliardiella</i> sp.	Herb
<i>Hyparrhenia hirta</i>	Grass
<i>Hyparrhenia tamba</i>	Grass
<i>Hypoxis argentea</i>	Geophyte
<i>Jamesbrittenia albiflora</i>	Dwarf shrub
<i>Jamesbrittenia atropurpurea</i>	Dwarf shrub
<i>Juncus rigidus</i>	Rush
<i>Kalanchoe thyrsiflora</i>	Succulent
<i>Lantana rugosa</i>	Dwarf shrub
<i>Ledebouria luteola</i>	Geophyte
<i>Leptochloa fusca</i>	Grass
<i>Lobelia erinus</i>	Herb
<i>Lobelia thermalis</i>	Herb
<i>Lotononis listii</i>	Herb
<i>Lycium horridum</i>	Dwarf shrub
<i>Marsilea burchellii</i>	Fern
<i>Massonia jasminiflora</i>	Geophyte
<i>Medicago lacineata</i>	Herb
<i>Melinis nerviglumis</i>	Grass
<i>Melolobium candicans</i>	Dwarf shrub
<i>Microchloa caffra</i>	Grass
<i>Mohria vestita</i>	Fern
<i>Moraea pallida</i>	Geophyte
<i>Myrsine africana</i>	Shrub
<i>Nenax microphylla</i>	Dwarf shrub
<i>Nolletia ciliaris</i>	Dwarf shrub
<i>Olea europaea</i> subsp. <i>africana</i>	Tree
<i>Orbea lutea</i> var. <i>lutea</i>	Succulent
<i>Oropetium capense</i>	Grass
<i>Osyris lanceolata</i>	Shrub
<i>Panicum coloratum</i>	Grass
<i>Paspalum dilatatum</i>	Grass
<i>Paspalum distichum</i>	Grass
<i>Pavonia burchellii</i>	Herb

<i>Pelargonium aridum</i>	Geophyte
<i>Pelargonium sidoides</i>	Geophyte
<i>Pellaea calomelanos</i>	Fern
<i>Phragmites australis</i>	Reed
<i>Pseudoschoenus inanus</i>	Sedge
<i>Rhigozom obovatum</i>	Shrub
<i>Rhoicissus tridentata</i>	Shrub
<i>Rhynchosia sp.</i>	Herb
<i>Rhynchosia totta</i>	Herb
<i>Rosenia humilis</i>	Dwarf shrub
<i>Ruschia hamata</i>	Succulent
<i>Salvia stenophylla</i>	Herb
<i>Scolopia zeyheri</i>	Shrub
<i>Searsia burcehlilii</i>	Shrub
<i>Searsia ciliata</i>	Shrub
<i>Searsia erosa</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Searsia leptodictya</i>	Tree
<i>Searsia pyroides</i>	Shrub
<i>Senecio sp.</i>	Herb
<i>Setaria sphacelata</i>	Grass
<i>Solanum incanum</i>	Herb
<i>Solanum tomentosum</i>	Herb
<i>Sporobolus africanus</i>	Grass
<i>Stapelia grandiflora</i>	Succulent
<i>Tarchonanthes minor</i>	Shrub
<i>Themeda triandra</i>	Grass
<i>Thesium costatum</i>	Herb
<i>Tragus koelerioides</i>	Grass
<i>Triraphis andropogonoides</i>	Grass
<i>Typha capensis</i>	Bulrush
<i>Vachellia karroo</i>	Tree
<i>Wahlenbergia androsaceae</i>	Herb
<i>Wahlenbergia nodosa</i>	Dwarf shrub
<i>Xysmalobium sp.</i>	Geophyte

Soutpan	
Species	Growth form
* <i>Bidens bipinnata</i>	Herb
* <i>Cylindropuntia imbricata</i>	Succulent
* <i>Cirsium vulgare</i>	Herb
* <i>Eucalyptus camaldulensis</i>	Tree
* <i>Opuntia engelmannii</i>	Succulent
* <i>Opuntia ficus-indica</i>	Succulent
* <i>Plantago lanceolata</i>	Herb
* <i>Prosopis glandulosa</i>	Tree

* <i>Schkuhria pinnata</i>	Herb
* <i>Tagetes minuta</i>	Herb
* <i>Verbena bonariensis</i>	Herb
<i>Albucca unifolia</i>	Geophyte
<i>Aloe grandidentata</i>	Succulent
<i>Alternanthera sessiliflora</i>	Herb
<i>Aptosimum elongatum</i>	Herb
<i>Arctotis arctotoides</i>	Herb
<i>Aristida congesta</i>	Grass
<i>Asparagus laricinus</i>	Shrub
<i>Asparagus suaveolens</i>	Dwarf shrub
<i>Atriplex lindleyi</i>	Dwarf shrub
<i>Barleria macrostegia</i>	Herb
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Bonatea antennifera</i>	Geophyte
<i>Boscia albitrunca</i>	Tree
<i>Chascanum pinnatifidum</i>	Herb
<i>Chasmatophyllum masculinum</i>	Succulent
<i>Cheilanthes eckloniana</i>	Fern
<i>Chloris virgata</i>	Grass
<i>Chrysocoma ciliata</i>	Dwarf shrub
<i>Colchicum longipes</i>	Geophyte
<i>Crassula capitella</i>	Succulent
<i>Cymbopogon pospischilii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus difformis</i>	Sedge
<i>Cyperus marginatus</i>	Sedge
<i>Dicoma macrocephala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros lycioides</i>	Shrub
<i>Diospyros austro-africana</i>	Shrub
<i>Diplachne fusca</i>	Grass
<i>Enneapogon cenchroides</i>	Grass
<i>Enneapogon scoparius</i>	Grass
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis obtusa</i>	Grass
<i>Eragrostis superba</i>	Grass
<i>Eragrostis truncata</i>	Grass
<i>Eragrostis nindensis</i>	Grass
<i>Eriospermum porphyrium</i>	Geophyte
<i>Eucomis autumnalis</i>	Geophyte
<i>Euphorbia clavarioides</i>	Succulent
<i>Euphorbia spartaria</i>	Succulent
<i>Eustachys paspaloides</i>	Grass
<i>Felicia muricata</i>	Dwarf shrub

<i>Fingerhuthia africana</i>	Grass
<i>Geigeria filifolia</i>	Herb
<i>Gnidia polycephala</i>	Dwarf shrub
<i>Gymnosporia buxifolia</i>	Shrub
<i>Haemanthus humilis</i>	Geophyte
<i>Helichrysum lucilioides</i>	Dwarf shrub
<i>Hereroa glenensis</i>	Succulent
<i>Hertia pallens</i>	Dwarf shrub
<i>Heteropogon contortus</i>	Grass
<i>Hibiscus pusillus</i>	Herb
<i>Indigofera nigromontana</i>	Dwarf shrub
<i>Jamesbrittenia albiflora</i>	Herb
<i>Juncus rigidus</i>	Rush
<i>Kalanchoe rotundifolia</i>	Succulent
<i>Lobelia thermalis</i>	Herb
<i>Lycium cinereum</i>	Dwarf shrub
<i>Lycium horridum</i>	Dwarf shrub
<i>Malephora smithii</i>	Succulent
<i>Marsilea</i> sp.	Fern
<i>Massonia jasminiflora</i>	Geophyte
<i>Melolobium candicans</i>	Dwarf shrub
<i>Menodora africana</i>	Herb
<i>Mestoklema arboriforme</i>	Succulent
<i>Microchloa caffra</i>	Grass
<i>Microloma armatum</i>	Dwarf shrub
<i>Moraea pallida</i>	Geophyte
<i>Nananthus broomii</i>	Succulent
<i>Nenax microphylla</i>	Dwarf shrub
<i>Nolletia ciliaris</i>	Dwarf shrub
<i>Olea europaea</i> subsp. <i>africana</i>	Tree
<i>Osteospermum scariosum</i>	Herb
<i>Osteospermum spinescens</i>	Dwarf shrub
<i>Oxalis depressa</i>	Geophyte
<i>Pellaea calomelanos</i>	Fern
<i>Pentzia incana</i>	Dwarf shrub
<i>Pentzia quinquefida</i>	Dwarf shrub
<i>Rosenia humilis</i>	Dwarf shrub
<i>Ruschia hamata</i>	Dwarf shrub
<i>Salsola aphylla</i>	Dwarf shrub
<i>Salsola humifusa</i>	Dwarf shrub
<i>Salvia stenophylla</i>	Herb
<i>Searsia ciliata</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Sebaea compacta</i>	Herb
<i>Selago geniculata</i>	Herb
<i>Senecio consanguineus</i>	Herb

<i>Solanum supinum</i>	Herb
<i>Sporobolus fimbriatus</i>	Grass
<i>Sporobolus ioclados</i>	Grass
<i>Sporobolus ludwigii</i>	Grass
<i>Suaeda fruticosa</i>	Dwarf shrub
<i>Themeda triandra</i>	Grass
<i>Trachyandra asperata</i>	Geophyte
<i>Tragus koelerioides</i>	Grass
<i>Vachellia karroo</i>	Tree
<i>Ziziphus mucronata</i>	Tree
* <i>Bidens bipinnata</i>	Herb

Dewetsdorp	
Species	Growth form
* <i>Acacia dealbata</i>	Tree
* <i>Argemone ochroleuca</i>	Herb
* <i>Cestrum laevigatum</i>	Shrub
* <i>Conyza bonariensis</i>	Herb
* <i>Cotoneaster franchetii</i>	Shrub
* <i>Cylindropuntia imbricata</i>	Succulent
* <i>Echinopsis schickendantzii</i>	Succulent
* <i>Eucalyptus camaldulensis</i>	Tree
* <i>Fraxinus americana</i>	Tree
* <i>Oxalis corniculata</i>	Geophyte
* <i>Plantago lanceolata</i>	Herb
* <i>Pyracantha angustifolia</i>	Shrub
* <i>Salix babylonica</i>	Tree
* <i>Sesbania punicea</i>	Shrub
* <i>Tagetes minuta</i>	Herb
* <i>Verbena bonariensis</i>	Herb
<i>Agrostis lachnantha</i>	Grass
<i>Ammocharis coranica</i>	Geophyte
<i>Anacampseros rufescens</i>	Succulent
<i>Arctotis arctotoides</i>	Herb
<i>Aristida congesta</i>	Grass
<i>Aristida diffusa</i>	Grass
<i>Artemisia afra</i>	Shrub
<i>Asparagus cooperi</i>	Dwarf shrub
<i>Asparagus suaveolens</i>	Dwarf shrub
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Berula erecta</i>	Herb
<i>Brachiaria eruciformis</i>	Grass
<i>Brunsvigia radulosa</i>	Geophyte
<i>Buddleja saligna</i>	Shrub
<i>Bulbine frutescens</i>	Geophyte



<i>Chasmatophyllum masculinum</i>	Succulent
<i>Cheilanthes eckloniana</i>	Fern
<i>Chenopodium album</i>	Herb
<i>Chloris virgata</i>	Grass
<i>Colchicum cf. burkei</i>	Geophyte
<i>Convolvulus sp.</i>	Herb
<i>Crassula capitella</i>	Succulent
<i>Crassula dependens</i>	Succulent
<i>Crassula nudicaulis</i>	Succulent
<i>Curio radicans</i>	Succulent
<i>Cymbopogon pospischilii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus marginatus</i>	Sedge
<i>Dianthus basuticus</i>	Herb
<i>Dicoma anomala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros austro-africana</i>	Shrub
<i>Diospyros lycioides</i>	Shrub
<i>Diplachne fusca</i>	Grass
<i>Eragrostis chloromelas</i>	Grass
<i>Eragrostis nindensis</i>	Grass
<i>Eriocephalus spinescens</i>	Dwarf shrub
<i>Eriospermum porphyrium</i>	Geophyte
<i>Euclea crispa</i> subsp. <i>ovata</i>	Shrub
<i>Eucomis autumnalis</i>	Geophyte
<i>Euphorbia clavarioides</i>	Succulent
<i>Euryops empetrifolius</i>	Dwarf shrub
<i>Felicia filifolia</i>	Dwarf shrub
<i>Felicia muricata</i>	Dwarf shrub
<i>Gazania krebsiana</i>	Herb
<i>Gerbera piloselloides</i>	Herb
<i>Grewia occidentalis</i>	Shrub
<i>Haplocarpha scaposa</i>	Herb
<i>Helichrysum dregeanum</i>	Dwarf shrub
<i>Helichrysum nudifolium</i>	Herb
<i>Helichrysum zeyheri</i>	Dwarf shrub
<i>Hemarthria altissima</i>	Grass
<i>Hermannia coccocarpa</i>	Herb
<i>Hermannia depressa</i>	Herb
<i>Hesperantha longituba</i>	Geophyte
<i>Heteropogon contortus</i>	Grass
<i>Hibiscus pusillus</i>	Herb
<i>Hyparrhenia hirta</i>	Grass
<i>Lapeirousia plicata</i> subsp. <i>foliosa</i>	Geophyte
<i>Lessertia sp.</i>	Herb
<i>Lotononis listii</i>	Herb

<i>Lycium horridum</i>	Dwarf shrub
<i>Massonia jasminiflora</i>	Geophyte
<i>Melolobium candicans</i>	Dwarf shrub
<i>Melolobium sp.</i>	Dwarf shrub
<i>Moraea pallida</i>	Geophyte
<i>Nananthus broomii</i>	Succulent
<i>Nenax microphylla</i>	Dwarf shrub
<i>Olea europaea subsp. africana</i>	Tree
<i>Osteospermum scariosum</i>	Herb
<i>Oxalis depressa</i>	Geophyte
<i>Panicum coloratum</i>	Grass
<i>Pelargonium aridum</i>	Geophyte
<i>Pelargonium sidoides</i>	Geophyte
<i>Pellaea calomelanos</i>	Fern
<i>Pennisetum sphacelatum</i>	Grass
<i>Pentzia incana</i>	Dwarf shrub
<i>Phragmites australis</i>	Reed
<i>Rabiea sp.</i>	Succulent
<i>Ruschia hamata</i>	Dwarf shrub
<i>Ruschia intricata</i>	Succulent
<i>Ruschia unidens</i>	Succulent
<i>Salsola aphylla</i>	Dwarf shrub
<i>Salvia verbenaca</i>	Herb
<i>Scabiosa columbaria</i>	Herb
<i>Schistostephium crataegifolium</i>	Herb
<i>Searsia dentata</i>	Shrub
<i>Searsia erosa</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Searsia pyroides</i>	Shrub
<i>Selago densiflora</i>	Herb
<i>Setaria sphacelata</i>	Grass
<i>Sporobolus fimbriatus</i>	Grass
<i>Stomatium bolusiae</i>	Succulent
<i>Themeda triandra</i>	Grass
<i>Tragus koelerioides</i>	Grass
<i>Triraphis andropogonoides</i>	Grass
<i>Vachellia karroo</i>	Tree

Wepener	
Species	Growth form
* <i>Acacia dealbata</i>	Tree
* <i>Agave americana</i>	Succulent
* <i>Bidens bipinnata</i>	Herb
* <i>Bidens formosa</i>	Herb
* <i>Bidens pilosa</i>	Herb
* <i>Cichorium intybus</i>	Herb

* <i>Conyza albidum</i>	Herb
* <i>Cotoneaster franchetii</i>	Shrub
* <i>Datura stramonium</i>	Herb
* <i>Echinopsis schickendantzii</i>	Succulent
* <i>Eucalyptus camaldulensis</i>	Tree
* <i>Eucalyptus sideroxylon</i>	Tree
* <i>Gleditsia triacanthos</i>	Tree
* <i>Nicotiana glauca</i>	Shrub
* <i>Opuntia ficus-indica</i>	Succulent
* <i>Papaver aculeatum</i>	Herb
* <i>Polygonum aviculare</i>	Herb
* <i>Populus deltoides</i>	Tree
* <i>Populus simonii</i>	Tree
* <i>Populus x canescens</i>	Tree
* <i>Pyracantha angustifolia</i>	Shrub
* <i>Richardia brasiliensis</i>	Herb
* <i>Robinia pseudoacacia</i>	Tree
* <i>Rosa eglanteria</i>	Shrub
* <i>Salix babylonica</i>	Tree
* <i>Salix fragilis</i>	Tree
* <i>Schkuhria pinnata</i>	Herb
* <i>Schoenoplectus tabernaemontani</i>	Sedge
* <i>Tagetes minuta</i>	Herb
* <i>Tamarix chinensis</i>	Tree
* <i>Verbena bonariensis</i>	Herb
* <i>Xanthium spinosum</i>	Herb
* <i>Xanthium strumarium</i>	Herb
<i>Agrostis lachnantha</i>	Grass
<i>Aloe broomii</i>	Succulent
<i>Andropogon appendiculatus</i>	Grass
<i>Aristida congesta</i>	Grass
<i>Artemisia afra</i>	Shrub
<i>Asparagus cooperi</i>	Dwarf shrub
<i>Asparagus denudatus</i>	Dwarf shrub
<i>Asparagus laricinus</i>	Shrub
<i>Asparagus suaveolens</i>	Dwarf shrub
<i>Asplenium aethiopicum</i>	Fern
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Berkheya raphontica</i>	Herb
<i>Brunsvigia radulosa</i>	Geophyte
<i>Buddleja salviifolia</i>	Shrub
<i>Chasmatophyllum masculinum</i>	Succulent
<i>Cheilanthes eckloniana</i>	Fern
<i>Cheilanthes sp.</i>	Fern
<i>Chloris virgata</i>	Grass

<i>Cineraria</i> sp.	Herb
<i>Clematis brachiata</i>	Climber
<i>Clutia pulchella</i>	Shrub
<i>Colchicum</i> cf. <i>burkei</i>	Geophyte
<i>Cotyledon orbiculata</i> var. <i>oblonga</i>	Succulent
<i>Crassula dependens</i>	Succulent
<i>Crassula lanceolata</i>	Succulent
<i>Crassula nudicaulis</i>	Succulent
<i>Cussonia paniculata</i>	Tree
<i>Cymbopogon pospischilii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus congestus</i>	Sedge
<i>Cyperus difformis</i>	Sedge
<i>Cyperus fastigiatus</i>	Sedge
<i>Cyperus marginatus</i>	Sedge
<i>Delosperma cooperi</i>	Succulent
<i>Dicoma anomala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros austro-africana</i>	Shrub
<i>Diplachne fusca</i>	Grass
<i>Echinochloa colona</i>	Grass
<i>Eleocharis</i> sp.	Sedge
<i>Enneapogon scoparius</i>	Grass
<i>Eragrostis capensis</i>	Grass
<i>Eragrostis chloromelas</i>	Grass
<i>Eragrostis curvula</i>	Grass
<i>Eragrostis gummiflua</i>	Grass
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis obtusa</i>	Grass
<i>Eriospermum porphyrium</i>	Geophyte
<i>Euclea coriacea</i>	Shrub
<i>Euclea crispa</i> subsp. <i>crispa</i>	Shrub
<i>Euclea crispa</i> subsp. <i>ovata</i>	Shrub
<i>Euphorbia clavarioides</i>	Succulent
<i>Euryops annae</i>	Dwarf shrub
<i>Felicia filifolia</i>	Dwarf shrub
<i>Felicia muricata</i>	Dwarf shrub
<i>Gerbera</i> sp.	Herb
<i>Gladiolus</i> sp.	Geophyte
<i>Glekia krebsiana</i>	Herb
<i>Gomphostigma virgatum</i>	Herb
<i>Grewia occidentalis</i>	Shrub
<i>Haplocarpha scaposa</i>	Herb
<i>Helichrysum nudifolium</i>	Herb
<i>Helichrysum rugulosum</i>	Herb
<i>Helichrysum splendidum</i>	Herb

<i>Helictotrichon turgidulum</i>	Grass
<i>Hereroa glenensis</i>	Succulent
<i>Hermannia cuneifolia</i>	Dwarf shrub
<i>Hermannia depressa</i>	Herb
<i>Hesperantha longituba</i>	Geophyte
<i>Heteropogon contortus</i>	Grass
<i>Hyparrhenia hirta</i>	Grass
<i>Juncus effusus</i>	Rush
<i>Kalanchoe thyrsiflora</i>	Succulent
<i>Kniphofia cf. ritualis</i>	Geophyte
<i>Lotononis listii</i>	Herb
<i>Lycium horridum</i>	Dwarf shrub
<i>Marsilea sp.</i>	Fern
<i>Maytenus heterophylla</i>	Shrub
<i>Melolobium candicans</i>	Dwarf shrub
<i>Melolobium sp.</i>	Dwarf shrub
<i>Mohria sp.</i>	Fern
<i>Mohria vestita</i>	Fern
<i>Moraea pallida</i>	Geophyte
<i>Myrsine africana</i>	Shrub
<i>Nenax microphylla</i>	Dwarf shrub
<i>Nolletia ciliaris</i>	Dwarf shrub
<i>Olea europaea subsp. africana</i>	Tree
<i>Osteospermum scariosum</i>	Herb
<i>Osyris lanceolata</i>	Shrub
<i>Oxalis depressa</i>	Geophyte
<i>Paspalum distichum</i>	Grass
<i>Pelargonium sp.</i>	Geophyte
<i>Pellaea calomelanos</i>	Fern
<i>Pennisetum sphacelatum</i>	Grass
<i>Pentzia incana</i>	Dwarf shrub
<i>Pentzia quinquefida</i>	Dwarf shrub
<i>Persicaria lapathifolia</i>	Herb
<i>Persicaria sp.</i>	Herb
<i>Phragmites australis</i>	Reed
<i>Pogonarthria squarrosa</i>	Grass
<i>Pseudognaphalium luteo-album</i>	Herb
<i>Rabiea sp.</i>	Succulent
<i>Ranunculus multifidus</i>	Herb
<i>Rhamnus prinoides</i>	Shrub
<i>Rosenia sp.</i>	Dwarf shrub
<i>Rumex lanceolatus</i>	Herb
<i>Ruschia hamata</i>	Dwarf shrub
<i>Ruschia putterillii</i>	Succulent
<i>Ruschia unidens</i>	Succulent
<i>Salix mucronata</i>	Tree

<i>Salvia stenophylla</i>	Herb
<i>Salvia verbenaca</i>	Herb
<i>Scabiosa columbaria</i>	Herb
<i>Scolopia zeyheri</i>	Shrub
<i>Searsia burchellii</i>	Shrub
<i>Searsia divaricata</i>	Shrub
<i>Searsia erosa</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Searsia pyroides</i>	Shrub
<i>Selago sp.</i>	Herb
<i>Senecio glaberrimus</i>	Herb
<i>Setaria pallide-fusca</i>	Grass
<i>Setaria sphacelata</i>	Grass
<i>Sporobolus fimbriatus</i>	Grass
<i>Stapelia grandiflora</i>	Succulent
<i>Stoebe plumosa</i>	Dwarf shrub
<i>Tarchonanthus minor</i>	Shrub
<i>Themeda triandra</i>	Grass
<i>Tragus berteronianus</i>	Grass
<i>Vachellia karroo</i>	Tree
<i>Viscum rotundifolium</i>	Parasite

Vanstadensrus	
Species	Growth form
* <i>Acacia dealbata</i>	Tree
* <i>Azolla filiculoides</i>	Fern
* <i>Datura stramonium</i>	Herb
* <i>Populus x canescens</i>	Tree
* <i>Pyracantha angustifolia</i>	Shrub
* <i>Rosa eglanteria</i>	Shrub
* <i>Schkuhria pinnata</i>	Herb
* <i>Xanthium spinosum</i>	Herb
<i>Albuca sp.</i>	Geophyte
<i>Amphiglossa triflora</i>	Dwarf shrub
<i>Aristida congesta</i>	Grass
<i>Artemisia afra</i>	Shrub
<i>Asparagus denudatus</i>	Dwarf shrub
<i>Berkheya macrocephala</i>	Herb
<i>Berkheya onopordifolia</i>	Herb
<i>Berkheya raphontica</i>	Herb
<i>Bulbine abyssinica</i>	Geophyte
<i>Cheilanthes eckloniana</i>	Fern
<i>Celtis africana</i>	Tree
<i>Chasmatophyllum musculinum</i>	Succulent
<i>Cheilanthes sp.</i>	Fern
<i>Chloris virgata</i>	Grass

<i>Chrysocoma ciliata</i>	Dwarf shrub
<i>Clematis brachiata</i>	Climber
<i>Colchicum cf. burkei</i>	Geophyte
<i>Crassula lanceolata</i>	Succulent
<i>Crassula natans</i>	Succulent
<i>Crassula nudicaulis</i>	Succulent
<i>Cussonia paniculata</i>	Tree
<i>Cymbopogon pospischilii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Cyperus longus</i>	Sedge
<i>Cyperus marginatus</i>	Sedge
<i>Dicoma anomala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros austro-africana</i>	Dwarf shrub
<i>Diplachne fusca</i>	Grass
<i>Eragrostis biflora</i>	Grass
<i>Eragrostis chloromelas</i>	Grass
<i>Eragrostis gummiflua</i>	Grass
<i>Eragrostis lehmanniana</i>	Grass
<i>Eriospermum porphyrium</i>	Geophyte
<i>Euclea crispa</i> subsp. <i>crispa</i>	Shrub
<i>Euphorbia clavarioides</i>	Succulent
<i>Felicia filifolia</i>	Dwarf shrub
<i>Felicia muricata</i>	Dwarf shrub
<i>Glekia krebsiana</i>	Herb
<i>Gomphostigma virgatum</i>	Herb
<i>Grewia occidentalis</i>	Shrub
<i>Haplocarpha scaposa</i>	Herb
<i>Helichrysum nudifolium</i>	Herb
<i>Helichrysum rugulosum</i>	Herb
<i>Hermannia cuneifolia</i>	Dwarf shrub
<i>Hyparrhenia hirta</i>	Grass
<i>Juncus rigidus</i>	Rush
<i>Limosella grandiflora</i>	Herb
<i>Ludwigia</i> sp.	Herb
<i>Lycium horridum</i>	Dwarf shrub
<i>Marsilea</i> sp.	Fern
<i>Massonia jasminiflora</i>	Geophyte
<i>Maytenus undata</i>	Shrub
<i>Melolobium</i> sp.	Dwarf shrub
<i>Moraea pallida</i>	Geophyte
<i>Myrsine africana</i>	Shrub
<i>Olea europaea</i> subsp. <i>africana</i>	Tree
<i>Oxalis depressa</i>	Geophyte
<i>Oxalis smithii</i>	Geophyte
<i>Pelargonium aridum</i>	Geophyte

<i>Pellaea calomelanos</i>	Fern
<i>Pentzia incana</i>	Dwarf shrub
<i>Pseudognaphalium luteo-album</i>	Herb
<i>Rabiea</i> sp.	Succulent
<i>Ruschia hamata</i>	Dwarf shrub
<i>Salsola</i> sp.	Dwarf shrub
<i>Salvia verbenaca</i>	Herb
<i>Scolopia zeyheri</i>	Shrub
<i>Searsia erosa</i>	Shrub
<i>Searsia lancea</i>	Tree
<i>Senecio glaberrimus</i>	Herb
<i>Solanum tomentosum</i>	Herb
<i>Sporobolus fimbriatus</i>	Grass
<i>Stoebe plumosa</i>	Dwarf shrub
<i>Tarchonanthus minor</i>	Shrub
<i>Themeda triandra</i>	Grass
<i>Tragus koelerioides</i>	Grass
<i>Vachellia karroo</i>	Tree



## **Appendix C: Index of Habitat Integrity (IHI)**

## Bloemfontein: Renosterspruit/Bloemspruit

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Bloemfontein MOSS
UPPER LATITUDE	S 29.097238
UPPER LONGITUDE	S 26.281694
UPPER ALTITUDE	1352m
LOWER LATITUDE	S 29.097238
LOWER LONGITUDE	E 26.331591
LOWER ALTITUDE	1332m
SURVEY SITE (if applicable)	Renosterspruit
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange
QUATERNARY	C52F
ECOREGION 2	11_8
DATE	08/09/2020
RIVER	Renosterspruit
TRIBUTARY	Bloemspruit
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	2-15

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	2.0			Base Flows	3.0
Zero Flows	-5.0			Zero Flows	-5.0
Floods	4.0			Moderate Floods	4.0
<b>HYDROLOGY RATING</b>	<b>5.0</b>			Large Floods	4.0
pH	3.5			<b>HYDROLOGY RATING</b>	<b>4.1</b>
Salts	3.5			Substrate Exposure (marginal)	3.0
Nutrients	3.0			Substrate Exposure (non-marginal)	4.0
Water Temperature	2.5			Invasive Alien Vegetation (marginal)	5.0
Water clarity	2.5			Invasive Alien Vegetation (non-marginal)	5.0
Oxygen	3.0			Erosion (marginal)	3.0
Toxics	4.5			Erosion (non-marginal)	3.0
<b>PC RATING</b>	<b>4.5</b>			Physico-Chemical (marginal)	3.0
Sediment	3.0			Physico-Chemical (non-marginal)	3.0
Benthic Growth	3.0			<b>Marginal</b>	<b>5.0</b>
<b>BED RATING</b>	<b>3.0</b>			<b>Non-marginal</b>	<b>5.0</b>
Marginal	3.0			<b>BANK STRUCTURE RATING</b>	<b>5.0</b>
Non-marginal	3.0			Longitudinal Connectivity	2.5
<b>BANK RATING</b>	<b>3.0</b>			Lateral Connectivity	2.5
Longitudinal Connectivity	2.0			<b>CONNECTIVITY RATING</b>	<b>2.5</b>
Lateral Connectivity	2.0				
<b>CONNECTIVITY RATING</b>	<b>2.0</b>			<b>RIPARIAN IHI %</b>	<b>17.2</b>
				<b>RIPARIAN IHI EC</b>	<b>F</b>
<b>INSTREAM IHI %</b>	<b>10.0</b>			<b>RIPARIAN CONFIDENCE</b>	<b>3.7</b>
<b>INSTREAM IHI EC</b>	<b>F</b>				
<b>INSTREAM CONFIDENCE</b>	<b>3.2</b>				

## Bloemfontein: Seven Dams Stream

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Bloemfontein MOSS
UPPER LATITUDE	S 29.070844
UPPER LONGITUDE	E 26.212381
UPPER ALTITUDE	1434
LOWER LATITUDE	S 29.026698
LOWER LONGITUDE	E 26.197227
LOWER ALTITUDE	1355
SURVEY SITE (if applicable)	Seven Dams Stream, Bloemfontein
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange (Code: 13)
QUATERNARY	C52G
ECOREGION 2	11_10
DATE	2020/09/08
RIVER	Seven Dams Stream
TRIBUTARY	
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	>0-2

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	2.0			Base Flows	2.0
Zero Flows	-2.0			Zero Flows	-2.0
Floods	-3.5			Moderate Floods	-3.0
<b>HYDROLOGY RATING</b>	<b>2.3</b>			Large Floods	-3.0
pH	1.0			<b>HYDROLOGY RATING</b>	<b>2.4</b>
Salts	1.0			Substrate Exposure (marginal)	1.0
Nutrients	2.0			Substrate Exposure (non-marginal)	1.0
Water Temperature	2.5			Invasive Alien Vegetation (marginal)	1.0
Water clarity	1.5			Invasive Alien Vegetation (non-marginal)	1.0
Oxygen	1.5			Erosion (marginal)	2.0
Toxics	2.0			Erosion (non-marginal)	1.0
<b>PC RATING</b>	<b>1.7</b>			Physico-Chemical (marginal)	1.5
Sediment	1.5			Physico-Chemical (non-marginal)	1.5
Benthic Growth	1.5			<b>Marginal</b>	<b>2.0</b>
<b>BED RATING</b>	<b>1.5</b>			<b>Non-marginal</b>	<b>1.5</b>
Marginal	1.5			<b>BANK STRUCTURE RATING</b>	<b>1.9</b>
Non-marginal	1.5			Longitudinal Connectivity	1.5
<b>BANK RATING</b>	<b>1.5</b>			Lateral Connectivity	1.5
Longitudinal Connectivity	1.5			<b>CONNECTIVITY RATING</b>	<b>1.5</b>
Lateral Connectivity	1.5				
<b>CONNECTIVITY RATING</b>	<b>1.5</b>			<b>RIPARIAN IHI %</b>	<b>60.6</b>
				<b>RIPARIAN IHI EC</b>	<b>C/D</b>
<b>INSTREAM IHI %</b>	<b>64.8</b>			<b>RIPARIAN CONFIDENCE</b>	<b>2.8</b>
<b>INSTREAM IHI EC</b>	<b>C</b>				
<b>INSTREAM CONFIDENCE</b>	<b>2.5</b>				

## Botshabelo: Klein-Modder River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Botshabelo MOSS
UPPER LATITUDE	S 29.254739
UPPER LONGITUDE	E 26.700417
UPPER ALTITUDE	1396m
LOWER LATITUDE	S 29.243168
LOWER LONGITUDE	E 26.671173
LOWER ALTITUDE	1385m
SURVEY SITE (if applicable)	Klein-Modder River
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange
QUATERNARY	C52B
ECOREGION 2	
DATE	22/09/2020
RIVER	Klein-Modder River
TRIBUTARY	Modder River
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	2-15

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	2.0			Base Flows	3.0
Zero Flows	-4.5			Zero Flows	-4.5
Floods	4.0			Moderate Floods	4.0
<b>HYDROLOGY RATING</b>	<b>4.5</b>			Large Floods	4.0
pH	3.0			<b>HYDROLOGY RATING</b>	<b>3.9</b>
Salts	2.5			Substrate Exposure (marginal)	3.0
Nutrients	3.0			Substrate Exposure (non-marginal)	4.0
Water Temperature	3.0			Invasive Alien Vegetation (marginal)	4.0
Water clarity	2.5			Invasive Alien Vegetation (non-marginal)	4.0
Oxygen	2.5			Erosion (marginal)	3.0
Toxics	3.5			Erosion (non-marginal)	3.0
<b>PC RATING</b>	<b>3.0</b>			Physico-Chemical (marginal)	3.0
Sediment	3.0			Physico-Chemical (non-marginal)	3.0
Benthic Growth	3.0			<b>Marginal</b>	4.0
<b>BED RATING</b>	<b>3.0</b>			<b>Non-marginal</b>	4.0
Marginal	3.0			<b>BANK STRUCTURE RATING</b>	<b>4.0</b>
Non-marginal	3.0			Longitudinal Connectivity	2.5
<b>BANK RATING</b>	<b>3.0</b>			Lateral Connectivity	2.5
Longitudinal Connectivity	2.5			<b>CONNECTIVITY RATING</b>	<b>2.5</b>
Lateral Connectivity	2.5				
<b>CONNECTIVITY RATING</b>	<b>2.5</b>			<b>RIPARIAN IHI %</b>	<b>27.1</b>
				<b>RIPARIAN IHI EC</b>	<b>E</b>
<b>INSTREAM IHI %</b>	<b>33.7</b>			<b>RIPARIAN CONFIDENCE</b>	<b>3.7</b>
<b>INSTREAM IHI EC</b>	<b>E</b>				
<b>INSTREAM CONFIDENCE</b>	<b>3.2</b>				

## Thaba Nchu: Sepane River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Thaba Nchu MOSS
UPPER LATITUDE	S 29.218738
UPPER LONGITUDE	E 26.843256
UPPER ALTITUDE	1527 m
LOWER LATITUDE	S 29.182031
LOWER LONGITUDE	E 26.744282
LOWER ALTITUDE	1430 m
SURVEY SITE (if applicable)	Sepane River
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange
QUATERNARY	C52B
ECOREGION 2	11_3
DATE	22/09/2020
RIVER	Sepane River
TRIBUTARY	Modder River
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	>0-2

MRU		MRU	
INSTREAM IHI		RIPARIAN IHI	
Base Flows	2.0	Base Flows	2.5
Zero Flows	-3.0	Zero Flows	-3.0
Floods	4.0	Moderate Floods	4.0
HYDROLOGY RATING	2.9	Large Floods	3.5
pH	2.0	HYDROLOGY RATING	3.2
Salts	2.5	Substrate Exposure (marginal)	2.0
Nutrients	3.0	Substrate Exposure (non-marginal)	3.0
Water Temperature	3.0	Invasive Alien Vegetation (marginal)	4.0
Water clarity	2.5	Invasive Alien Vegetation (non-marginal)	3.0
Oxygen	2.0	Erosion (marginal)	2.0
Toxics	2.5	Erosion (non-marginal)	2.0
PC RATING	2.5	Physico-Chemical (marginal)	2.5
Sediment	3.0	Physico-Chemical (non-marginal)	3.0
Benthic Growth	3.0	Marginal	4.0
BED RATING	3.0	Non-marginal	3.0
Marginal	3.0	BANK STRUCTURE RATING	3.8
Non-marginal	3.0	Longitudinal Connectivity	2.0
BANK RATING	3.0	Lateral Connectivity	2.0
Longitudinal Connectivity	3.0	CONNECTIVITY RATING	2.0
Lateral Connectivity	3.0		
CONNECTIVITY RATING	3.0	RIPARIAN IHI %	36.2
		RIPARIAN IHI EC	E
INSTREAM IHI %	42.8	RIPARIAN CONFIDENCE	3.7
INSTREAM IHI EC	D		
INSTREAM CONFIDENCE	3.2		



## Dewetsdorp: Modder River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Dewetsdorp MOSS
UPPER LATITUDE	S 29.587953
UPPER LONGITUDE	E 26.706953
UPPER ALTITUDE	1504m
LOWER LATITUDE	S 29.562040
LOWER LONGITUDE	E 26.700158
LOWER ALTITUDE	1485m
SURVEY SITE (if applicable)	Modder River
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange
QUATERNARY	C52A
ECOREGION 2	11_3
DATE	08/07/2020
RIVER	Modder River
TRIBUTARY	
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	>0-2

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	2.0			Base Flows	3.0
Zero Flows	-4.0			Zero Flows	-4.0
Floods	2.5			Moderate Floods	3.5
<b>HYDROLOGY RATING</b>	<b>4.0</b>			Large Floods	2.5
pH	1.0			<b>HYDROLOGY RATING</b>	<b>3.4</b>
Salts	1.5			Substrate Exposure (marginal)	2.0
Nutrients	2.0			Substrate Exposure (non-marginal)	3.0
Water Temperature	2.0			Invasive Alien Vegetation (marginal)	3.0
Water clarity	2.0			Invasive Alien Vegetation (non-marginal)	2.0
Oxygen	1.5			Erosion (marginal)	3.0
Toxics	2.0			Erosion (non-marginal)	3.0
<b>PC RATING</b>	<b>1.7</b>			Physico-Chemical (marginal)	1.5
Sediment	2.0			Physico-Chemical (non-marginal)	1.5
Benthic Growth	2.0			<b>Marginal</b>	<b>3.0</b>
<b>BED RATING</b>	<b>2.0</b>			<b>Non-marginal</b>	<b>3.0</b>
Marginal	2.0			<b>BANK STRUCTURE RATING</b>	<b>3.0</b>
Non-marginal	2.0			Longitudinal Connectivity	1.5
<b>BANK RATING</b>	<b>2.0</b>			Lateral Connectivity	1.5
Longitudinal Connectivity	2.0			<b>CONNECTIVITY RATING</b>	<b>1.5</b>
Lateral Connectivity	2.0				
<b>CONNECTIVITY RATING</b>	<b>2.0</b>			<b>RIPARIAN IHI %</b>	<b>44.2</b>
				<b>RIPARIAN IHI EC</b>	<b>D</b>
<b>INSTREAM IHI %</b>	<b>50.7</b>			<b>RIPARIAN CONFIDENCE</b>	<b>3.7</b>
<b>INSTREAM IHI EC</b>	<b>D</b>				
<b>INSTREAM CONFIDENCE</b>	<b>3.2</b>				

## Wepener: Caledon River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Wepener MOSS
UPPER LATITUDE	S 29.696116
UPPER LONGITUDE	E 27.001705
UPPER ALTITUDE	1425
LOWER LATITUDE	S 29.724848
LOWER LONGITUDE	E 26.963345
LOWER ALTITUDE	1422
SURVEY SITE (if applicable)	Caledon River, Wepener
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange (Code: 13)
QUATERNARY	D23J
ECOREGION 2	11_3
DATE	2020/08/04
RIVER	Caledon River
TRIBUTARY	
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	LOWLAND
WIDTH (m)	>15

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	-2.0			Base Flows	-2.0
Zero Flows	0.0			Zero Flows	-1.0
Floods	1.0			Moderate Floods	1.0
<b>HYDROLOGY RATING</b>	<b>0.8</b>			Large Floods	1.0
pH	1.5			<b>HYDROLOGY RATING</b>	<b>1.2</b>
Salts	1.5			Substrate Exposure (marginal)	2.0
Nutrients	2.0			Substrate Exposure (non-marginal)	3.0
Water Temperature	1.0			Invasive Alien Vegetation (marginal)	3.0
Water clarity	2.5			Invasive Alien Vegetation (non-marginal)	4.0
Oxygen	1.5			Erosion (marginal)	2.0
Toxics	1.5			Erosion (non-marginal)	2.0
<b>PC RATING</b>	<b>1.6</b>			Physico-Chemical (marginal)	2.0
Sediment	2.5			Physico-Chemical (non-marginal)	0.0
Benthic Growth	2.0			<b>Marginal</b>	3.0
<b>BED RATING</b>	<b>2.2</b>			<b>Non-marginal</b>	4.0
Marginal	2.0			<b>BANK STRUCTURE RATING</b>	<b>3.5</b>
Non-marginal	3.0			Longitudinal Connectivity	2.0
<b>BANK RATING</b>	<b>2.4</b>			Lateral Connectivity	3.0
Longitudinal Connectivity	2.0			<b>CONNECTIVITY RATING</b>	<b>2.5</b>
Lateral Connectivity	2.0				
<b>CONNECTIVITY RATING</b>	<b>2.0</b>			<b>RIPARIAN IHI %</b>	<b>49.8</b>
				<b>RIPARIAN IHI EC</b>	<b>D</b>
<b>INSTREAM IHI %</b>	<b>66.8</b>			<b>RIPARIAN CONFIDENCE</b>	<b>2.8</b>
<b>INSTREAM IHI EC</b>	<b>C</b>				
<b>INSTREAM CONFIDENCE</b>	<b>2.5</b>				

## Wepener: Sandspruit

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Wepener MOSS
UPPER LATITUDE	S 29.753629
UPPER LONGITUDE	E 27.059434
UPPER ALTITUDE	1432
LOWER LATITUDE	S 29.721234
LOWER LONGITUDE	E 26.979300
LOWER ALTITUDE	1421
SURVEY SITE (if applicable)	Sandspruit, Wepener
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange (Code: 13)
QUATERNARY	D23G
ECOREGION 2	
DATE	2020/08/04
RIVER	Sandriver
TRIBUTARY	
PERENNIAL (Y/N)	N
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	>15

MRU		MRU	
INSTREAM IHI		RIPARIAN IHI	
Base Flows	-2.0	Base Flows	-1.5
Zero Flows	-2.0	Zero Flows	-2.0
Floods	1.0	Moderate Floods	1.0
HYDROLOGY RATING	1.6	Large Floods	1.0
pH	2.0	HYDROLOGY RATING	1.2
Salts	2.0	Substrate Exposure (marginal)	1.0
Nutrients	2.0	Substrate Exposure (non-marginal)	2.0
Water Temperature	1.0	Invasive Alien Vegetation (marginal)	2.0
Water clarity	2.5	Invasive Alien Vegetation (non-marginal)	2.0
Oxygen	1.0	Erosion (marginal)	2.0
Toxics	1.5	Erosion (non-marginal)	2.0
PC RATING	2.0	Physico-Chemical (marginal)	2.0
Sediment	2.5	Physico-Chemical (non-marginal)	0.0
Benthic Growth	2.0	Marginal	2.0
BED RATING	2.3	Non-marginal	2.0
Marginal	2.0	BANK STRUCTURE RATING	2.0
Non-marginal	2.5	Longitudinal Connectivity	1.5
BANK RATING	2.2	Lateral Connectivity	1.5
Longitudinal Connectivity	1.5	CONNECTIVITY RATING	1.5
Lateral Connectivity	1.5		
CONNECTIVITY RATING	1.5	RIPARIAN IHI %	67.3
		RIPARIAN IHI EC	C
INSTREAM IHI %	62.0	RIPARIAN CONFIDENCE	2.8
INSTREAM IHI EC	C/D		
INSTREAM CONFIDENCE	2.5		

## Vanstadensrus: Witspruit

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Vanstadensrus MOSS
UPPER LATITUDE	S 29.983295
UPPER LONGITUDE	E 27.018900
UPPER ALTITUDE	1489
LOWER LATITUDE	S 29.995062
LOWER LONGITUDE	E 26.974511
LOWER ALTITUDE	1425
SURVEY SITE (if applicable)	Witspruit, Vanstadensrus
SITE LATITUDE (if applicable)	
SITE LONGITUDE (if applicable)	
SITE ALTITUDE (if applicable)	
WMA	Upper Orange (Code: 13)
QUATERNARY	D24C
ECOREGION 2	
DATE	2020/08/04
RIVER	Witspruit
TRIBUTARY	Vanstaensrus stream system
PERENNIAL (Y/N)	Y
GEOMORPH ZONE	FOOTHILL
WIDTH (m)	2-15

	MRU				MRU
INSTREAM IHI				RIPARIAN IHI	
Base Flows	-2.0			Base Flows	-2.5
Zero Flows	-2.0			Zero Flows	-2.0
Floods	-3.5			Moderate Floods	-3.0
HYDROLOGY RATING	2.4			Large Floods	-3.0
pH	1.5			HYDROLOGY RATING	2.6
Salts	1.5			Substrate Exposure (marginal)	2.0
Nutrients	2.0			Substrate Exposure (non-marginal)	2.0
Water Temperature	1.0			Invasive Alien Vegetation (marginal)	1.0
Water clarity	2.5			Invasive Alien Vegetation (non-marginal)	2.0
Oxygen	2.0			Erosion (marginal)	2.0
Toxics	1.5			Erosion (non-marginal)	2.0
PC RATING	1.7			Physico-Chemical (marginal)	2.0
Sediment	2.5			Physico-Chemical (non-marginal)	0.0
Benthic Growth	1.5			Marginal	2.0
BED RATING	2.2			Non-marginal	2.0
Marginal	2.5			BANK STRUCTURE RATING	2.0
Non-marginal	2.5			Longitudinal Connectivity	2.0
BANK RATING	2.5			Lateral Connectivity	1.5
Longitudinal Connectivity	2.0			CONNECTIVITY RATING	1.8
Lateral Connectivity	2.0				
CONNECTIVITY RATING	2.0			RIPARIAN IHI %	56.7
				RIPARIAN IHI EC	D
INSTREAM IHI %	57.4			RIPARIAN CONFIDENCE	2.8
INSTREAM IHI EC	C/D				
INSTREAM CONFIDENCE	2.5				