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AGRICULTURAL SUITABILITY ASSESSMENT FOR TELLURIC FARM NEAR PLETTENBERG BAY

Report by
Johann Lanz

5 September 2022

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1 INTRODUCTION AND AIM

The aim of this assessment was to assess the suitability of the farm, from a natural agricultural resource point of view, for the proposed vineyard development. The locality of the site is shown in Figure 1.

The proposed development requires environmental authorisation and in terms of the National Environmental Management Act (Act No 107 of 1998 - NEMA), an application for environmental authorisation requires an agricultural assessment. However, it should be noted that this assessment is not an agricultural impact assessment in the usual sense of such an assessment. The main impact of concern in agricultural impact assessments is the loss of agricultural production land. In this case, agricultural production land and production potential are being created by the activity that has triggered the assessment. The aim of this assessment is therefore to confirm whether the site is viable or not for the crop that is proposed, and that the soil resources on the site will not be damaged by the proposed activity.

Figure 1. *Locality map of the proposed farm north of Plettenberg Bay.*

It should further be noted that the screening tool agricultural sensitivity of the site, which focuses on the value of agricultural land with respect to its potential loss, and the associated site sensitivity verification, is not relevant in the case of agricultural establishment.

2 METHODOLOGY

The assessment was based on information provided by the viticulturist for the proposed project, Megan van der Merwe. She assessed a number of potential sites in the area before the proposed farm portions were purchased for the development. Those assessments included fairly detailed soil test pit investigations to determine soil suitability for vineyards. The proposed site was chosen and purchased above several other potential sites because the soils were assessed as suitable. The viticultural assessments included climatic assessment of the area.

This assessment by Johann Lanz was also informed by existing soil and agricultural potential data for the site. Soil data was sourced from the land type data set, of the Department of Agriculture, Forestry and Fisheries (DAFF).

Information on the quantity and quality of available irrigation water was sourced from Steenekamp (2022).

3 ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE OR DATA

There are no specific assumptions, uncertainties or gaps in knowledge or data that affect the findings of this study.

4 RESULTS

A satellite image map of the site is given in Figure 2.

The underlying geology of that part of the site where vineyard establishment is proposed, is conglomerate, sandstone, siltstone and mudstone of the Enon Formation, Uitenhage Group. The land type data (Land type Db28) indicates that the soils are shallow to moderately deep (250 to 700 mm) duplex soils with a clay content of between 10 and 25% in the upper soil horizons and are predominantly of the Valsrivier, Sterkspruit and Estcourt soil forms. Megan van der Merwe's field investigation of test pits confirmed the dominance of Estcourt and Sterkspruit soils on the site.

These types of soils are not the traditional types of soils used in the South African wine industry and pose certain challenges for effective wine production. However, similar soils are very effectively used in some of the newer wine areas such as the Agulhas area. Although such soils are challenging, high-end viticultural practices with high levels of management input, such as this farm plans, can deal effectively with such conditions.

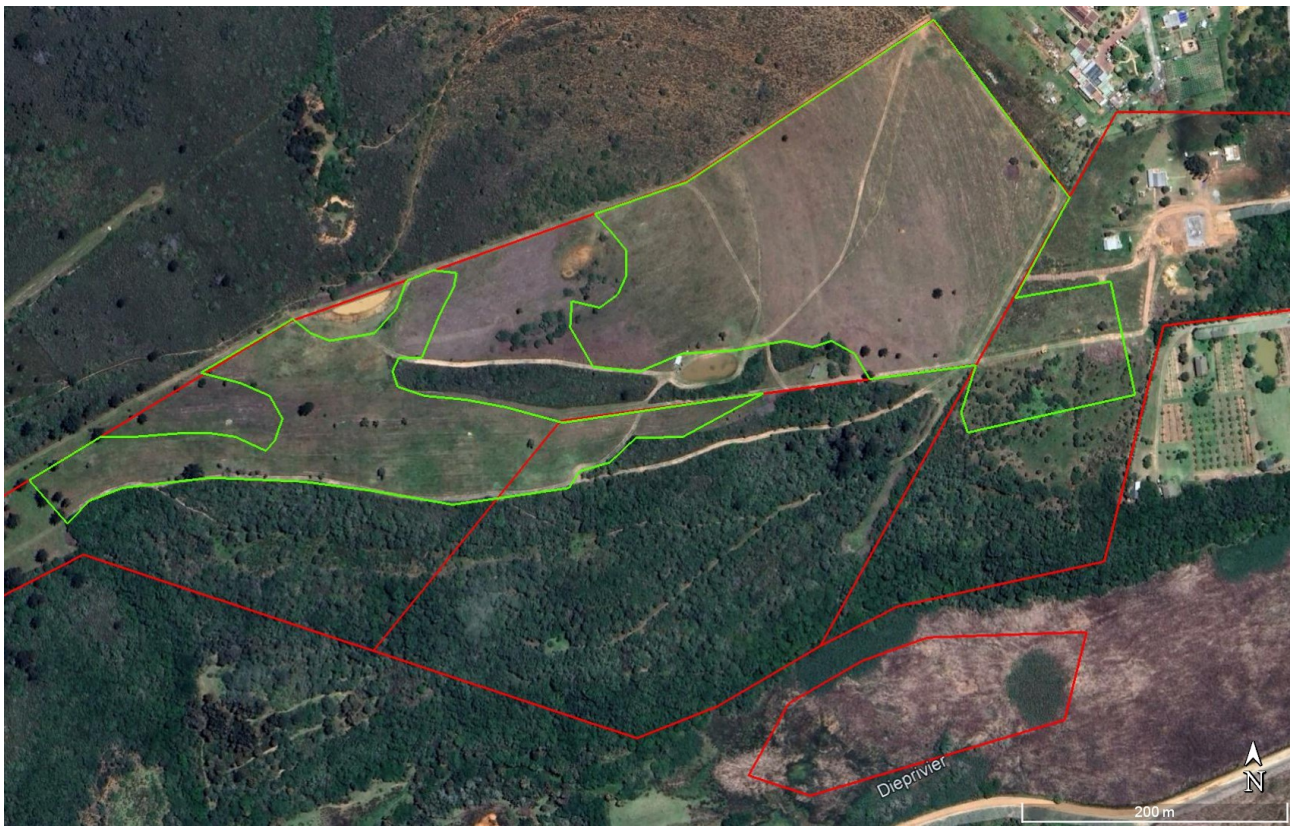

Figure 2. *Satellite image map showing the planed vineyard area (green outline).*

Water quantity and quality from the available borehole as given by Steenekamp (2022) is suitable for the irrigation requirements of the proposed vineyards.

5 CONCLUSION

An assessment of the available information from the on-site soil investigations, that were done for the purposes of site selection and planning, confirms that the site is suitable for wine production. The soils are shallow to moderately deep duplex soils with a clay content of between 10 and 25% in the upper soil horizons and are predominantly of the Sterkspruit and Estcourt soil forms. Although such soils pose challenges for wine making, this assessment is confident that the site can be effectively used for the proposed vineyard development and that the soil resources on the site will not be damaged by the proposed activities. Therefore, from an agricultural suitability point of view, it is recommended that the application be approved.

6 REFERENCES

Department of Agriculture, Forestry and Fisheries (DAFF), 2002. National land type inventories data set. Pretoria.

Soil Classification Working Group. 1991. Soil classification: a taxonomic system for South Africa. Soil

and Irrigation Research Institute, Department of Agricultural Development, Pretoria.

Steenekamp, G. 2022. Telluric: Report on geohydrological investigation as technical input to the water use license application. Unpublished Report.

APPENDIX 1: SPECIALIST CURRICULUM VITAE

Johann Lanz
Curriculum Vitae

Education

M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - 1997
B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I have been registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science since 2012 (registration number 400268/12) and am a member of the Soil Science Society of South Africa.

Soil & Agricultural Consulting **Self employed** **2002 - present**

Within the past 5 years of running my soil and agricultural consulting business, I have completed more than 170 agricultural assessments (EIAs, SEAs, EMPRs) in all 9 provinces for renewable energy, mining, electrical grid infrastructure, urban, and agricultural developments. I was the appointed agricultural specialist for the nation-wide SEAs for wind and solar PV developments, electrical grid infrastructure, and gas pipelines. My regular clients include: Zutari; CSIR; SiVEST; SLR; WSP; Arcus; SRK; Environamics; Royal Haskoning DHV; ABO; Enertrag; WKN-Windcurrent; JG Afrika; Mainstream; Redcap; G7; Mulilo; and Tiptrans. Recent agricultural clients for soil resource evaluations and mapping include Cederberg Wines; Western Cape Department of Agriculture; Vogelfontein Citrus; De Grendel Estate; Zewenwacht Wine Estate; and Goedgedacht Olives.

In 2018 I completed a ground-breaking case study that measured the agricultural impact of existing wind farms in the Eastern Cape.

Soil Science Consultant **Agricultural Consultors International (Tinie du Preez)** **1998 - 2001**

Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

Contracting Soil Scientist **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

Completed a contract to advise soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

APPENDIX 2: DECLARATION OF THE SPECIALIST

Note: Duplicate this section where there is more than one specialist.

I, **Johann Lanz**, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
  - ~~am not independent, but another specialist that meets the general requirements set out in Regulation 13 have been appointed to review my work (Note: a declaration by the review specialist must be submitted);~~
- in terms of the remainder of the general requirements for a specialist, am fully aware of and meet all of the requirements and that failure to comply with any the requirements may result in disqualification;
- have disclosed/will disclose, to the applicant, the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.

Signature of the specialist: 

Date: **5 September 2022**

Name of company: **Johann Lanz – soil scientist (sole proprietor)**

2022

AGRICULTURAL AGRO-ECOSYSTEM SPECIALIST ASSESSMENT AND MANAGEMENT PLAN FOR A FUTURE-CENTRIC FARM: TELLURIC.

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Introduction

ACME Capital (PTY) Ltd have recently purchased a small, 30.24 ha property situated on a small hill in Plettenberg Bay, with 10 ha available for the establishment of vineyards under the brand of Telluric Farm. The owners have decided to realign the cadastral boundaries to isolate the Northern part of the property most suitable for agriculture – a portion of 17.5 ha. They plan on retaining only 17.5 ha of the 30.24 ha total area, which will serve as the study site for this environmental assessment.

The proposed small wine grower will be located on a small hillside above the Dieprivier Vlei in Plettenberg Bay, facing predominantly South East. Annual production will begin at 2730 cases (6 x 750mL) in year one (leaf 3) with the aim to increase to 6860 cases by year four. The farm will produce mainly the following two vinifera varietals: Pinot Noir and Chardonnay. The majority of the wine will be sold directly from the (to be developed at a later stage) on-site tourism facility. This facility will serve two goals – as a tasting room where wines can be sampled and purchased by direct customers for off-site consumption, as well as a restaurant where wines are to be paired with fresh food grown from said farm for on-site consumption, as well as distribution to the local community. Harvested from a small 1 ha portion of the property, produce will travel a much shorter distance from farm to fork, significantly minimizing the food's carbon footprint.

The proposal aims to augment the current land with compatible use which is not only sustainable, but generates a positive socio-economic return. The report has been prepared in order to not only apply with the requirements of the CARA application for cultivation of virgin land, but also to serve as critical insight into how Telluric farm intends to revolutionize the way we look at agri-ecosystems through the lens of viticulture in the Plettenberg Bay wine region.

The ACME Capital team is also responsible for the birth and successes of a young wine farm, Beau Constantia, in the historic Constantia wine region. Beau Constantia is the result of a rehabilitated Constantia Wild Park – originally a goat farm destroyed by devastating fires of 2000, which destroyed most of the existing pastures and resulted in the germination of a dense stand of alien vegetation. The land was purchased in 2002 and before any work could begin an extensive alien clearing program was undertaken, including the clearing of a firebreak around the border of the farm. During the clearing processes any indigenous trees amongst the alien species were retained with the intention to restore the site to its original pristine state.

They planted their first vines in 2003 and today the property prides itself with 11 ha of the 22 ha property under vine. Annexure A provides insight into the development journey of Beau Constantia.

Socio economic impact

Bitou population, employment and education

According to the 2017 Bitou Municipality SEP (Socio-economic Profile) the 2018 estimated population was 56 422, with a calculated population of 61 184 by 2023, equating to a growing rate of 8.5% in that time span. In Bitou, the dependency ratio was 46.1 in 2011 and will be 46.3 in 2023, after a peak of 47.7 in 2018. This ratio expresses the dependency of people who are part of the workforce and those, who are depending on them (children and seniors). A higher dependency ratio means a higher pressure on social systems and the delivery of basic services (Department of social development, 2017).

The official unemployment rate from the 2001 census is 30.1% with the youth unemployment rate (ages 15-34) being 37.9%. A total of 25.9 percent of students that enrolled in Grade 10 in 2014 dropped out of school by the time they reached Grade 12 in 2016. According to the 2017 Bitou Municipality SEP these high levels of drop-outs are influenced by a wide array of economic factors including:

- Unemployment
- Poverty
- Indigent households
- High levels of households with no income / households earning less than R515 a month

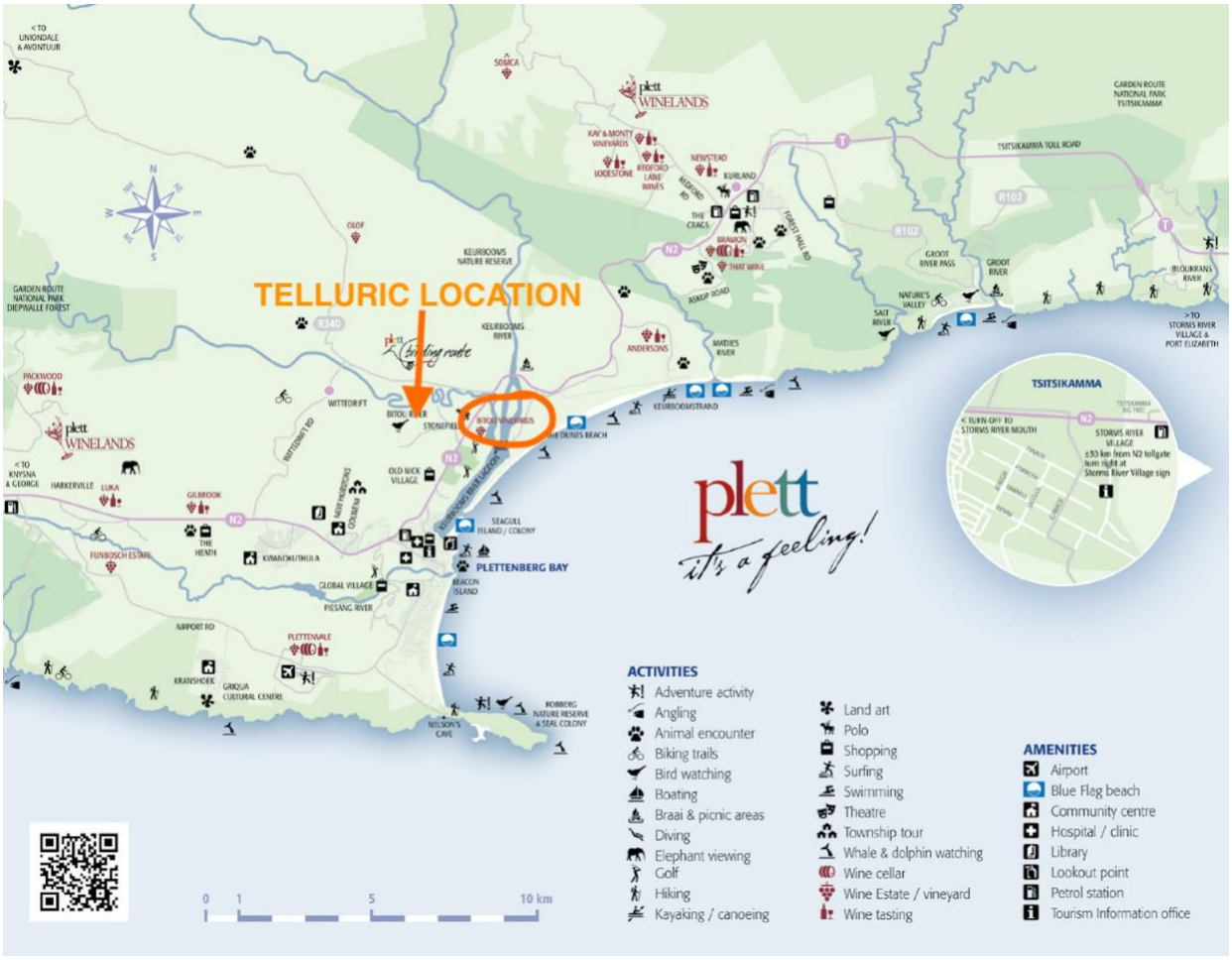
Opportunity

In terms of viticulture, the region is young. Expansion has mainly been focused toward early ripening white varietals, however, according to Plettenberg Bay Tourism, the red varietals are showing favour of late. As a region and as growers within a new region it is important to continue the growth pattern of new plantings and new role players. The regional yardstick has always been toward growers in the Western Cape. However, the region's recent successes, awards and positive reports all tend toward further expansions.

In identifying and assessing potential environmental impacts associated with the proposed development, Telluric has carefully considered the socio-economic impacts on surrounding place and people.

The Plettenberg Bay Winelands Area comprises of a number of wine estates, scenic routes and cultural landscapes and is considered a destination place. The review has found that although the site is located right on the urban edge, the development of agricultural opportunity for tourist-related infrastructure in the area should be supported. Telluric purely aims to connect the dots of a sparse greater Plettenberg Bay Wine Route by starting/ finishing the successes of the already established route. This represents an opportunity for the sustainable development of current rural territory and the creation of further tourism opportunity that will contribute to efficient progress of the region as a whole.

In the below image the extent of the Plettenberg Bay Wine Route can clearly be seen, with the proposed location of Telluric farm a mere 1km away from its closest wine-producing neighbour, Bitou Vineyards:



Distance from Telluric to Bitou Vineyards: 1km

The key social issues associated with the establishment and development phase include:

A) Potential positive impacts:
- Creation of employment and business opportunities for locals.
- Support for local economic development and tourism.

B) Potential negative impacts:
- Noise, dust and safety impacts associated with the movement of heavy vehicles.

The Development option would represent an opportunity to support the development of

tourism in the area. The employment and investment opportunities associated with the establishment and operational phase, as well as the benefits associated with attracting visitors will be hugely beneficial.

Establishment/ Development phase:

- Telluric will inform the local authorities, local community leaders and organizations about the potential job opportunities for local builders and contractors.
- Telluric will establish a database of local construction companies in the area, specifically SMME's, prior to the commencement of the development.
- Telluric will look to employ the labour required for the establishment/ development phase from the local Bitou community with narrow focus on the Wittedrift area in order to maximize opportunities for members from the local community.
- Contractors appointed will ensure that workers are transported to and from the site on a daily basis.
- Contractors should ensure that the construction site area is fenced off and movement of construction workers to and from the site is monitored.
- All work will adhere to Regulations in terms of the Basic Conditions of Employment Act No 75, 1997.
- Construction-related activities should comply with all relevant building regulations.

Operation Phase:

- Telluric will inform the local authorities, local community leaders and organizations about the potential job opportunities.
- Telluric will employ majority workers from the local Wittedrift community.
- Telluric will liaise with the local Plettenberg Bay Tourism Association and other key stakeholders to identify ways in which opportunities for the local businesses and the tourism sector can be enhanced.

Staff requirement:

Labour is the largest cost component of wine grape producers (Vinpro, 2019) and has been calculated to represent 40% or more of their total cash expenditure. Staff numbers required on an operational vineyard (Vinpro, 2019) have been calculated to 1-unit staff/ha and Telluric will therefore employ 10 permanent staff members purely to tend to the 10ha of vineyards inter alia.

Due to the establishment requirements and the means to farm with minimum mechanization, however, another 15 temporary workers will be required for the Establishment phase (first 3 years), as well as the seasonal work to follow in the years thereafter.

In addition to farming staff above, the farm will also permanently employ 2 security guards from onset. Once the restaurant/ tourism side of the business has been developed, further opportunity will be created for at least another 22 permanent staff members (chefs, FOH, kitchen and cleaning staff) as well as a further 20 waitrons

The go-ahead on this project's development thus would be of significant benefit to the community in terms of job creation, skills development and local economic development. The proposed development would also encourage tourists to the area. The proposal also fits with the forward planning frameworks for the area, especially with regard to tourism development (Plett Tourism, 2021). The latter statement referring to future prospects for the region as set out by Plettenberg Bay tourism. According to the tourism body there is a possibility for a wine processing and packaging plant that would provide additional agri-tourism products in the area to contribute towards a greater initiative. Additional funding may be provided by private and public sector partners with Wesgro, WITU, Vinpro and private sector.

Dormell Properties 139 (PTY) Ltd (of which ACME Capital (PTY) Ltd is a subsidiary) has proved its socio-economic service through its Cape Town brand and farm "Beau Constantia" where:

- They serve an 11.42 ha vineyard-established property with 10 permanent employees on the farm side, 2 permanent employees in their offices, 4 security guards, 10 part time tasting room staff members and 15 seasonal workers for the vineyards.
- Their restaurant employs 22 chefs, 2 Front of House staff members and 20 waitrons.
- They have started an education trust that benefits the children of their long-standing farm employees; the income for the trust being funded through the sale of water bottled from source on site.
- They endeavor to continually offer courses and educational workshops to their staff; investing in their personal growth, while equipping them with skills to better perform their duties.
- They host bi-annual charity fundraisers in aid of NPO's focused on education for previously disadvantaged learners.

Wine farming

Agriculture may be one of the most impactful sectors on the environment, but it is also the main source of survival for the human race. The late few years have shown an increase in the growing interest of companies and the scientific community in the social aspects of agriculture. Sustainability in terms of environmental impact is no longer seen as a single bottom line and the three areas of interest in sustainability now comprise of: economic, environmental and social. When considering an integrated sustainability strategy, in proportion to its social and economic relevance, the wine sector has a limited environmental impact (Trioli, Sacchi, Corbo and Trevisan, 2015).

In particular: According to the January 2021 Macro Economic Impact of the South African Wine Industry on the South African Economy, it found that in 2019 the total wine industry socio-economic impact (sum of direct, indirect and induced effects) was as follows:

A) South African economy (national impact)
    a. Contributed R55 bn to GDP (at market prices), equal to 1.1% of GDP;
    b. Supported 269,096 jobs (1.6% of national formal and informal employment),…
    c. …which resulted in a total household income of R19.1 bn;
    d. Contributed R98.1 bn to net capital formation/utilisation;
    e. Resulted in a tax contribution of R17.9 bn…
    f. … which is equal to 1.4% of all tax income received by the government;
    g. Made a net positive contribution of R8.3 bn to the Balance of Payments;
    h. Provided a further 12,878 people in the tourism industry with jobs (5,809 permanent employees, 4,414 casual employees during peak season and 2,655 casual employees the rest of the year).
    i. The wine industry's economy-wide multipliers and efficiency ratios are higher than that of the average South African industry, making it an attractive sector to stimulate growth.

B) Western Cape economy (provincial impact)
    a. Contributed R31 bn to GDP (at market prices);
    b. Supported 166,652 jobs…
    c. …which resulted in a total household income of R9.3 bn;
    d. Contributed R50 bn to net capital formation/utilisation;
    e. Resulted in a tax contribution of R12 bn.

Wine farming through Permaculture

Theorized and turned practice by Australian researcher and biologist Bill Mollison, Permaculture is defined as "a portmanteau of permanent agriculture and permanent culture" (What is permaculture?, 2021), a scenario where an agriculturally productive ecosystem is consciously designed to have the diversity, stability and resilience of natural ecosystems.

It is known that there is no possibility of stable social order without agriculture (What is permaculture?, 2021). It is also known that we only make up but a small part of the total natural species assembly. Yet, most cultivated ecosystems are entirely anthropocentric. Telluric aims to use the principles of permaculture in designing a holistic viticultural venture that integrates landscape and people in perfect harmony to create a sustainable, healthy, profitable and productive system. We understand that there is a way to work with nature, instead of against it.

Intensive agriculture has led to a loss of biodiversity in our agro-ecosystems and Telluric's farming philosophy is aimed at reducing these negative impacts and restoring biodiversity by

implementing conservation actions within their farmed landscape. In turn, they believe this philosophy is win-win as the enhancement of biodiversity also provides beneficial ecological services to their vineyards, such as: Agricultural production, biological pest control, maintenance of soil structure and fertility, carbon storage, nutrient cycling and the regulation of hydrological cycles and microclimate.

By integrating ecological infrastructures into the vineyards, they will improve the quality of production whilst maintaining the quality of the landscape.

Telluric Operations Guideline

CONSERVATION AND IMPROVEMENT OF THE FARM AND VINEYARD ENVIRONMENT

ENVIRONMENT MANAGEMENT FOR CULTIVATED AREAS AND FARMING ACTIVITIES:

- **Slopes** in excess gradient of 30% will not be cultivated to vineyards in order to prevent erosion. Beau Constantia is famous for farming vineyards against some of the steepest Agricultural slopes in the Western Cape with majority of the planted surface falling within the slope class >30 and with slope percentages of 101-321% without any impacts from erosion by means of connecting different contours at roughly 100m intervals.
- **Roads** will avoid any sensitive ecological areas[1] and will be designed with erosion threats in mind.
- Telluric will also conserve the 0.42 ha area surrounding the single *Muraltia knysnaensis* that was found by David Hoare Consulting (Pty) Ltd.
- **Water management plan** implemented to ensure efficient water use
- **No pesticides** will be used in the farming of vineyards, thus no drift from vineyards into natural areas.
- **No fertilizer run-off** will threaten adjacent natural areas[2] as no chemical fertilizers will be applied during farming of the vineyards in order to prevent:
    - The spread of alien plants
    - Poisoning of indigenous plant species
    - Poisoning of aquatic animals
- **Cleaning products** for all use will be environmentally friendly, preventing:
    - Pollution of water sources
    - Pollution of soil by greywater utilization
- **Corridors of natural habitats** will be retained between the continuous areas of natural habitat fragmented for establishment of vineyard blocks. These corridors are seen by Telluric as essential in order to link fragmented space to allow for continuous ecological processes such as:
    - Species movement
    - Pollination
    - Nesting
- **Rehabilitation** is of utmost importance and Telluric aims to restore and re-create habitats on the site previously disturbed. Careful research and consultation will go into the selection of species that will form part of this process, such as:
    - Utilization of locally collected seed
    - Utilization of species historic to the area
- Telluric values all of its available resources and will aim at producing as close as possible to zero waste. For any waste that may generated, the Telluric **waste management**

[1] I.e. wetlands or rare plant populations.
[2] Especially wetlands and rivers.

program will at all times abide by the rules, laws and regulations set out by the National Environmental Management: Waste Act, No 59 of 2008.

- **Fuel tanks and fuel use** will be efficient and conservative.
- **Invasive alien plants** are seen as threat to the environment by causing direct habitat destruction, increasing the risk and intensity of wildfires, and reducing surface and sub-surface water. Telluric will control such alien plants occurring on the property, including cultivated and natural areas.
- Telluric farm takes their responsibility for the **prevention and management of all fires** potentially occurring on their land seriously and will comply with the rules and regulations set out in the National Veld and Forest Fire Act of 1998 in terms of:
    - Sufficient fire breaks, free of combustible material
    - Farm roads in cultivated areas serving as fire breaks
    - Having a compiled fire-fighting plan for the farm
    - Having sufficient, maintained, fire-fighting equipment
    - Training farm staff in fire fighting
    - Joining a Fire Protection Association (FPA) to ensure that they comply with legislation.

  Furthermore, Telluric overall will serve as a large fire-break to combat wildfires spreading across the greater natural landscape as their Beau Constantia Farm managed to serve as firebreak on the Vlakkenberg during the devastating Cape wildfire of March 2015 that had started in the mountains above Muizenberg and spread as far as Constantia and Cape Point, during which 5000 ha of land were reduced to ashes. The firebreaks established around Beau Constantia, as well their trained fire team, managed to contain the fire on their South-Easterly border, curbing the spread further down into Hout Bay and over onto the Table Mountain World Heritage Site.
- Telluric farm will keep **electricity usage** as efficient and sustainable as possible with all available technologies being utilised in order for us to keep consumption from the Plettenberg bay electricity grid as small as possible.
- **Air and noise pollution** threats will be managed preventatively.
- Telluric will conserve threatened ecosystems, rivers and wetlands.

CONSERVATION AND IMPROVEMENT OF NATURAL AREAS

Telluric draws inspiration from studies concerning large permanent habitats in the region in order to conserve/create/improve on ecological infrastructures to serve as ecological compensation areas amongst cultivated *Vitis Vinifera* species. They will retain and develop:

a) Stepping stones (small habitats on site that allow the build-up of animal populations)
b) Corridor structures (to assist animal species in their free movement between large regional habitats and the smaller, developed, stepping stones.

According to the International Organization for Biological and integrated Control (IOBC), a minimum of 5% of farmland is required for designation as ecological infrastructures in order to maintain an adequate diversity of species. Telluric is determined to exceed this number.

Telluric will also conserve the 0.42 ha area where a single *Muraltia knysnaensis* was found by David Hoare Consulting (Pty) Ltd.

SOIL AND TERRAIN

Soil is the fundamental foundation of our business. It has an effect on the performance of the grapevine cultivars planted to a specific site and the suitability of this specific terrain has been studied for the planting of the following grape varieties:

- *Vitis Vinifera* Pinot noir
- *Vitis Vinifera* Chardonnay
- *Vitis Vinifera* Sauvignon Blanc
- *Vitis Vinifera* Syrah
- *Vitis Vinifera* Gamay Noir

The following aspects have been considered in the suitability of the terrain for above-mentioned species:

- Vigour
- Delayed budding
- Disease pressure
- Ripening
- Quality
- Macro climate
- Meso climate
- Historic weather data

In order to prevent the future disturbance of the soil it is vital that proper soil preparation only be implemented for the fragmented areas where vineyards are to be established. In the long run, this will aid in preserving healthy soil microbe biodiversity as well as well as prevent erosion by aiding in water infiltration to deeper lying soil layers, through the layers of physical limitations that currently prevent healthy root growth.

Comprehensive soil studies have been taken and Telluric aims to rehabilitate the soil whilst minimizing as far as possible chemical adjustment materials. During the **once-off soil preparation process** tractor and implement traffic on the soil will be kept to an absolute minimum to prevent counter-productive soil compaction. This means that carbon-releasing soil

preparation work will only happen at establishment, after which the farm will follow a no-till philosophy with permanent cover crops adding, rather than subtracting, to their important soil carbon sequestration strategy. Moreover, as perennial crops with a relatively deep root system, vineyard soils are suggested to have great potential to sequester Carbon (Suddick et al., 2013).

SOIL SURVEY

Land capability (Cape Farm Mapper):

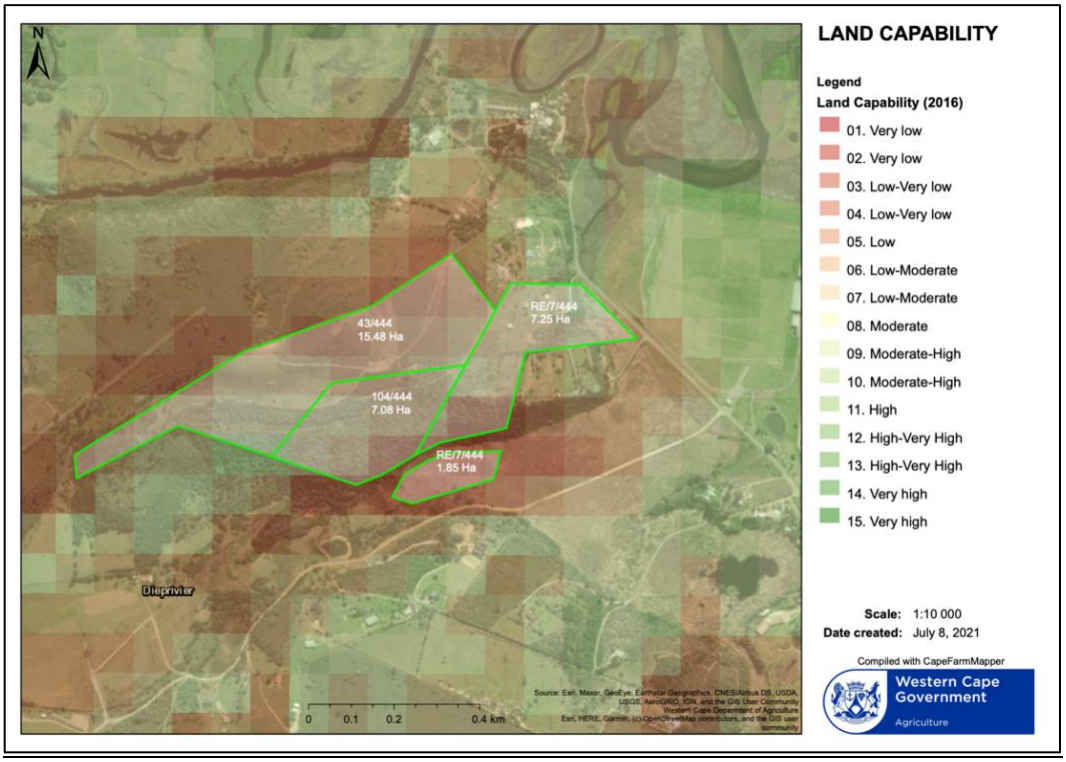


Figure A: Agricultural sensitivity based on Land capability from Cape Farm Mapper.

ERF 104/444:

Land Capability (DAFF 2016)

Land Capability (1-15):	06. Low-Moderate
Soil Capability (1-9):	06. Moderate-High
Terrain Capability (1-9):	03. Low
Climate Capability (1-9):	06. Moderate-High

ERF 43/444:

Land Capability (DAFF 2016)

Land Capability (1-15): 06. Low-Moderate
Soil Capability (1-9): 05. Moderate
Terrain Capability (1-9): 03. Low
Climate Capability (1-9): 06. Moderate-High

ERF RE/7/444:

Land Capability (DAFF 2016)

Land Capability (1-15): 09. Moderate-High
Soil Capability (1-9): 05. Moderate
Terrain Capability (1-9): 06. Moderate-High
Climate Capability (1-9): 06. Moderate-High

It is important to note that vineyards for quality wine production require soils falling within the Moderate to Moderate-low land capabilities as is the case for **ERF 104/444.**

Methodology:

In order to assess the impact of the impact of the proposed agricultural activities on the site comprehensive soil studies have been done. The soil survey was conducted using:

A) Soil sampling
B) Profile pits
C) Dynamic Cone Penetrometer readings

Soil classification is based on the Soil Classification Taxonomic system for South Africa. Descriptions for different soil forms as well as results for chemical analysis of samples taken are included in the report. The survey was conducted on ERF 104/444 and ERF RE/744 in serious detail and on smaller portions of ERF 43/444.

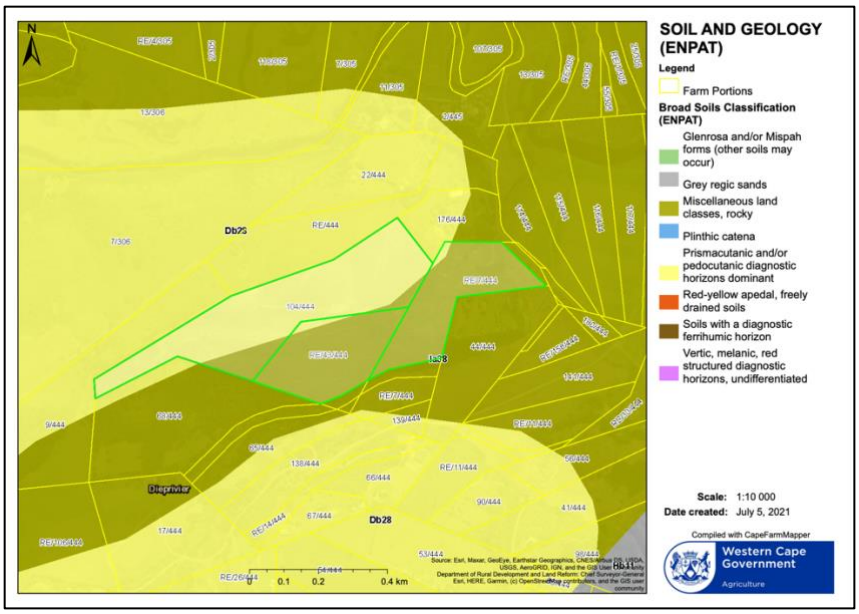


Figure B: Soil and geology as indicated on Cape Farm Mapper – Prismacutanic and/or pedocutanic diagnostic horizons are dominant.

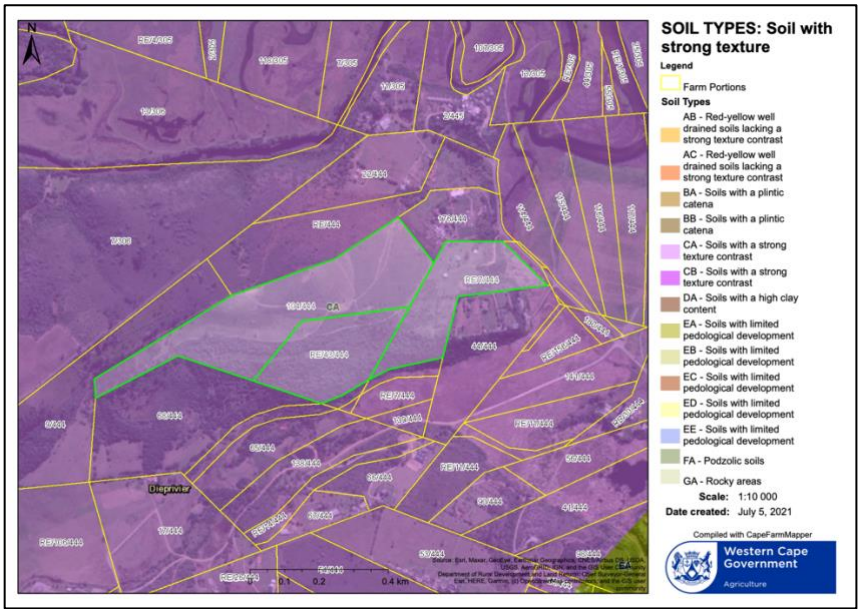


Figure C: Soil Type map by Cape Farm Mapper shows that soils present a strong texture contrast between horizon layers.

SOIL CHEMICAL ANALYSIS

Figure D: Markings indicating locations of the various soil samples taken from the properties.

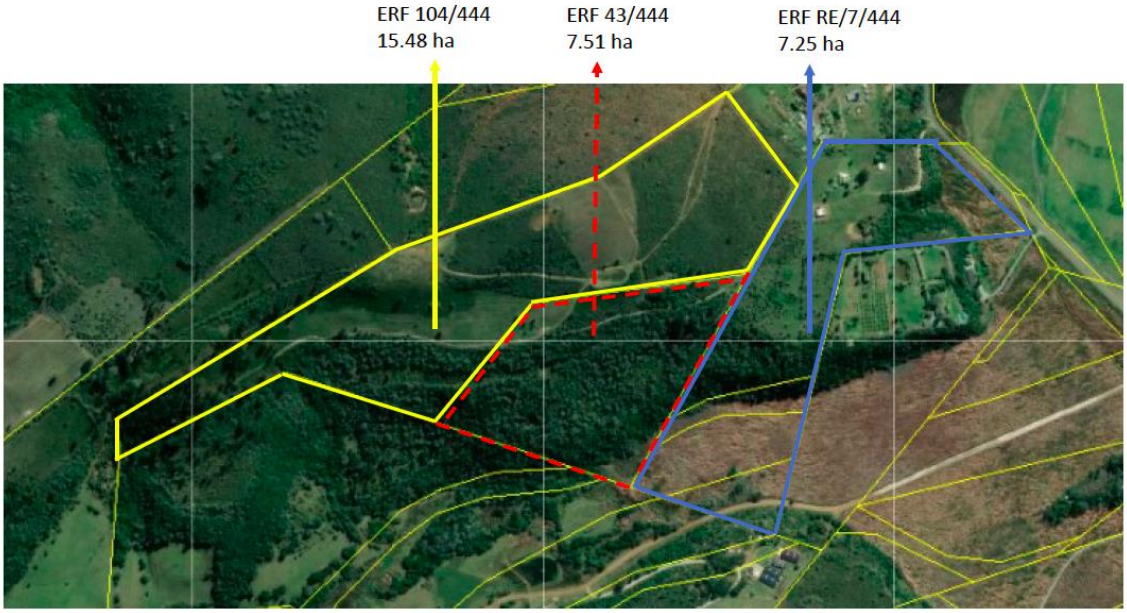


Figure E: Markings indicating the different erf numbers.

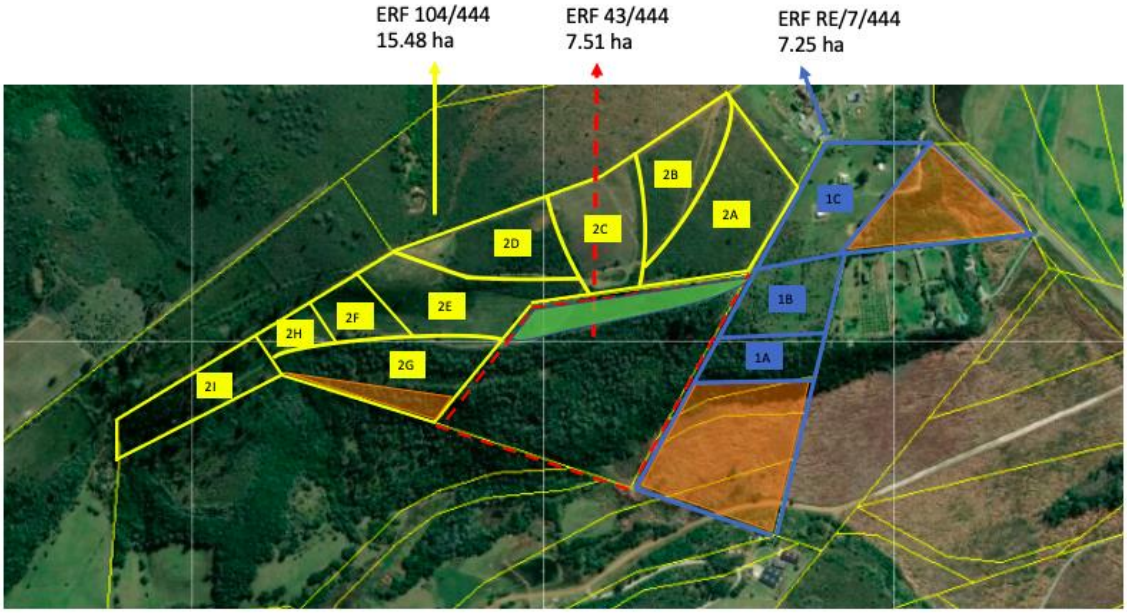


Figure F: The different erf units were subdivided into smaller units (1A-1C for ERF RE/&/444 and 2A-2I for ERF 104/444) according to soil groups and slope.

Note: Area indicated in ORANGE not suitable for planting.
Area indicated in GREEN is a suitable portion for planting within ERF 43/444.

Below the soil analysis interpretation of the different erf units as per the subdivision in *Figure F* above:

Texture

Since soil texture influences potassium and phosphor norms in particular, it is essential to make a distinction between sandy, loamy and clayey soils. This also serves as an indication of the expected leaching tempo of nutrients such as nitrogen, magnesium and potassium.

pH

The pH of soil is determined in potassium chloride (KCl) or water (H2O). Bemlab uses the KCL method. When the soil solution has a pH(KCl) below 5,5 (pH (H20) < 6,5), it means that the amount of active hydrogen ions (H+) is too high, which causes soil to be overly acid and to have a negative effect on root growth. Lime should therefore be applied to make a correction.

Given the Ca (cmol/kg) > Mg (cmol/kg), as in the case of Table 1 below, the amount of lime per hectare that has to be applied for each 300 mm depth, has been calculated as follows:

Orchard	pH	Stone	Ca/Mg Ratio	Lime (ton/ha) for each 300mm	
	KCl	Vol %	Ca/Mg	Calcitic	Dolomitic

1A	5.83	25	3.29	0.00	0
1B	5.60	7	1.41	0.18	0
1C	5.35	11	1.33	0.85	0
2A	5.11	7	1.28	2.33	0
2B	5.40	24	1.93	0.00	0
2C	5.70	87	1.86	0.24	0
2D	4.80	20	1.64	3.81	0
2E	5.03	2	1.40	2.10	0
2F	5.00	0	1.34	2.55	0
2G	5.90	18	2.26	0.00	0
2H	5.15	51	1.37	0.90	0
2I	4.55	25	1.08	0.00	0

Table 1: Lime requirements per ha.

Lime, phosphorus and potassium are to be added to the soil surface before ploughing.

The two kinds of lime that may be applied, are calcitic lime ($CaCO_3$) and dolomitic lime ($CaMg(CO_3)_2$). Dolomitic lime only has to be applied if the Ca:Mg ratio is higher than 5. A mixture of the two (1:1) is sometimes recommended if the ratio is around 4.

Lime is not easily soluble in water and therefore moves very slowly in the soil. Consequently, it should be applied during soil preparation so that it can be worked into and mixed with the soil at a depth of up to 900 mm. If the pH is lower than 5,5 in existing vineyards, as with the areas on this particular piece of land highlighted in yellow above, the lime requirement should only be calculated to a soil depth of 300 mm. Lime is then worked into the topsoil with a fork, spade or wiggle plough.

Furthermore, the calculated lime requirement should be adjusted downwards depending on the stone volume percentage. According to the stone volume percentages for the two properties, the lime additions will be affected as follows:

Orchard	pH	Rock correction	Final lime addition
	KCl	%	t/ha per 300mm
1A	5.83	0.75	0.00
1B	5.60	0.93	0.17
1C	5.35	0.89	0.76
2A	5.11	0.93	2.17
2B	5.40	0.76	0.00
2C	5.70	0.13	0.03
2D	4.80	0.80	3.04
2E	5.03	0.98	2.05
2F	5.00	1.00	2.55
2G	5.90	0.82	0.00
2H	5.15	0.49	0.44
2I	4.55	0.75	0.00

Resistance

Resistance, measured in ohm, is reciprocal to conductivity (mS/m). Salts, e.g. calcium and sodium, conduct electricity and reduce the resistance of the soil solution. A low resistance in the soil thus indicates the presence of large quantities of salts in the soil, i.e. the soil is saline.

Various kinds of brackishness are encountered in soils. Both the exchangeable sodium percentage (ESP), i.e. the percentage constituted by Na of the total amount of exchangeable cations (S-value), and the specific resistance serve as criteria for classifying the type of soil brackishness.

With average resistance figures far exceeding 300 ohm and the ESP < 15 %, it means that there is no issue with brackishness in the soil on either of the two properties.

T-Value

Estimation of the cation exchange value of the soil.

Phosphor (P)

In soil analysis reports phosphor is usually indicated in mg/kg. Texture is an important factor when determining the P-requirement. If the Bray II method of analysis is being used, the norms are as follows:

0 – 6 % clay (Sandy) : 20 mg/kg P
6 – 15 % clay (Loamy) : 25 mg/kg P
> 15 % clay (Clayey) : 30 mg/kg P

The site showed the following:

Orchard	Clay	Thus texture	Phosphate (Bray II)	Doublesuperphosphate requirement
	%		Mg/kg	tons/ha
1A	28	Clayey	34.125	0
1B	25	Clayey	14.9	0.604
1C	25	Clayey	7.412	0.90352
2A	24.7142857	Clayey	1.44222222	1.142311111
2B	25	Clayey	2.25	1.11
2C	36	Clayey	2.2175	1.1113
2D	18	Clayey	5.5	0.98
2E	28	Clayey	4.25	1.03
2F	27	Clayey	1.5	1.14
2G	37.6666667	Clayey	7	0.92
2H	33	Clayey	2.4	1.104
2I	31	Clayey	2	1.12

For this site with >15% clay, the P-content should be augmented to the specific norm of 30mg/kg P. For soil preparation the average P-content is determined to 600 mm soil depth, or:

$$\left(\frac{30mg}{kg} - Pvalue\right) x\ 2\ x\ \frac{depth}{15}\ x\ \frac{100}{20}$$

During the harvest 0,7 kg P is removed for each ton of grapes produced and post-harvest maintenance fertilization should be calculated accordingly, except where soil analyses indicate the P-content to be optimal or above the norm. It is important not to apply excessive amounts of P, since this may limit potassium uptake. Phosphate contents of more than 50 mg/kg in sandy soils, 60 mg/kg in loamy soils and 70 mg/kg in clayey soils, may be problematic.

Potassium (K)

As with P, soil texture plays a role in the interpretation of soil analyses, partly because K is leached very quickly out of sandy soil, otherwise because clay mineralogy plays an important role in K-binding. On sandy soils K-fertilisation is not recommended during soil preparation, seeing that it may easily leach out on such soils. A broad norm which may be set for K-nutrition, is that the K-content of the soil should constitute 4 % or more of the total exchangeable cations (S-value in soil analysis table). This norm is not, however, applicable to soils with a history of gypsum or lime applications, or where the resistance is lower than 500 ohm, or where the pH (KCl) is higher than 6, or where the calcium ions amount to more than 5 cmol/kg. In such cases laboratory analyses show an unrealistically high “cation exchange capacity (CEC)” and if the K-content therefore has to be adjusted to 4%, very large quantities must be applied.

The following general norms may be used as guidelines for maximum K-values of non sandy soils. In the main, these norms are linked to the differences in clay mineralogical types occurring in the various regions, and are more or less representative of K-contents which constitute 4% of the total interchangeable cations:

Coastal region : 70 mg/kg
Breede River area : 80 mg/kg
Olifants River area : 100 mg/kg
Karoo : 100 mg/kg
Orange River area : 120 mg/kg

K-adjustment during soil preparation is only required in exceptional circumstances. Where shortages do occur or are expected in heavy soils, the average K-requirement is determined to a soil depth of 600 mm. Where the K-content is below the norms mentioned above, K-fertilisation should be applied. In the case of production vineyards the K-content is only determined to a soil depth of 300 mm. The requirement per hectare is 4,5 kg of K to increase the K-content in the soil by 1 mg/kg over 300 mm in depth. This boils down to 9 kg KCl per ha or 11,25 kg K2SO4 per ha. During soil preparation (to a soil depth of 600 mm) 18 kg KCl per ha or 22,5 kg K2SO4 per ha should therefore be applied for each 1 mg/kg increase required in the soil.

If K-contents in production vineyards are optimal, apply maintenance fertilisation of 3 kg K per ton of production per annum. To determine whether KCl or K2SO4 should be applied, the resistance should be taken into account. Potassium sulphate is only recommended when the resistance of the soil is less than 500 ohms. Since excessive K-contents in the soil may cause problems with colour and pH in wine, over-fertilization should be avoided.

Nitrogen (N)

Nitrogen is not applied at all during soil preparation. After establishment 30 kg N per ha may be applied to young vineyards after budding. In clayey soils this should suffice for the year. Sandy soils should receive an extra 30 kg N per ha both after flowering and in the late summer.

SOIL FORMS

At large, the Telluric site is underlain by formations of the Cape Supergroup Sedimentary rocks, which occurs on the surface along the SA South coast. It is known for its iconic deformation that has created the Cape Field Mountain range. Telluric, specifically, is located on a large deposit of Kirkwood conglomerate, siltstone and mudstone with a 20-30m unsaturated root zone.

Profiles presented soils with special subsoil characteristics relating to pedogenic accumulation and having an orthic topsoil. This means soil forms form part of the Duplex Soil Group, meaning marked textural contrast between layers through clay enrichment, with diagnostic Pedocutanic or Prismacutanic B horizons being dominant.

The transition from the overlying horizon to the subsoil is clear with a sandy topsoil deposited on top of the clayey subsoil. Sodium and magnesium often play a role in dispersion of the clay in the topsoil and, where applicable, the E horizon, after which it is leached to the subsoil. The clay enriched subsoil has a high clay content, and 2:1 clay minerals of the smectite dominate the clay fraction, allowing the soil to swell and shrink when wetted and dried out again. The subsoil soil has a very strongly developed pedocutaneous or prismacutaneous structure.

Due to the abrupt transition to the B horizon, the topsoil becomes very wet and, if not stabilized, becomes subject to water erosion (also as a result of the high sodium content which promotes dispersion), further requiring that the land be properly prepared. Prevailing slopes on the property (<20%) will aid in the drainage potential with low-lying areas usually showing slow internal drainage and limited external drainage.

It was found that the majority of the area is covered by the soil form Estcourt, with only a small portion of the site covered by the soil form Sterkspruit. These soils are brownish, strongly structured, on partly decomposed parent rock, with good nutrient reserves and water-retention properties. They do, however, show some physical limitations and require deep soil preparation via a downward mixing and shift trenching action before planting – a hallmark for successful South African viticulture (Sawis).

The lower wing lifts and breaks up the subsoil and lets it fall back before reaching the surface, while a second, smaller wing operates about 30cm below the surface, breaking up the topsoil. The topsoil then tumbles into the space right behind the plough, mixing downwards. This allows for the sharp contrast between the light topsoil and heavy subsoil textures to be broken up and for the upper soil layer and limiting gravel layers to be mixed downwards into the clay subsoil without ploughing the clay up to the surface. The latter is prevented by using the correct tool design during a period when the clay subsoil is dry so that it does not "peel upwards".

Estcourt (Es1200)

Orthic A
E-Horizon
Prismacutanic B

1000 – E-Horizon grey when moist
B horizon has continuous black cutans on vertical ped faces 1200 NUWEPLAAS

Sterkspruit (Ss1200)

Orthic A

Prismacutanic B

1000 – A Horizon not bleached
Red B Horizon 1200 BETHULIE

The image below (Figure G) shows the proposed land for agricultural use. Blocks have been placed in accordance to best fit as well as shape of the contours.

The total area under vine does not exceed 6.81 ha with 4.5 ha to provide animal movement corridors and shelter (further discussed below). Roads can be seen as per “proposed circular road” with a connecting parking area that guests will journey from by foot to the proposed restaurant seen at “vineyard center point”. Furthermore, the two Farm sheds refer to buildings already existing on the property that will be converted into staff cottages and a working shed. All wetlands areas have been considered in the development of this land. The proposed plan also shows two main dwellings (1 and 2) for which space will be retained in the case that the owners would wish to later move onto the property.

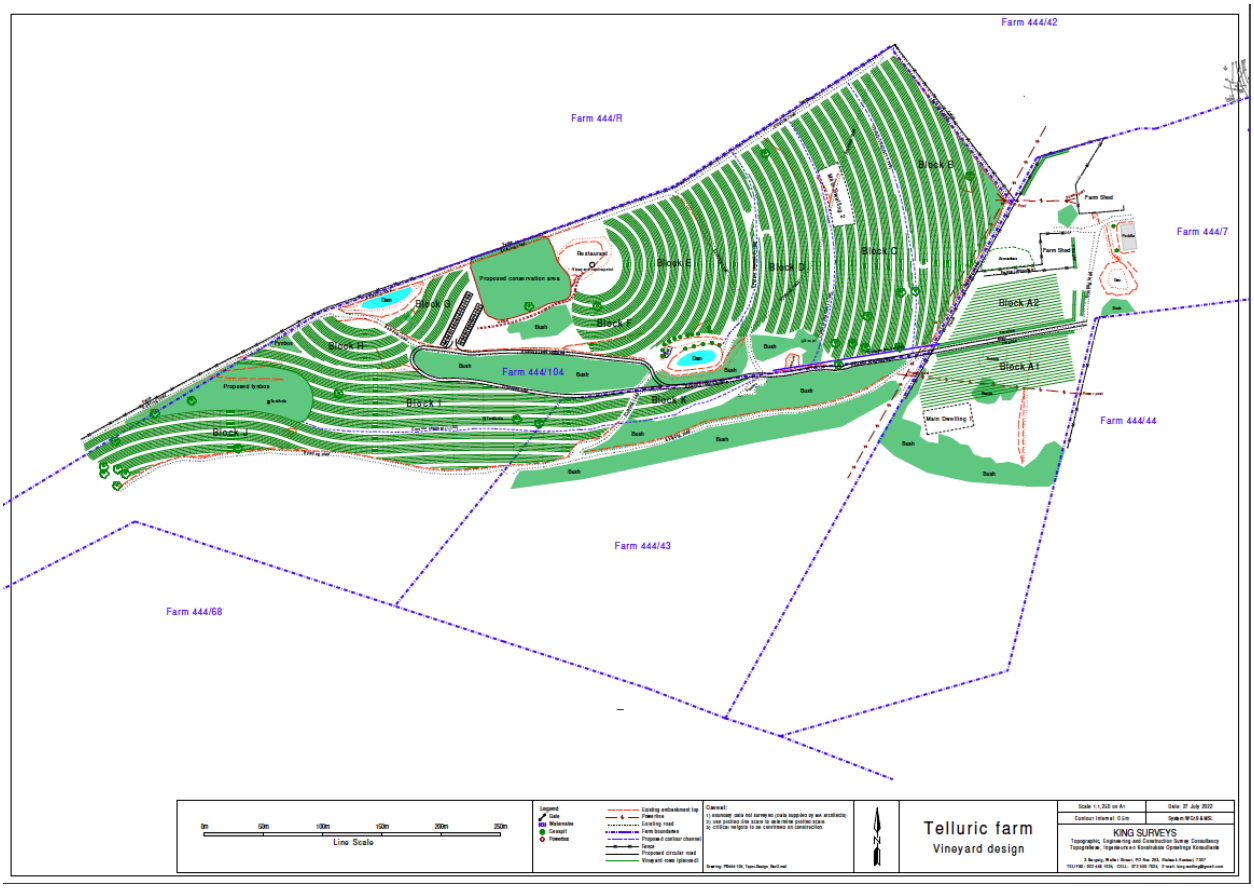
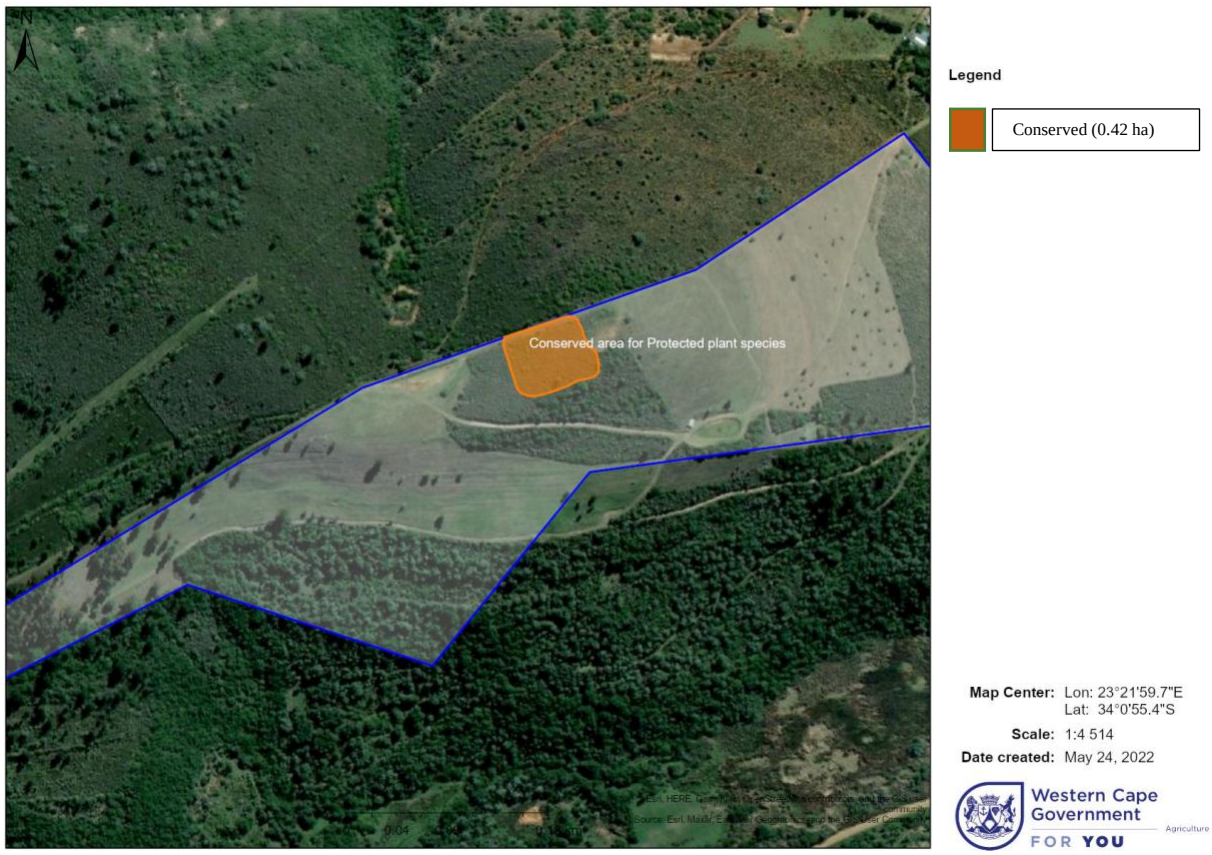


Figure G: Proposed Agricultural land use indicating blocks to be established

Further to Figure G above, below is a larger terrain map to show the exact perimeter of the potential suitable habitat for the *Muraltia knysnaensis* which Telluric will conserve. This is also indicated under “Proposed Conservation Area” in figure G.



TERRAIN

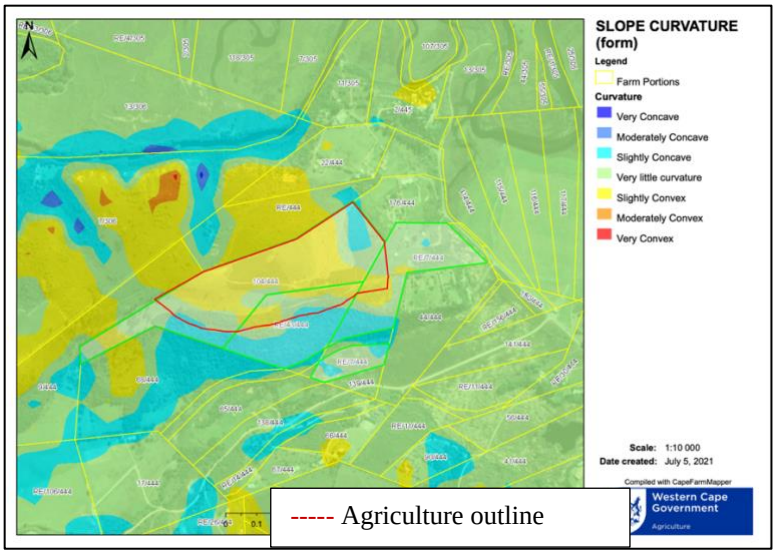


Figure H: Slope curvature as per Cape Farm Mapper.

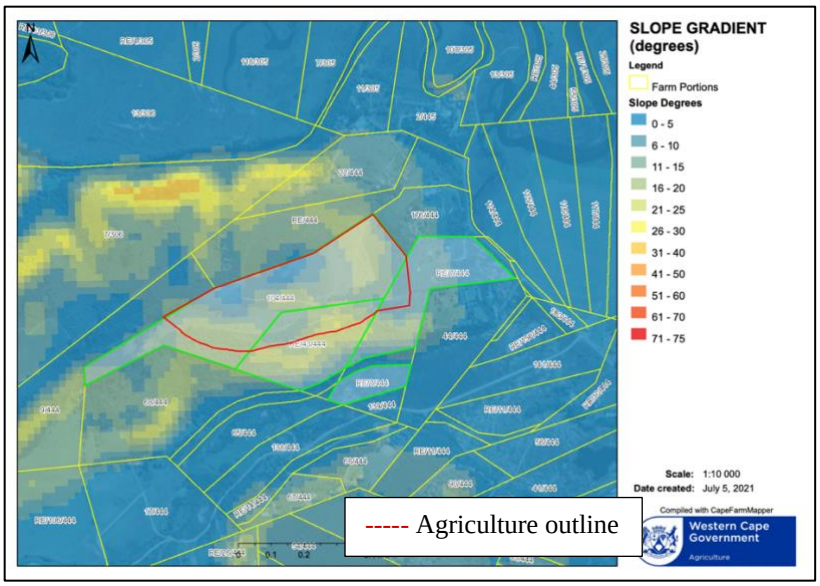


Figure I: Slope gradient degrees per Cape Farm Mapper.

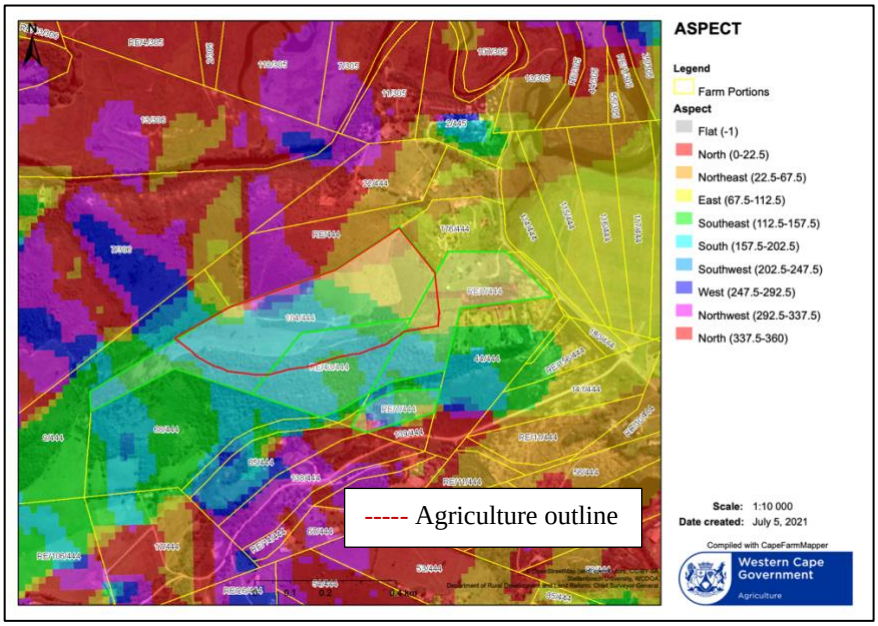


Figure J: Aspect per Cape Farm Mapper.

CULTIVARS AND ROOTSTOCK

It is vital to select *Vitis Vinifera* cultivars suited to the terrain in order to limit use of chemicals for the cultivar to survive in situ, for example with regards to disease susceptibility. The aim is for minimum intervention by man, and only healthy, certified, planting material will be used.

Rootstocks for grafting of above-ground fruit-bearing cultivars will be selected based on their:

- Resistance against prevalent soil-borne pests
- Suitability for the soil physical and –chemical conditions

This will further minimize the intervention required by man for the successful cultivation of quality grapes.

VINEYARD LAYOUT

- Vineyard layout will be designed in such a way, whereby:
    - Gradient erosion is non-existent
    - Micro-climate is naturally managed (influencing disease susceptibility and the need to intervene)
    - Row direction, plant width, training system and vine development ensure optimum air movement and sunlight exposure
    - The use of precautions such as contour drains, drainage ditches and rock-filled sumps in water-breaking/ erosion prevention are limited
    - Windbreaks will take the shape of retained indigenous vegetation
    - The use of growth tubes will be deemed unnecessary in preventing environmental pollution
    - Spacing will be a function of soil potential to prevent excessively dense canopies that require intervention.

CULTIVATION PRACTICES

- By creating favourable conditions during soil preparation, cultivation practices can be kept to an absolute minimum.

Training system:

- Telluric will make use of the *Sur Échalas* vine training system (also known as single-pole viticulture)
- The reason for the above training system is two-fold, enabling a productive ecosystem:
    - Increased quality
    - Lower environmental impact
- "Gobelet training has been used since Roman times. The spurs are arranged on short arms in an approximate circle at the top of a short trunk, making the vine shape look like a glass or goblet. Vine density can be as high as 9 000 vines per hectare" (Wines of South Africa - Blogs - Stok-by-paaltjie, 2022)
- By simply establishing each bushvine/ gobelet next to its own pole, significant differences are achieved in microclimate. According to Wine of Origin South Africa; Where traditional trellis-wired vertical shoot positioning is two dimensional, this

system allows for 360° light penetration. And with the fruiting zone only elevated by around 40 cm, it still translates into 2-3°C cooler micro-climate and improved air circulation.

- By using *Sur Échalas* a higher vine density can be accommodated against uneven slopes without having to reshape/ shift the natural contours of the land or cut terraces that would ultimately release large amounts of carbon.
- It is expensive to develop and costly to maintain, but produces high quality wine whilst reducing the per square meter footprint.

Floor management:

- Cultivation of indigenous permanent cover crop will improve water retention and soil structure and control unwanted weeds.
- There will be no application of non-organic chemical herbicides.
- Telluric firmly disapproves of conventional so-called "clean cultivation" due to the associated risks of soil erosion, negative effects on soil structure and water retention capabilities.
- Cover crop cultivation will exist in every work row and take form as one of the following:
  - Planting of vegetables to be used in the restaurant and community feeding scheme
  - Natural, indigenous species already existing on the site left undisturbed.
  - Introduction/ establishment of indigenous permanent cover.

  Above will assist in:

  - The no-use of harsh chemical herbicides
  - Combatting soil erosion and – compaction
  - Improvement of the soil structure
  - An increase water infiltration and conservation
  - Increase organic matter content of the soil
  - Stabilize soil temperatures
  - Providing overwintering sites for natural enemies to pests

- No mechanization will be used to manage the permanent cover.

NUTRITION

Unnecessary application of nutrients contributes to:

- The pollution of rivers, dams and other water sources via leaching
- Excessive vegetation leading to an increase in disease pressure and a much higher requirement for chemical intervention
- Susceptibility to fungal diseases and insects (specifically Nitrogen)

Representative soil samples will ensure that only nutrients removed from the soil during the growth season will be replaced. The nature of the nutrition philosophy will be biodynamic and aim towards utilizing resources on-site.

CORRIDORS OF NATURAL HABITATS

When large, continuous areas of habitat are broken up into disconnected fragments, many ecological processes that keep these systems functioning are disrupted and many species could disappear. Corridors of natural habitats are needed to link fragments to allow species movement to continue.

In designing vineyard block layout Telluric will utilize both retention of existing corridors as well as the establishment of new biodiversity corridors with indigenous species suitable to the specific habitat. These corridors will, amongst others, include stream bank vegetation and wide road-side verges,

Corridors of natural vegetation will be kept between blocks to provide animal movement corridors and shelter, and new corridors will be established throughout blocks to connect them. Any rehabilitation efforts are valuable in enhancing the health of naturally occurring habitats. Yet if incorrect species choices are made, re-planting can do more harm than good. For that reason, an indigenous landscaper will be consulted for species suitable for planting in the area.

Rehabilitation will utilize locally collected seed or species that historically occurred in the area. Properly designed and managed farm dams should attract a variety of birds, insects and animals to the area and so contribute to conservation of biodiversity. Dams will not be stocked with alien fish such as small-mouthed bass and trout which decimate indigenous fish populations. Farm dams stocked with indigenous fish species can make a significant contribution to conservation.

The regional equivalent for Cape Nature will be consulted regarding the most environmentally friendly and effective methods for control for problem animals. Control of household pests like rats and mice will utilize environment friendly methods to prevent poisoning of predators and raptors (e.g. owls) and bird boxes will provide nesting opportunities for these natural predators inside the vineyard blocks.

Bees are naturally occurring in the area and the permanent covers and natural corridors need bees to pollinate them. Cover crops help regulate soil Nitrogen levels, increase organic matter soil content and help improve the water-holding capacity of the soil. They also eliminate the need for chemicals use. Having cover crops in the vineyard and consequently, bees, create a healthier ecosystem for vines that then produce better quality grapes.

Having a sustainable ecosystem is the key for any organic and biodynamic winegrower; that’s why Telluric will also have beehives around the vineyards.

There are several benefits of honeybees in the development of berries and bunches. For example, bees can aid in removing calyptras during flowering and set and so help reduce the occurrence of millerandage (mostly known for the Pinot Noir variety) due to the persistence of the calyptra. They can also be used as entomovectors in the place of *Trichoderma koningii* – fungi used as biological control measures against *Botrytis Cinerea*. Honey from the hives will be used in the later developed restaurant. In order to improve on the site's vertical diversity, Telluric will plant at least one native fruit tree per ha. By attracting birds, insects and other groups of animals they will promote the long-term colonization of the new ecosystem.

Telluric will also provide structural elements such as dry-stone walls (from local stone such as schists with dry joints) with dual functionality – to preserve biodiversity and allow for improvement of the structural vineyard landscape. A simple, natural, structure like the one above can play a vital role in biodiversity preservation by acting as a reservoir for several fauna- and flora species, some natural enemies to vineyard pests. The numerous cavities and crevices provide favorable conditions for many species of reptiles (wall lizards, snakes), mammals (hedgehogs and shrews), birds and insects, including wild bees, beetles and ants and also for spiders. In terms of viticulture, one can utilize these stone structures to plant vineyards into the property's hillside, mitigate erosion, hold the soil, slow down runoff of water and allow the penetration into the soil and replenishment of reserves.

IRRIGATION

Water is considered as one of the most important natural resources in farming and thus the consumption of water on the farm will follow the model and principles set out by sustainable agriculture and not negatively impact the surrounding environment, but instead strive to regenerate all consumable resources. The vineyards will be dryland cultivated as far as possible and only deficit irrigation will take place if required for successful cultivation of the viticultural crop.

Irrigation is required to provide water to any crop to meet crop growth and evapotranspiration requirements when there is insufficient water from rainfall or existing soil moisture. Due to Plettenberg bay's annual rainfall being less than 800mm of rain a year (±700mm annually) we cannot fully use dry land farming, however by making use of deficit irrigation we can use many of the dry land farming principles and thus ensure water is used conservatively. In the future when the vines have been planted, irrigation will begin and as stated will only happen during drought sensitive growth stages of the vine. An advantage of the Plettenberg bay climate for the conservation of water is that most of its rainfall occurs during the summer months when the vine is drought sensitive and transpiration is highest. This will help us minimize our water usage during sensitive growth stages as there will be more water available in the soil for the vine.

Water irrigation legal aspects according to department of Water and Sanitation National Water Act, 1998 (act no. 36 of 1998) regulations require that the taking of water for irrigation purposes be measured, recorded, and reported.

All water that is taken from a water source for the purposes of irrigation require that the water user measure the volume of water used/extracted from such a water source. Telluric farm will so install and operate a water measuring device to measure water taken from a potential water resource, and of course, cover the expenses of installation.

The installation of the water meter will fall in line with the guidelines stated in the above-mentioned regulation. Important aspects of this regulation include:

a) The self-registering water measuring device will be suitable for the water source.
b) Records of volumes extracted/used will be measured at end of each calendar month or according to the water use authorization for at least 5 years.
c) Accuracy of water measuring device will be tested and proof of verification will be kept.

Aspects relating to the keeping of records include:

a) Within seven days from the last day of each month the authorities will be provided with the measured monthly volume and any other information required by the authority.
b) On demand by the authority records of the monthly volumes will be provided for.

WATER SYSTEMS

Telluric water use strategy

Telluric Farm aspires to follow a conservative water use strategy when it comes to irrigation of the vines and its general farming practices, however due to Plettenberg Bay's annual rainfall statistics they cannot follow a dry land farming strategy but can adopt many of the strategies' principles. The farm will need to apply for a water use license from the Department of Water and Sanitation (DWS), the need for a water use licence is mainly due to the inconsistent annual rainfall as well as the amount of annual rainfall being well below the 800 mm per annum threshold for dry land farming.

Another major deciding factor in having to obtain the water use licence is that within the Bitou municipality the rules and guidelines that govern a general water use licence fall well below the volumes that are needed for them to run optimally. They have estimated that the vineyard alone needs to be supplemented with ±22 000 m3 of water a year for irrigation purposes. This abstraction volume is not set in stone and will fluctuate with the annual rainfall volumes. Due to this the best possible source for this volume of water is a borehole, under Bitou municipality regulations the use and establishment of a borehole needs to be registered with the DWS and due to the abstraction volumes per annum they need to obtain the water use licence.

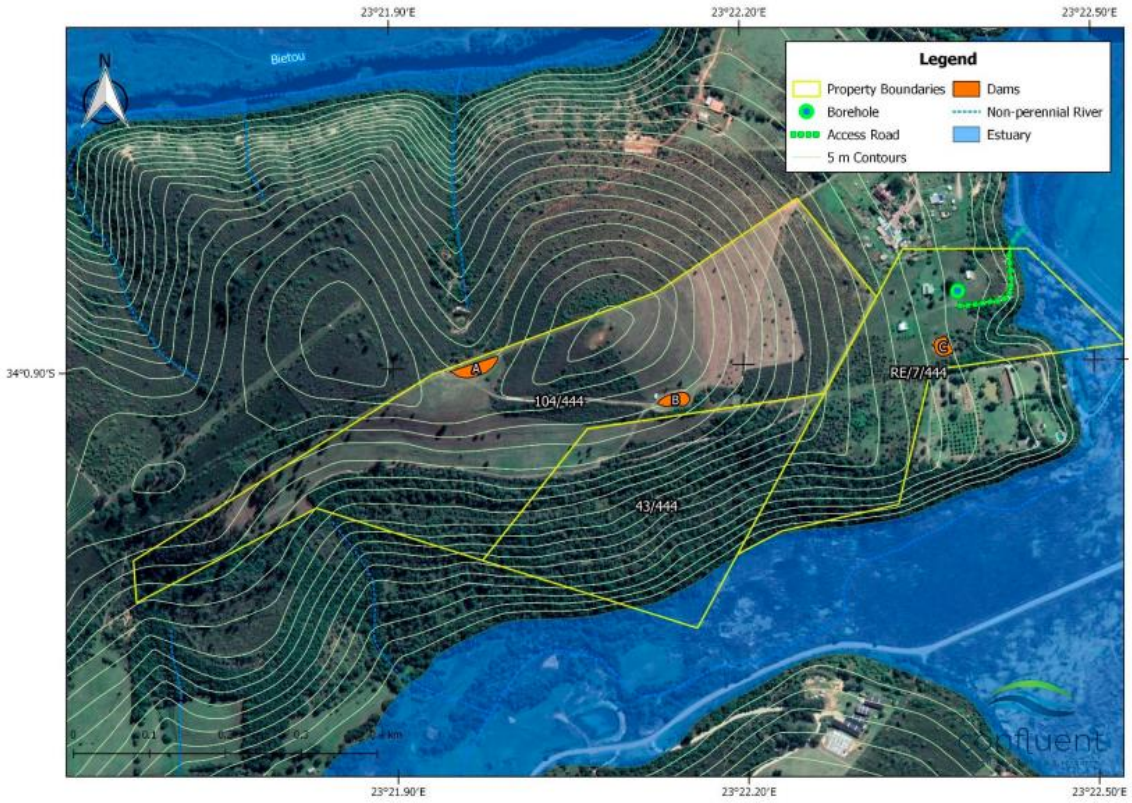
On Telluric farm there are three established dams situated across the properties, all sitting sit at low lying catchment areas so that water naturally falls towards them. All three of the dams have been confirmed by water specialist Dr. James Dabrowski to not impede on the natural function of wetlands and all other water catchment areas.

The two top dams (labelled A & B) have built furrows that help funnel runoff towards them. The furrows help maximize the capture of the runoff as well as prevent soil erosion by channeling the runoff towards the catchment areas. Dam C will be the main water-holding dam and furrows on either side of the main road leading up to property 104/444 from RE/7/444 will allow for water to drain into this main dam via gravity.

As vineyard blocks are placed, roads and other structures that might alter the flow of water additional furrows will be built in order to ensure maximum runoff is funneled into the catchment dams. In order to ensure these dams are efficiently storing water, all three dams will undergo a restoration and upgrading process. These processes will include the clearing, grading and proper sealing of the dams via sodium bentonite clay application (sealing process explained at the bottom). There will be one main dam used for irrigation on the farm (dam C). Dam C will likely be used as the catchment dam for all rainfall that falls on the Eastern side of the farm. Due to its location, they can effectively funnel rainwater towards it using furrows/water channels as they develop the future blocks on the Eastern side. None of the dams are registered with Breede-Gouritz catchment management agency (BGCMA). Telluric will need to register all 3 dams with the agency to ensure legal use.

It is most likely that the annual rainfall in Plettenberg bay will not be substantial enough for irrigation needs and in order to supplement irrigation needs Telluric would need to pump water out of a borehole that is marked and labelled on the bottom property.

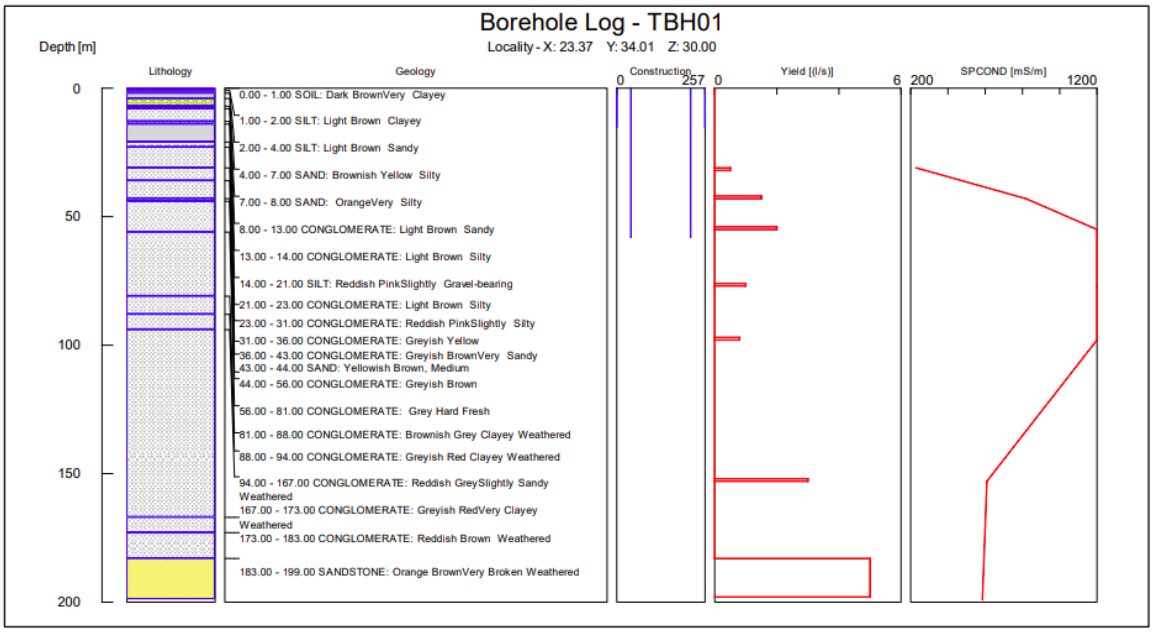
The water will be pumped from the borehole to Dam C and then from C to tanks at the peak of the peak of the property. This will be the most effective way to move the water as Dam C and the borehole are situated on the same side of the mountain. They then plan to irrigate either side of the farm via gravity instead of having to pump it from one dam all around the farm.



Above one can see the different dam locations (Obtained from the Aquatic Assessment Report for Cape EAPrac), as well as the location of the borehole.

The Borehole on Telluric has been designed and built in such a way to not interfere with any shallow groundwater and is considered a deep aquifer. The borehole has been drilled to a depth of 195 m and the design of the borehole is as follows: The first 15m of the hole has 10'' steel casing installed to stabilise the top portion of the hole, the next 43m has 8" steel casing. From the surface down to ±150m of the borehole has been steel cased and grouted, this ensures that the space between the steel casing and the borehole is sealed in order to prevent contamination from upper water table seeping down thus ensuring they don't impact the shallow water table that is of ecological importance. The remaining 18-20m will have perforated PVC pipe installed which has been gravel packed to ensure water is able to enter the well but will keep out any small sand and silt particles present in the aquifer. This is done to ensure the quality of water is optimal.

The design of this hole is of vital importance to them to ensure they do not contaminate or impact any ecologically important shallow water tables. Due to the utilizing of such a deep-water aquifer the quantities of water available has been estimated to 8280 L/Hr as a sustainable yield at 24h a day and 365 days a year - a substantial rate that will coincide with water demands if they are to ever increase because of unbeknown pressures such as low annual rainfall years. Below a diagram of the borehole design supplied by Geohydrologist Gerhard Steenekamp.



Restoration and sealing of the dams

The dams will be emptied via pumping of all the water into a holding tank or sleeve. Following this, the soil in the dams that need to be sealed should be loosened to a depth of 200 – 300 mm and all slopes in the dams need to be adjusted to roughly 18-20 degrees. All organic matter, plants and foreign matter/materials (stones, rocks, roots, etc…) should be removed and the soil needs to be prepared to wet of optimal conditions (this refers to adding water to the area needing to be sealed until the moisture content is over the optimal so that wet of optimal compaction can occur). Then the bentonite clay needs to be spread over the wet area via raking or something similar and mixed into the soil by either hand, disc plough or rotary tiller in order to achieve an homogeneous mixture. After the sodium bentonite has been mixed in a plate compactor needs to be used in order to seal and smooth the area. The final sealed thickness should be approximately 100-150mm.

The total planned storage capacity of 5000 to 10 000 cubic metres exceeds the upper limit which can be generally authorized. Dam enlargement therefore requires a WULA as per section 21 (b) of the NWA.

PRUNING AND TRELLISSING

The pruning system, as well as the trellis system will be designed in such a way that it achieves optimum vine shape (optimally spaced shoots). The South African wine industry at large currently utilizes wooden trellising posts treated with chemicals creosote or copper-chromium-arsenate (CCA) to prevent rot or infestation by pests. The use of theses posts is of concern to Telluric from

a point of negative health- and environmental impacts, specifically with reference to soil health and potential contamination of the site.

Telluric has considered the following options as alternative trellising solutions:

- Steel
- Concrete
- Plastic
- Untreated wood

From an environmental perspective wood has the lowest carbon footprint. Forests are highly efficient carbon sinks and carbon dioxide is stored throughout a wooden medium's entire lifetime, further sequestrating gas from the atmosphere. It is, as a medium, biodegradable and hence does not contribute to environmental pollution. It is a renewable resource and so the most sustainable option to consider. The wooden poles will be pressure treated with Tanalised™ E, which is new to South Africa. It is made up of Organic Azole Biocides and **recycled copper** and the most Eco-friendly treatment on the market. Follow the link below to view an independent assessment undertaken by Ecospecifier Global:

www.ecospecifier.co.za/products/product-summary/?prodid=27097

As for pruning – All pruning will take place by hand and aim at preventing excessive canopy density in order to minimize intervention later in the season (Conservation of Agricultural Resources Act No. 43, 1983). Pruning wounds on trunks and bearers will be treated with a biological control agent immediately after pruning. Several products that contain *Trichoderma* are available to prevent infection at the pruning site. *Trichoderma* spp. are fungi that occur naturally in soil, compost, above and below-soil parts of plants. As live organisms they will colonize the wound site and prevent certain fungal pathogens from entering by producing toxins and/or enzymes that are target specific.

CROP AND CANOPY MANAGEMENT

Telluric will at all costs avoid excessive summer manipulations, and will follow pruning with suckering and shoot thinning immediately. The team will further address excessive vigour and density of vegetation early on, by:

- Selecting the appropriate rootstock,
- Selecting the appropriate training system
- Selecting the appropriate *Vitis Vinifera* clones
- Utilizing correct pruning techniques
- Adjusting any means of nutrition to achieve no more than a balanced source-sink ratio

GROWTH REGULATORS

By cultivating correct clones of cultivars already ideally adapted to the environment, no growth regulators or stimulants will be necessary.

INTEGRATED PEST AND DISEASE MANAGEMENT

PEST MANAGEMENT

Telluric will manage vineyard pests in such a way that chemical control can be eliminated as far as possible, and will ensure the application of biological chemicals if intervention is at all necessary.

The strategy involves comprehensive monitoring of pests and deems natural enemies absolutely essential. The following pests could be found in some sections of the vineyards:

Vine Mealybug (*Planococcus ficus)*	
General affects	• Mechanical damage • Vector for leafroll virus

Control	• Mealybug development is highly dependent on the temperature – after 7 to 10 days at an average of 25˚C, crawlers hatch from eggs
	• Weeds such as Cape mallow, nightshade and milk thistle = alt. hosts
	• <u>Integrated control:</u>
	  ○ Chemical, biological and cultivation methods are used together to control the pest
	  ○ Biological control: Augmentative releases of natural enemies.
	  ○ Chemical control using non-toxic biological insecticide Eco-BB® by means of dormancy sprays and soil drenches during dormancy with Eco-BB® at 1kg/ha for soil drenching purposes and 300g/ha for full surface-spray purposes during dormancy (end of autumn due to soil wetness prior to budding).

Monitoring	• Monitor vineyard with a history of mealybug infestation • Signs of their presence include presence of ants and a sooty mould • Sample 20 vines per hectare randomly

Ants – live in symbiosis with mealybugs
• Mealybug secrets honeydew = food for ants = ants protect mealy bugs from natural enemies therefore NB i.t.o. biological control • Chemical control – at bud swell but before bud break • Product – Antset @ 250mL/100L water

- Application - Apply to the point of run-off as a coarse spray directly to the bottom 30 cm of grapevine stems only, using a ring-spray attachment fitted to the lance of a knapsack sprayer. The trellis poles and all other structures that Ants may climb to reach the vines, are also be treated at the bottom. Apply a maximum of one application per growing season.
- NOTE: Chemical stem barriers have been found to be effective against various ant pests, including *L. humile and A. custodiens*, and are considered to be a suitable method of ant control in terms of IPM as ants are left to forage on the orchard floor where they fulfil important ecological functions such as feeding on other pest insects (Samways &Tate 1984, Moreno et al., 1987, Stevens et al. 1995 and James et al. 1998).
- We sterilize contaminated implements and vineyard workers when moving from contaminated to uncontaminated blocks.

Snails	
Monitoring	• Visibility prior to budding.
General affects	• Feeding on vine (and weeds)
Control	• Introduction of predatory birds such as chickens or ducks. They will be kept in pens during evenings to protect them from larger predators, and will roam the vineyard floor in search of snails during the season. This interaction will also be beneficial in soil nutrition by means of natural manuring.

Bud mite (Grapevine bud mite)	
Monitoring	• Vines are inspected during growth season for shoot, leaf and bunch symptoms.
General affects	• Overwinter in grapevine buds = attack = uneven/delayed bud break • Primary buds can be killed = secondary buds sprout (later than primary buds therefore less fertile or infertile = lower yields)
Control	• Several species of predatory mites control grapevine bud mite. Species from the genera *Euseius* and *Typhlodromus* are particularly important natural enemies of grapevine bud mite. • Other beneficial predators include thrips and larvae of cecidomyiid flies.

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DISEASE MANAGEMENT

It is vital that all diseases be controlled preventatively. Due to the climate of the specific site fungicides will be necessary to ensure agricultural success. Telluric will follow anti-resistance strategies to prevent any resistance buildup against said fungicides. Minimum amounts will be

applied during the season and there will be interseason rotation alternating between the different chemical groups of systemic fungicides. Below the major diseases and their control methods:

1. *Oidium (Powdery Mildew)* causes berries to burst and a fungicide registered for biological use will need to be applied preventatively at budding (2-5cm), flowering and again at pea size.

2. *Downy Mildew* prevention should start at 10cm shoot length and continue up until the point of harvest, with retention periods taken into account. Systemic fungicides will only be used prior to and during flowering, with contact fungicides to follow thereafter.

3. *Botrytis* will be managed preventatively by creating healthy airflow in the canopy during canopy management and by limiting any damage to berries by means of pests or work actions. Only if conditions for the disease are favorable (high disease pressure in the area), a targeted fungicide should be applied from *veraison.*

4. *Sour rot* will be prevented by avoiding damage to fruit by birds, Powdery Mildew, Botrytis and fruit fly.

5. *Leafroll* is a viral disease caused by a complex of viruses that shortens the lifespan of vines. The viruses are transmitted by means of insect vectors, the Grapevine Mealybug being the most important, or via grafting actions. It will be prevented by means of planting certified plant material and by controlling the Vine Mealybug (above).

WASTE MANAGEMENT

It is the duty of employer and employees at Telluric farm to ensure that any waste generated within the farm as well as from farming activities shall be properly identified, stored, managed, disposed, or recycled according to the rules, laws and regulations set out by the National Environmental Management: Waste Act, No 59 of 2008. Any waste generated and disposed of incorrectly will not be tolerated and shall affect the farm in negative manner and legal action could be brought upon the farm/company.

General waste

Definition: general waste is defined as waste that does not pose an immediate hazard or threat to health or to the environment. General waste includes domestic, building and demolition, business, and inert waste generated.

Commitment: All general waste that is generated by Telluric whether it be through agriculture, domestic or business waste will be stored, managed, and disposed of correctly. Where possible all recyclable waste will be sent to the relevant local recycling facilities. The Bitou municipality will collect all domestic refuse from the site on a stipulated day every week. The municipality uses a split bag system which we will abide by so that recycling is carried out in an efficient manner by Telluric. This will mean that all non-recyclable waste is placed in a black bag and all recyclable waste is placed in a yellow bag for differentiation.

Hazardous waste

Definition: Hazardous waste according to the Environmental Management Act and Regulations is defined as hazardous if it poses a health hazard or exhibits one or more of the following characteristics: ignitability, corrosively, reactivity, or toxicity.

Commitment: All hazardous products that are purchased by Telluric, will be accompanied by the relevant Material Safety Data Sheets (MSDS). Telluric will ensure that all hazardous products are stored correctly and meet the guidelines and storage standards set out by the IPW. All hazardous products will be disposed of in a safe and healthy manner that does not lead to any negative impact on the surrounding environment and will meet IPW disposal standards. Any unwanted or unidentified chemicals will always be treated as hazardous waste and all precautions will be taken when storing/disposing of this waste as to not allow unintentional release to the environment or exposure to people.

Bitou municipality guidelines for waste disposal

Garden waste: N/A to Telluric as we will dispose of all garden waste in our compost heap so that we are able to generate compost on site and reuse in the future for the farm.

Batteries: Wet cell batteries (used in tractors, cars, etc…) need to be stored in a sealed container in the workshop until we plan on disposing them safely. These batteries can be dropped off at our nearest battery centre. When dropping off used batteries the company accepting the battery will give us a discount on new batteries purchased due to recycling of the old battery.

Building and demolition waste: All waste produced via construction, alteration, repair or demolition of any structure that is non-hazardous and includes rubble, earth, rock and wood displaced during the mentioned activities needs to be disposed of at an approved facility. The disposal of the ‘builders waste’ is the sole responsibility of Telluric, approved sites for disposal include KK sand quarry for ‘clean builders’ rubble’. Alternatively, the ‘builders waste’ can be re-used on site.

Paint waste and empty paint containers: All water-based paints and any solvents may not be disposed of or discharged into stormwater, this can end up polluting the surrounding waterways and wetlands. The burning of empty paint cans is also prohibited as this may release any toxic

gasses into the environment. Telluric's responsibility will be to re-cycle all empty and dry metal paint containers, any leftover paint on site will be used in the future and thus all paint will be stored correctly according to the manufactures guidelines as well as any environmental guidelines to ensure no paint spills and seepage into the ground occurs. All oil-based paints need to be disposed of at a hazardous landfill site.

Tyres: All disposed of tyres may be kept in such a manner that is likely to not cause pollution of the environment or to cause harm to well-being and health. Under no circumstances may tyres be burnt or illegally dumped. Telluric will be responsible for the recycling of tyres in any manner we see fit to achieve the most practical repurposing of our tyre waste. Re-cycling may include the re-treading of decent quality used tyres for reuse or any re-use that does not negatively affect the environment and well-being of individuals.

Used automotive oils: All engine oils, grease, brake fluid etc… needs to be stored in sealed containers. All empty containers can be disposed and re-cycled, an agreement needs to be made with the local re-cyclers (Mr. Robert Scholtz 072 385 6439) so that the empty containers are handled and recycled in a responsible and environmentally friendly way. Under no circumstances may oil be dumped into stormwater drains or on the ground (farm roads etc…) as it will lead to contamination of groundwater and surface soils. Oils shall also not be discharged into effluent or sewage. All used oil can be taken to the waste transfer station – ROSE foundation container.

Agro-chemicals

All agro-chemicals (fertilizers, fungicides etc…) need to be stored in such a way that the storage conditions adhere to all the minimum requirements set out by the *South African National standard – SANS 10206:2010.* The disposal of these chemicals and their empty containers has to be carried out in such a way that is environmentally friendly and sustainable, detailed guidelines for the cleaning and disposal of these chemicals and their containers can be found at www.croplife.co.za/container- management/.

- All empty plastic agro-chemical containers may not be buried or burnt/incinerated on farms, instead to comply with regulations empty containers must be:
    - Triple rinsed
    - Rendered unserviceable via puncturing or cut up
    - Removed and stored securely until recycling
- It is important that all recyclers of plastic agrochemical containers supply management or the owner with a letter on letterhead of the company (including registration number), stating that the containers are destined for recycling and that they are transported, stored and processed according to relevant legislation and SANS regulations (10406:2014 and 10206:2010).

FUEL TANKS AND FUEL USE

Telluric will make use of one 1000L diesel storage trailer. Diesel needs to be stored on the farm to ensure efficient daily agricultural operations; the farm will make use of two tractors which in turn will require diesel. The storing of diesel on the farm will also allow for the most efficient and conservative use of diesel as this will prevent unnecessary regular trips into town whenever the vehicles on the farm needed to be filled up with diesel. According to the IPW all storage and filling areas, of which we will only have one, need to be situated on an impenetrable cement slab that is bunded by a wall that is at least 20cm high to prevent spillage from contaminating the environment.

In order to conserve diesel and keep the fuel consumption low and efficient on the farm the following will be done: all farm vehicles, machinery and implements will be subjected to regular maintenance according to manufacturing guidelines to ensure efficient operation and fuel consumption, service records will be kept for auditing purposes. Records of all fuel consumption will be kept (petrol, diesel, gas) in order to determine trends and for auditing purposes. The keeping of accurate records will allow us to calculate our carbon footprint. Summaries of annual fuel consumption can be used to demonstrate that our diesel use on the farm is stable or reducing. These summaries will help us determine periods of high diesel use and thus we can use that data in order to innovate alternative methods for these high use periods by which we will ultimately reduce the use of diesel and keep improving our carbon footprint each year.

Simple ideas of how we would begin to diminish our diesel use would be to make use of farm animals in order to replace simple tractor operations on the farm. Where possible a horse could pull a small plough to help loosen the soil for when we plant permanent cover crops, as well as to help make carbon and nitrogen more readily available in the soil. This exercise is far less invasive for the soil then a tractor pulled plough as it is not able to rip as deep.

ELECTRICITY

Electricity usage on Telluric farm will be kept as efficient and sustainable as possible with all available technologies being utilized in order for us to keep consumption from the Plettenberg bay electricity grid as small as possible. ERF RE/7/444 currently is the only plot owned by Telluric that has access to municipal electricity, this works in our favor as all proposed agricultural operations that require electricity such as a farm workshop will be located on the property. The viability of installing and running solar power on the roof of the workshop will be assessed, if found viable solar will be used to supplement our electrical needs from the municipal grid and ultimately lead us to a more conservative and sustainably green farm.

Throughout the year all municipal electrical consumption must be recorded at the end of each month, so that we will be able to summarize the consumption data and draw conclusions on whether the farm is moving in a more conservative and sustainable direction. The records will also be kept for auditing purposes and allow us to calculate our carbon footprint.

AIR AND NOISE POLLUTION

Agricultural and its associated activities are notoriously noisy, however the location of Telluric supports minimal air and noise pollution on the surrounding Plettenberg bay community. The farm is situated at the top of a valley above the Dieprivier Vlei roughly 4 kms away from the residential areas and effectively opposite the Plettenberg bay industrial area. In order to minimize our air and noise pollution all agricultural activities that produce excess noise will be planned so that we efficiently and timelessly complete the task, all tasks will be planned to take place during normal business hours and any weekend work will be minimized. In order to make sure all machinery meets non-noise polluting standards they will be regularly serviced and maintained as to minimize any mechanical noise. To avoid air pollution all machinery that produces any type of greenhouse gasses purchased by Telluric will meet international emission standards and we will strive to acquire the most efficient machinery in the needed field.

Other practices that will be done in order to minimize air pollution produced from the vineyard will be minimizing / eradicate tillage done on the farm via the use of permanent cover crops as much as possible will help reduce greenhouse gasses and the release of ozone precursors produced during tilling.

A key combatant to air pollution is the maintenance and preservation of ecological corridors, Telluric plans to preserve over 40% of the land for ecological corridors. These ecological corridors not only play an integral part in preserving the natural biodiversity of the land but also play an important role in the absorption of greenhouse gasses on the farm. The use natural predators in order to control pests can lower the farms air polluting potential, by eradicating the use of pesticides so that associated pesticide drift will be absent.

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Annexure A: