FRESHWATER RESOURCE VERIFICATION FOR THE PROPOSED EXPANSION OF CATTLE HOUSING FOR THE MARYKA BOERDERY, NEAR MALMESBURY, WESTERN CAPE

Prepared for

Eco Impact Legal Consulting (Pty) Ltd

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome - usually international in origin.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Gleying:	A soil process resulting from prolonged soil saturation which is manifested by the presence of neutral grey, bluish or greenish colours in the soil matrix.
Hydromorphic soil:	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).
Hydrology:	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Hydromorphy:	A process of gleying and mottling resulting from the intermittent or permanent presence of excess water in the soil profile.
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Obligate species:	Species almost always found in wetlands (>99% of occurrences).
Seasonal zone of wetness:	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50cm of the surface
Temporary zone of wetness:	The outer zone of a wetland characterised by saturation within 50cm of the surface for less than three months of the year.
Watercourse:	In terms of the definition contained within the National Water Act, 1998 (Act 36 of 1998) a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes where relevant, its bed and banks.
Wetland:	"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may, in turn, influence the ecological characteristics and functioning of wetlands.

1. INTRODUCTION

In January 2019 Scientific Aquatic Services (SAS) were requested to undertake a field verification of the watercourses identified within the specialist freshwater assessment conducted by Eco Impact Legal Consulting (Pty) Ltd in 2018 and implement the DWS Risk Assessment Matrix for the proposed development activities for the Maryka Boerdery, located on Portion 4 of the farm Nieuwe Post East no. 706, hereafter referred to as the 'study area' (Figure 2 and 3). The study area has existing cattle housing; however, the applicant wishes to expand its current operations and therefore requires additional facilities. The proposed development expansion will entail the following:

- The construction of 19 new cattle housing units of approximately 1100m^2 each with a 5m service road in between the cattle housing; and
- The expansion of an existing cattle manure and urine collection pond (36.8m x 210m x 1.5m deep) and the development of a new cattle manure and urine collection pond (36.8m x 130m x 1.5m deep). The manure and urine collection ponds will hereafter be referred to as the "effluent control ponds". Clay sourced from the property will be used to line these ponds.

An investigation of the clay material found within the study area (undertaken in 2014 by SKC Masakhizwe Engineers (Pty) Ltd) indicated that the clay material has an average permeability of 3.49E-07 cm/s. Thus, the clay material is impervious and would be suitable to line the effluent control ponds (SKC Masakhizwe Engineers (Pty) Ltd, 2014) as part of this development.

The effluent control ponds will collect urine and cattle manure from the cattle housing. The effluent will be treated by the onsite licensed compost facility; whereafter it will be used as compost fertiliser. As per the site development plan, all infrastructure components associated with the proposed development will be located no closer than 50m from the watercourse as identified within the freshwater assessment by Hanekom (2018) (Figure 1).

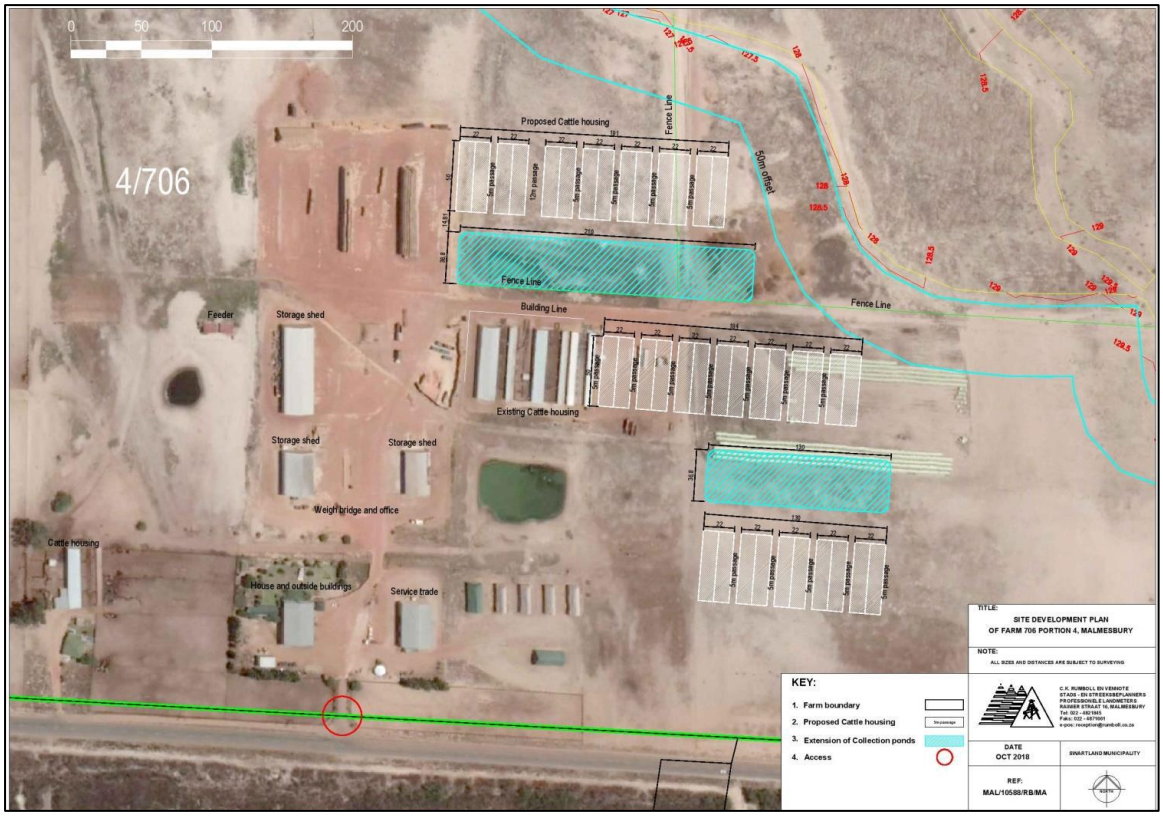

Figure 1: The proposed site development plan indicating that the proposed development activities would occur outside of a 50m setback area from the watercourse (located in the top left-hand corner of this image). Proposed new housing facilities are indicated in white while the effluent control ponds are indicated in blue.

In order to identify all watercourses that may potentially be impacted by any future proposed development, a 500m “zone of investigation” around the study area, in accordance with General Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998) (NWA), was used as a guide in which to assess possible sensitivities of the receiving environment. This area – i.e. the 500m zone of investigation around the study area – was assessed utilising desktop methods only and will henceforth be referred to as the “investigation area” (Figure 2 and Figure 3).

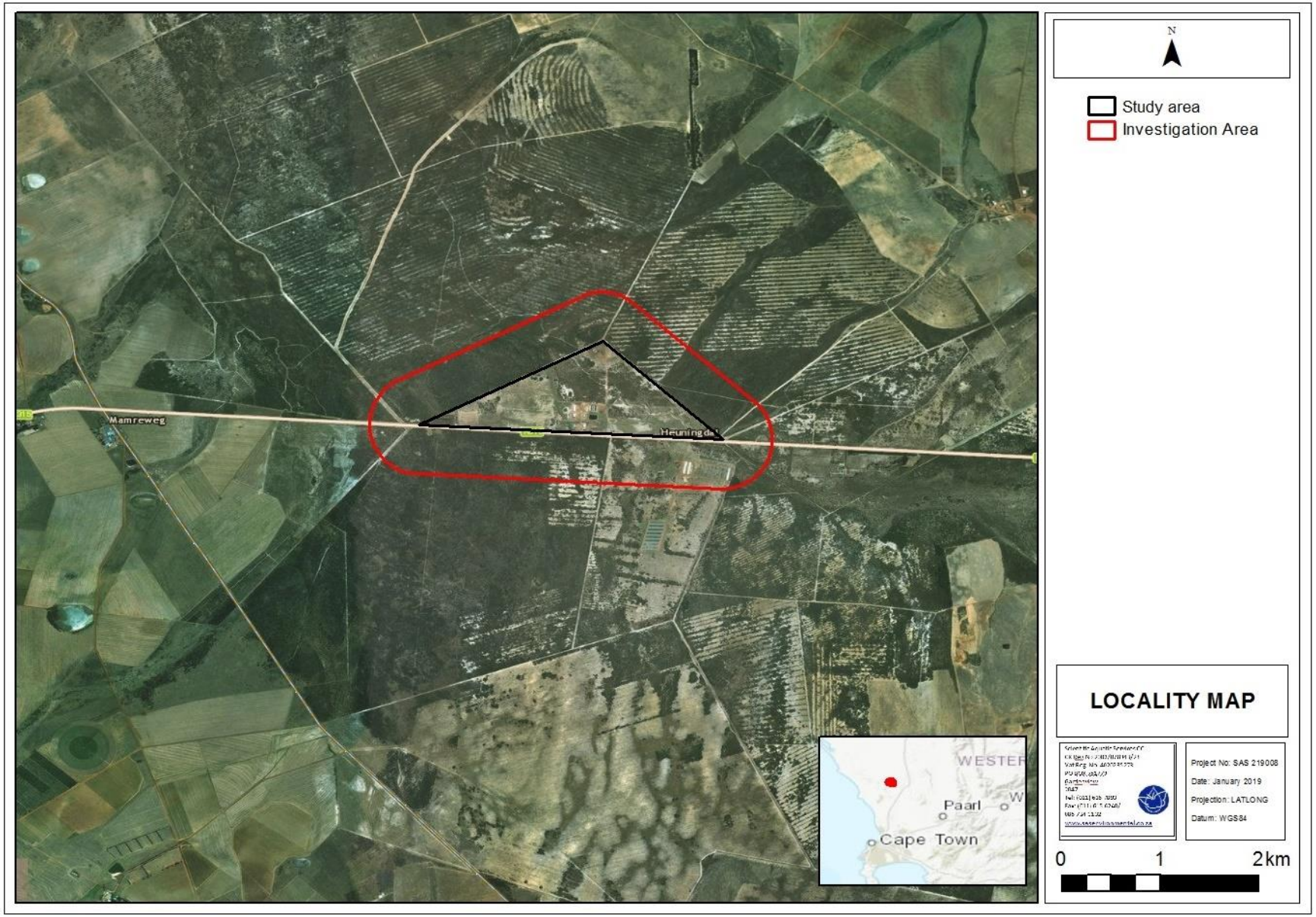

Figure 2: Digital satellite image depicting the study area in relation to the surrounding areas.

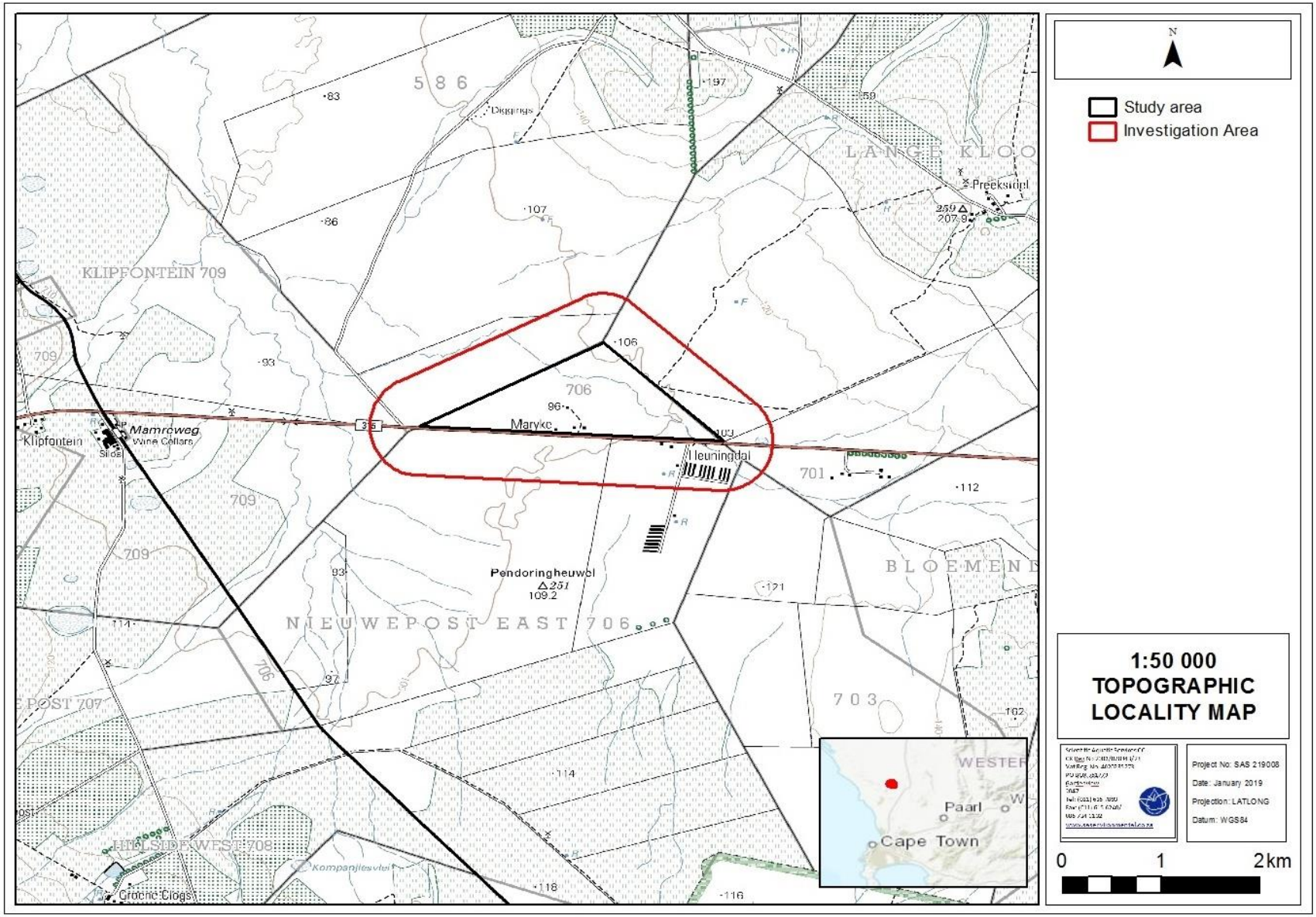

Figure 3: Location of the study area depicted on a 1:50 000 topographical map, in relation to surrounding areas.

1.1 Assumptions and Limitations

- The ground-truthing and delineation of the watercourse boundaries and the assessment thereof are confined to a single site visit undertaken on the 16th of January 2019 of the study area, during the summer season. All freshwater resources identified within the investigation area were delineated in fulfilment of Regulation GN509 of the National Water Act, 1998 (Act 36 of 1998) utilising various desktop methods including the use of topographic maps, historical and current digital satellite imagery and aerial photographs. These resources were not ground-truthed; however, the general surroundings were considered during the desktop assessment;
- The purpose of this verification was to confirm the delineations and classifications of the report undertaken by Nicolaas Hanekom (2018) and undertake the required Risk Assessment Matrix as promulgated in General Notice 509 of 2016, and therefore the report does not include any additional calculations for the Present Ecological State (PES) or the Ecological Importance and Sensitivity (EIS) as this was undertaken by Hanekom (2018). All delineations were undertaken utilising various desktop methods with spot verifications on site;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate, and some inaccuracies due to the use of handheld GPS instrumentation may occur; however, the delineations as provided in this report are deemed appropriately accurate to fulfil the authorisation requirements;
- Watercourses and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the watercourse boundaries may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, the delineations as provided in this report are deemed appropriately accurate to guide any future development plans.

2. RESULTS

2.1. Desktop Assessment Findings

Use was made of aerial photography, digital satellite imagery, and available provincial and national wetland databases to identify points of interest prior to the field survey. Watercourses often display a diversity of digital signatures that can be used to assist the field verification.

On review of the historical imagery dating back to 1938, the watercourse, as identified within the specialist freshwater report (Hanekom, 2018) is visible and bisects the northern portion of the study area (Figure 4). When this historical imagery is compared to the most recent digital satellite imagery (circa 2018), it is clear that the study area has been significantly transformed by the current agricultural and livestock activities within the surrounding area (Figure 4) which has altered the pattern, flow and timing of water in the landscape, through straightening and diverting of the watercourse around cultivated areas.

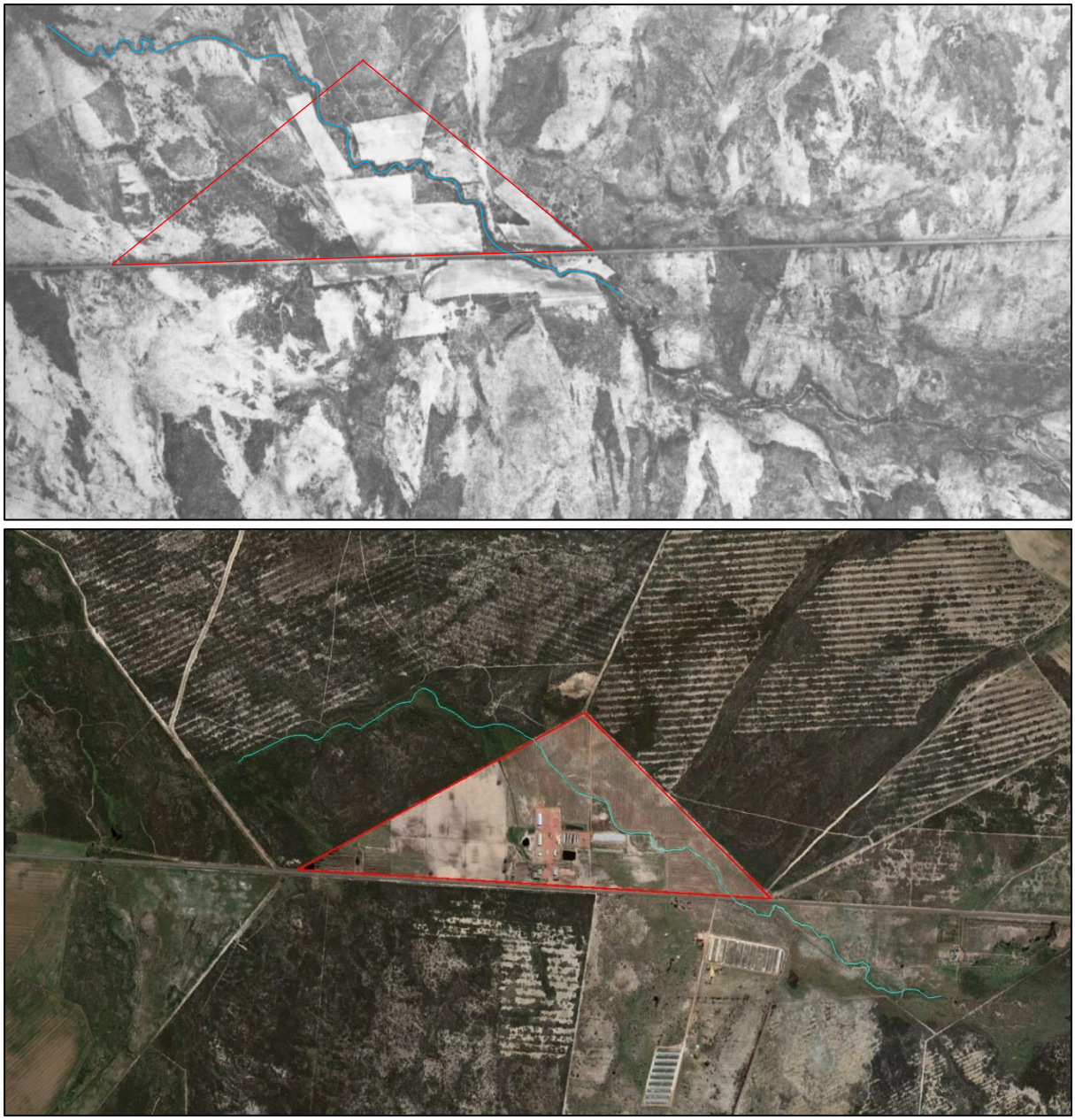

Figure 4: Historical imagery (top - circa 193 Flight plan 10093 of Job 120) indicates that the study area has already been impacted upon by cultivated areas since the 1930s. When compared to the most recent digital satellite imagery (bottom - circa 2018), the watercourse has been further degraded, through straightening and diversion thereof.

2.2. Site Verification Results

A site visit was undertaken on the 15th of January 2019, during which the presence of any areas representing with wetlands/riparian characteristics as defined by the DWAF (2008) or watercourses as defined by the National Water Act, 1998 (Act 36 of 1998) were identified. The following indicators assist in determining the presence of a watercourse within the study area:

- Terrain units are used to determine in which parts of the landscape a watercourse (including wetlands and rivers) was most likely to occur;
- Obligate and facultative freshwater species could be used in conjunction with terrain units as well as the point where a distinct change in the vegetation composition was observed to define the outer boundary of any watercourses. Obligate species are almost always found in a watercourse (>99% of occurrences) while facultative species are usually found in a watercourse (76%-99% of occurrences) but are also occasionally found in areas not associated with wetlands or rivers and often in areas of disturbance;
- Surface water and/or saturated soils can be used to determine if there is a permanent zone and to define the outer boundaries (temporary zone) of a watercourse; and
- Soil form indicators are used to determine the presence of soils that are associated with prolonged and frequent saturation and a fluctuating water table within 50 cm of the land surface.

It should be noted that for an area to be identified as a wetland, at least two (2) of the above indicators should be present (*Pers Comm Prof. F. Ellery*).

For the purposes of this investigation, the definitions of a watercourse, wetland and riparian habitat were taken as per that in the National Water Act, 1998 (Act 36 of 1998). The definitions are as follows:

A **watercourse** means:

(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse,
and a reference to a watercourse includes where relevant, its bed and banks.

Wetland habitat is “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure **distinct** from those of adjacent areas.

3. KEY OBSERVATIONS

1. As per the ecological study undertaken by Hanekom (2018), a watercourse is located within the study area, which drains in a south-east to northwest direction. The headwaters of this system are located approximately 3km south-east of the study area, which enters the study area through a culvert structure underneath the R315 road. This watercourse drains into the Groen River located approximately 1.7km west of the study area. As per the site development plan (Figure 1), no infrastructure would be located within 50m of this watercourse.

2. Hanekom (2018) determined that this watercourse is critically modified (Present Ecological State (PES) Category E) due to the significant loss of natural habitat and biota owing to the cultivation practices surrounding the watercourse. This was apparent during the site assessment undertaken by SAS in January 2019, as the embankments of some portions of the watercourse have been straightened, grazed and trampled, impacting on its geomorphology and hydrological regime (Figure 5). The PES Category E is thus supported by SAS.

3. Hanekom (2018) made use of the Riparian Vegetation Response Assessment Index (VEGRAI) to assess the vegetation component of this watercourse and ranked the VEGRAI to be D/E. From the photographs taken of the watercourse during the site assessment (Figure 5), the watercourse has limited vegetation cover with only a few patches of *Cynodon dactylon* grass established on the embankment, which conforms to the VEGRAI ranking and low ecological importance (Ecological Importance and Sensitivity (EIS)) of Hanekom (2018). This scoring is thus supported by SAS.

Figure 5: Photographs of the watercourse located within the study area. Only *Cynodon dactylon* grass species and saplings of the invasive *Acacia saligna* (Port Jackson) were present on the embankment thereof. (*The yellow arrow indicates the direction of drainage).

4. The soil profile of the watercourse was investigated with the use of a hand auger to determine if redoximorphic features such as mottling and gleying were present. These features are caused by prolonged saturated conditions in the soil and the subsequent development of anaerobic conditions. The various soil auger test holes developed within the watercourse bed all showed a very shallow (within the first 20 cm from the soil surface) gleyed soil layer (Figure 6). This layer, with a low chroma grey matrix, indicate that certain soil components (such as iron and manganese) have been leached out of the soils as they are usually permanently inundated. In this case, water seepage into the auger pit was observed within 40cm of the soil surface. This is a significant observation given that the field assessment was taken in the middle of the dry season.

Figure 6: Soil auger samples were taken within the watercourse bed. A prominent gleyed soil layer was apparent within the first auger sample taken (left). All auger samples taken within the same pit after that (right) are gleyed throughout the entire sample.

5. Within the ecological study undertaken by Hanekom (2018), this watercourse was identified as a non-perennial river. Based on the field observations by SAS, especially with regard to the shallow gleyed soil layer and saturated soil conditions, SAS classified this watercourse to be a wetland, as it conforms to the definition of a wetland as described in Section 2.2 (hereafter referred to as Wetland 1). It should be noted, however, that this system is in a severely degraded state (based on visual observations during the site visit).

6. A second watercourse was also identified by SAS during the site assessment (Figure 7 and Figure 8) and is also identifiable on the historical imagery (Figure 4). This system is located within the central portion of the study area and drains in a northerly direction, towards the Groen River. Based on comparisons of the current extent and condition of this watercourse from digital imagery to that of the historical imagery, it is clear that water from the surrounding feedlots and a dam (located west of the existing storage sheds) feeds into the system. Overall, this drainage line is considered severely degraded (to the same extent as the) and has limited ecological functioning.

Figure 7: Wetland 2 located within the study area. (Left) The upstream reach of the system (west of the dam) is well vegetated, however, trampling of vegetation was noted. (Right) The vegetation within the downstream reach was noted to be less vegetated, as it is adjacent to a feeding lot. (*The yellow arrow indicates the direction of drainage).

The locality of the wetlands in relation to the study area and the proposed activities is provided in Figure 8 below.

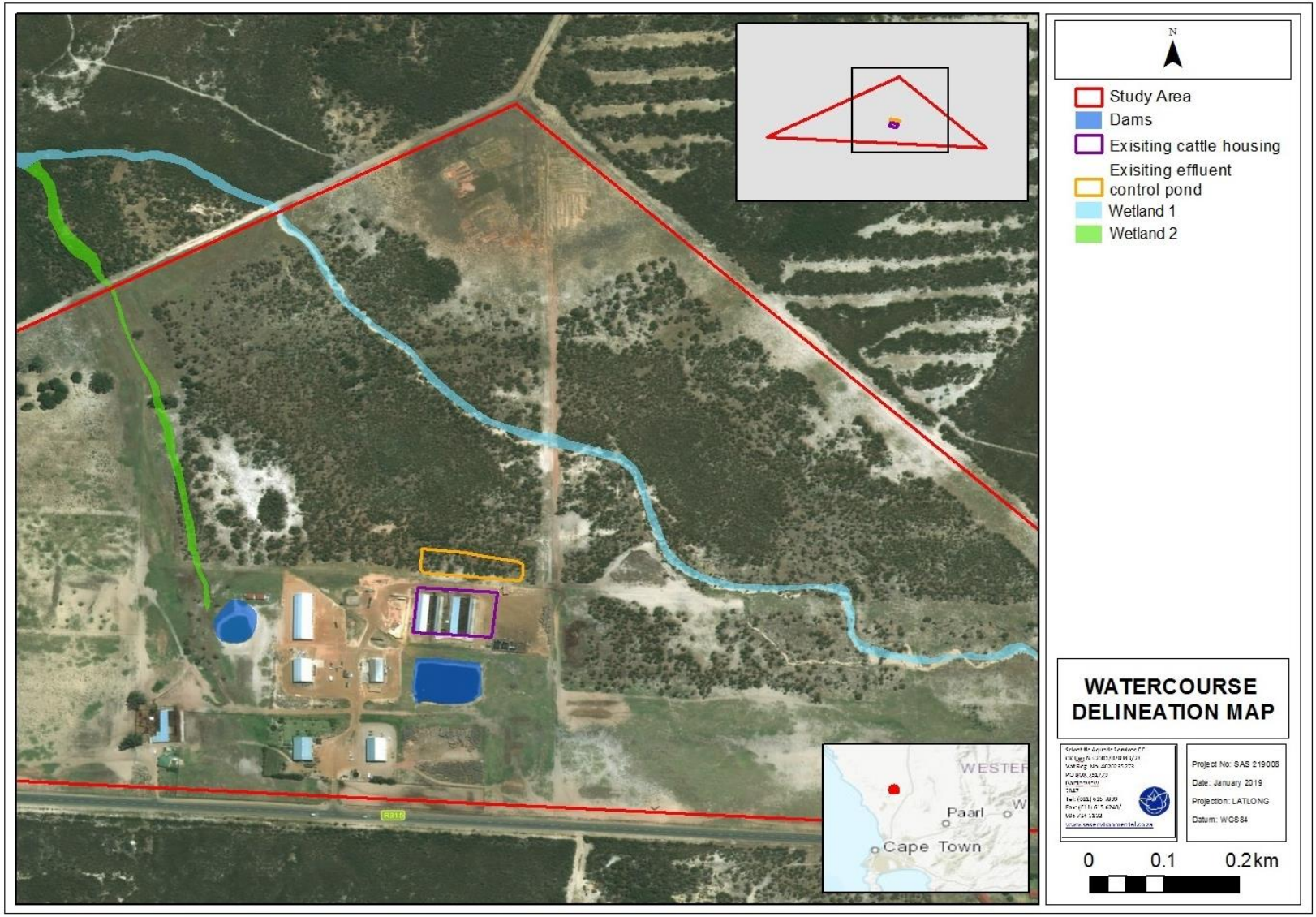

Figure 8: Delineation map for the watercourses associated with the study area, in relation to the existing infrastructure.

4. LEGISLATIVE REQUIREMENTS AND CONSTRAINTS ANALYSIS

The following legislative requirements were considered during the assessment.

a) National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA);
b) National Water Act, 1998 (Act 36 of 1998) (NWA); and
c) General Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998).

It is important to note that in terms of the definition of a watercourse as per the National Water Act, 1998 (Act 36 of 1998), all of the natural watercourses within the study area will be regulated by Section 21(c) and (i) as well as the applicable zones of regulation. All of the watercourses that will persist under normal conditions will thus require further authorisation from the Department of Environmental Affairs and Development Planning (DEA&DP) and the Department of Water and Sanitation (DWS).

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered to be important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on water resources arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015). It should be noted, however, that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et. al,* 2015).

Legislative requirements were taken into consideration when determining suitable zones of regulation for the watercourses. The definition and motivation for a regulated zone of activity as well as a buffer zone for the protection of the watercourses can be summarised as follows:

- **Activity 12** of Listing Notice 1 (GN 327) of the NEMA EIA regulations, 2014 (as amended) states that:
  The development of:
  (xii) Infrastructure or structures with a physical footprint of <u>100 square meters</u> or more;

  Where such development occurs—
  a) Within a watercourse;
  b) In front of a development setback; or
  c) If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse.

- **Activity 19** of Listing Notice 1 (GN 327) of the NEMA EIA regulations, 2014 (as amended) states that:
  The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock more than 10 cubic metres from a watercourse

- In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse for section 21(c) and 21(i) is defined as:
  a) the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) in the absence of a determined 1 in-100year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

A 500m zone of regulation (ZoR) was therefore implemented around the wetland features (Figure 9). Consultation and authorisation with the Department of Water and Sanitation, the custodians of water resources in South Africa, will therefore be required for all activities associated with the development to ascertain the potential risk of the development to the wetlands since the proposed development will be within its 500m ZoR (refer to Table 1 In Section 5 of this report for the risk outcomes). A 50m setback area was proposed by Hanekom (2018) and this is supported by SAS.

It is not expected that the proposed development will have a significant impact on Wetland 2 as this system is situated approximately 220 metres upgradient of the proposed expansion activities. The system was, however, considered as part of the Risk Assessment.

It should further be noted that activities within the 32m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) will potentially trigger an environmental authorisation from the Department of Environmental Affairs and Development Planning (DEA&DP) as the study area falls outside of the urban edge.

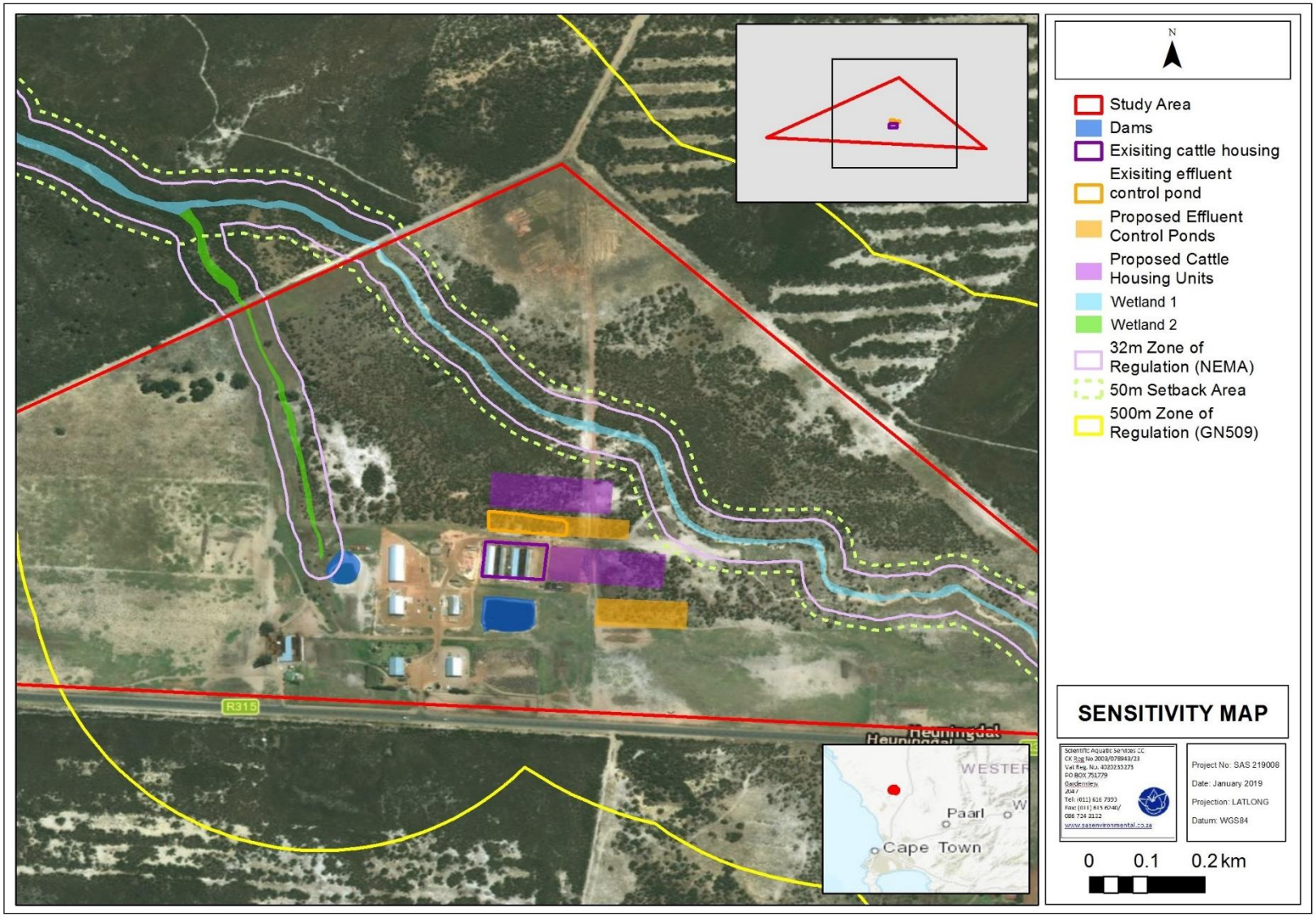

Figure 9: Applicable Zones of Regulation in accordance with the NWA and the NEMA associated with the watercourses identified within the study area.

5. RISK ASSESSMENT

Following the assessment of the watercourses, the Department of Water and Sanitation (DWS) specified Risk Assessment Matrix (as promulgated in GN509 of 2016) was applied to ascertain the significance of risk associated with the individual activities on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the watercourses within the development area. The points below summarise the considerations undertaken:

- The DWS risk assessment was applied assuming that all listed mitigation measures are implemented, thus the results of the DWS risk assessment provided in this report presents the perceived impact significance ***post-mitigation***;
- In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA *et al*. would be followed, i.e. the impacts would first be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required;
- The activities and the associated risks they pose are all highly site specific, not of a significant extent relative to the area of the watercourses assessed, and therefore have a limited spatial extent (i.e. within the investigation zone). The exception are risks to water contamination, however, if the effluent control ponds are well managed, this risk is considered very low;
- While the operation of the proposed cattle housing and effluent control ponds will be a permanent activity, the construction thereof is envisioned to take no more than a few months. However, the frequency of the construction impacts may be daily during this time; and
- Most impacts are considered to be easily detectable, with the exception of contamination of surface and groundwater which will require some effort.

5.1. Risk Assessment Outcome Discussion

The outcome of the DWS Risk Assessment is provided in Table 1, at the end of this section. There are four key ecological risks on watercourses that were assessed, namely:

- Loss of watercourse habitat and ecological structure resulting in impacts to biota;
- Changes to the socio-cultural and service provision;
- Impacts on the hydrology and sediment balance of the watercourses; and
- Impacts on water quality.

Since the proposed development would be located outside of the wetland and at least 50m from its delineated boundary, the activities which would form part of the construction phase of this development is considered of ‘Low’ risk significance, if the mitigation measures as presented in Table 1 are adhered to. This is mainly due to the distance these activities would be from the wetland and the overall flat topography of the area as a whole, which would limit any spread of effluent into the wetland. Some activities associated with the operational phase of the proposed development is considered to pose a ‘Moderate’ risk significance to the wetland, primarily due to the potential of failure of infrastructure which could cause effluent to enter the wetland.

It should be noted that the impact of the proposed activities during both the construction and operational phase on the groundwater were not considered as part of this study. Such aspects was investigated within the study of SKC Masakhizwe Engineers (Pty) Ltd (2014). The possibility of the effluent impacting on the ground water resources and potential mitigation measures are also provided within the Environmental Management Program (EMP) as prepared by Eco Impact Legal Consulting (Pty) Ltd (2018).

The overall surrounding area, and specifically the area associated with the development, has already been degraded (via trampling, grazing and cultivation activities) and very few vegetation species were present, thus the initial site clearing activities are considered to have a very low risk significance to the wetland in terms of impacts on its habitat provisioning and ecological functioning. During this phase,

the wetland should be demarcated as a no-go area, since no activities are proposed to occur within the wetland or 50m thereof, and also to ensure that no unauthorised activities would occur within the wetland.

During excavation activities as part of the construction of the cattle housing units and the effluent control ponds, soils removed should be stockpiled outside of the 50m buffer setback area surrounding the wetland, for subsequent use as part of other construction activities (construction of embankments surrounding the ponds) or as part of rehabilitation activities. These materials should not be contaminated, and it should be ensured that the minimum surface area is taken up. For the duration of the construction period, these stockpiles should be covered with a suitable geotextile covering such as hessian sheeting, to limit possible sedimentation of the wetland.

As part of the construction of the effluent control dams, it is imperative that the clay layer be compacted to the required density to ensure that no contaminated effluent leaches through the ponds and potentially into the wetland. Also, the ponds should be sized correctly to accommodate a 1:100 year rainfall event and to prevent exceeding its capacity during this time. The embankments of the ponds should preferably be sloped to a minimum of 1:3 and revegetated with indigenous vegetation to ensure structural stability of the ponds, but also potentially increase the habitat diversity within the study area.

During the operational phase, the possibility of failure of the effluent control dams is a reality. Therefore, the failure of the ponds, whether it be through accidental spillage or seepage, is still considered of 'Moderate' risk significance mainly due to the deep sandy soils within the study area which would allow for effluent to enter the wetland. A leak would result in contamination of surface water and soil quality within the wetland thus, it is essential that all stormwater management infrastructure surrounding the cattle housing units and the effluent control dams are regularly inspected and maintained to prevent effluent from entering the wetland. Regular testing of the surface water within the wetland (if present) should occur to ensure that no seepage which would not be immediately detected, occurs and to implement an emergency spill plan in such cases.

The results of the outcome of the DWS risk assessment are summarised in Table 1 below, including key mitigation measures for each activity that must be implemented to reduce the expected impacts. Although GN509 of 2016 makes allowance for activities with a low risk scoring to be generally authorised, since some of the activities associated with the operation of the cattle housing units and the effluent control ponds was determined to pose a 'Moderate' risk significance to the wetland, a full Water Use Licence Application (WULA) from the DWS would need to be obtained.

Table 1: A summary of the DWS Risk Assessment outcomes for the proposed development activities.

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
1	Construction Phase	Site clearing prior to the commencement of construction activities within the 500m Zone of Regulation (GN509) but at least 50m from the delineated boundary of the wetlands	*Removal of vegetation and associated disturbances to soils; and *Stockpiling of the removed vegetation (this would mainly be remnant crop roots) and cleared soils.	*Exposure of soils, which could enter the wetland and potentially increase the sediment load of the wetland; *This would likely lead to the smothering of biota (in areas where vegetation is present within the wetland) and potentially altering surface water quality of the wetland; *Removal of vegetation would decrease the ecosystem services and the habitat provisioning of the surrounding area to the wetland (albeit already limited).	**1,5**	**3,5**	**8**	**28**	**L**	*Since no activities or infrastructure are proposed within the delineated wetland, but within 50m thereof, it is considered imperative that the system be demarcated with danger tape and considered a no-go area for construction vehicles and personnel; *Contractor laydown areas and stockpiles are to remain outside of the 50m setback area proposed for the delineated boundary of the wetland; *Should any leakages from construction vehicles or material containers occur, they should be cleaned up immediately; *Refuelling of vehicles should take place on a sealed surface to prevent ingress of hydrocarbons into the soil; *Construction vehicles should be restricted to designated roads only.
2		Construction of the proposed effluent control ponds within the 500m Zone of Regulation (GN509) but at least 50m from the delineated boundary of the wetlands.	*Excavation of the footprint areas to the required depths (1.5 m deep); *Stockpiling of excavated soils; *Lining the new ponds with clay; and *Trampling by construction personnel.	*Potential of stockpiled soil (removed from the footprint area) or clay (used to line the dams) to enter the wetland, potentially increase the sediment load of the wetland; *Disturbances of soils leading to increased alien vegetation proliferation, and in turn, further alter the vegetation surrounding the wetland; and *Altered runoff patterns, leading to increased erosion and sedimentation of the downgradient wetland.	**1,5**	**3,5**	**8**	**28**	**L**	*The effluent control ponds should be appropriately sized to contain a 1:50 year flood event. During this time, the surge capacity should be maintained, and it should be ensured that no spillage occurs; *During the excavation activities, soil removed from the footprint areas of the ponds should be stockpiled outside of the 50m setback area surrounding the wetland, for subsequent use as part of other construction activities (construction of embankments surrounding the ponds) or as part of rehabilitation activities; *Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up. Stockpiles may not exceed 2m in height. For the duration of the construction period, these stockpiles should be covered with a suitable geotextile covering such as hessian sheeting, or if not planned to be used as part of the development, removed from the study area;

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
										*The clay layer should be compacted to the engineer specified compaction to ensure its impermeability; *The clay lining should be applied under dry conditions, as in over-wet conditions the clay would prove difficult to compact; and *The embankments of the ponds should be sloped to a minimum of 1:3 and be revegetated with indigenous vegetation to reinstate habitat and to ensure bank stability.
3		Construction of the cattle housing unit within the 500m Zone of Regulation (GN509) but at least 50m from the delineated boundary of the wetlands.	*Excavation of foundations for the cattle housing; *Stockpiling of excavated soils; *Mixing and casting of concrete; and *Trampling by construction personnel.	*Compaction of the surrounding natural area of the wetland (due to trampling and vehicle movement) could potentially lead to altered runoff patterns into the wetland and increase the sediment load of the wetland; *Since concrete will be cast within close proximity to the wetland, potential runoff thereof into the wetland could impact on the surface water quality thereof; *Over compaction of the surrounding areas to the footprint area after the construction of the infrastructure could decrease the potential for the establishment of vegetation.	**1,75**	**3,75**	**8**	**30**	**L**	*During the excavation activities, soil removed from the footprint areas of the ponds should be stockpiled outside of the 50m buffer area surrounding the wetland, for subsequent use as part of other construction activities (construction of embankments surrounding the ponds) or as part of rehabilitation activities; *Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up. Stockpiles may not exceed 2m in height. For the duration of the construction period, these stockpiles should be covered with a suitable geotextile covering such as hessian sheeting, or if not planned to be used as part of the development, removed from the study area; *All wet concrete areas must be contained so as to prevent any contaminated runoff into the wetland during the curing process; *All concrete mixing must be done using a mixer or on batter boards. At no point may concrete be mixed on unprotected ground; *Concrete spilt outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site; *All areas associated with the construction footprint should be ripped and revegetated to ensure that no significant change to the runoff patterns from these areas into the wetland is evident; and *Stormwater from the construction site should be managed so that no contaminated runoff enters the wetland.

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
4	Operational Phase	Operation of the cattle housing units within the 500m Zone of Regulation (GN509) but 50m from the delineated boundary of the wetlands.	*Potential spillage of urine and manure into Wetland 1 during transport from the cattle housing to the effluent control pond.	*Possible incision and alteration of the hydroperiod of wetland 1; *Contamination of the surface water (if present) and soils within wetland 1.	3,5	5,5	11	60,5	M	*It should be ensured that no contaminated water from the cattle housing enters the wetland. A stormwater management plan should be in place where any stormwater from the housing units enters small earth channels, which conveys the stormwater into the effluent control ponds, rather than allowing it to drain into the wetland freely; *A regular monitoring plan should be in place (of which all records should be kept on site) which records the runoff/effluent generated from the housing units which would be pumped to the effluent control ponds; *If a spill/leakage occurs, it should immediately be cleared and prevented to spread any further; *The housing units and its stormwater management system should be cleaned at regular intervals to prevent any future spillages or leaks from occurring; *The quality of the surface water (if present) and nutrient level of the soils in the wetland should be regularly tested, to ensure that no contamination (either due to non-point surface runoff or groundwater infiltration) is occurring; and *If erosion along the wetland embankment is apparent due to concentrated surface runoff into the wetland, the surrounding buffer is to the wetland should be further vegetated to increase the surface roughness and aid in diffusing overland flow into the wetland.
			*Potential spillage of urine and manure into Wetland 2 during transport from the cattle housing to the effluent control pond.	*Possible incision and alteration of the hydroperiod of wetland 2; *Contamination of the surface water (if present) and soils within wetland 2.	1	3	10	30	L	
			*Increased impermeable surface within the catchment of the wetland, could lead to higher flood peaks entering the wetland during high rainfall events.	*Erosion of wetland embankment due to concentrated flow into the wetland.	1,5	3,5	10	35	L	

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
5		Operation of the effluent control ponds within the 500m Zone of Regulation (GN509) but 50m from the delineated boundary of the wetlands.	*Potential failure of the ponds (leakages/seeping).	*Potential contamination of surface water, groundwater or soils within Wetland 1; and *Possible incision and alteration of the hydroperiod of wetland 1.	**3,75**	**5,75**	**11**	**63,25**	**M**	*An emergency spill/leak plan should be in place in the event of failure of the dam; *Once a spill/leak from the effluent control dams have been identified, all wastewater should then rather be stored in an alternative pond until the leak has been repaired; *No stockpiling of waste may occur within the 50m setback surrounding the wetland. If stockpiling of waste does occur, this should only be a temporary stockpile, awaiting transport to its designated area (the compost facility); *All waste removed (which would be used as fertiliser) from the ponds should be transported to the compost facility using designated roads, not within the 50m buffer surrounding the wetland; *The quality of the surface water (if present) and nutrient level of the soils in the wetland should be regularly tested, to ensure that no contamination (either due to non-point surface runoff or groundwater infiltration) is occurring; *If erosion along the wetland embankment is apparent due to concentrated surface runoff into the wetland, the surrounding buffer to the wetland should be further vegetated to increase the surface roughness and aid in diffusing overland flow into the wetland.
				*Potential contamination of surface water, groundwater or soils within Wetland 1; and *Possible incision and alteration of the hydroperiod of wetland 2.	**1**	**3**	**10**	**30**	**L**	
			*Repair of the pond structure (embankment areas and/or lining) in the event of a leak/spill detected.	*Potential of stockpiled soil to enter the wetlands, potentially increase the sediment load of the wetland; *Disturbances of soils leading to increased alien vegetation proliferation, and in turn, further alter the vegetation surrounding the wetlands; and *Altered runoff patterns, leading to increased erosion and	**3,25**	**5,25**	**8**	**42**	**L**	*If any repairs to the effluent pond embankments are required, the mitigation measures as per activity 2 applies.

No.	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures
				sedimentation of the downgradient wetlands.						

6. CONCLUSION

Based on the findings of the study, the following is recommended:

1. This verification is in agreement with the findings of the report compiled by Hanekom (2018) that a watercourse is located within the study area, of which all proposed infrastructure would be located at least 50m from the delineated boundary thereof. Based on the outcome of the site assessment undertaken by SAS, this watercourse is considered to be a wetland, and not a non-perennial river as reported by Hanekom (2018). No mention of Wetland 2 was made by Hanekom (2018) within the freshwater specialist report. Nevertheless, the risks associated with the proposed expansion to Wetland 2 are considered low as it is located 220 metres upgradient of the activities.
2. A 500m Zone of Regulation in accordance with General Notice 509 of 2016, as it relates to the National Water Act, 1998 (Act 36 of 1998) and a 50m no-go setback buffer are associated with both wetland features located within the study area.
3. Based on the outcome of the DWS Risk Assessment, the risk significance of the proposed development and associated activities on the wetlands is considered to be a 'Low' and 'Moderate' risk, assuming that the mitigation measures as presented in Table 1 are implemented. It is recommended that the DWS be consulted and this report presented to them to ensure that they agree with the opinion presented herein, and to get guidance as to the requirements of a Water Use Licence Application

7. REFERENCES

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