1. Comments submitted by State Departments

I&AP / State Department	Comment submitted	Response
BGCMA 09 February 2023 N. Ndlumbini	1. The Information contained on the section 24G Application reports prepared by Confluent Environmental Consultant for Viljee Keller Trust has been reviewed, and according to page 2, 3 and 5, the activities that took place within a watercourse or within a regulated area of a watercourses, triggers the National Water Act No. 36 of 1998.	As well as the registration of new boreholes with associated water uses.
	2. Please note that BGCMA has acknowledged the remarks made in this specialist assessment report concerning the impacts on aquatic environment, which is said to be negligible impacts on the watercourses and the remarks made on the Geohydrological assessment results from the pumping test to determine the influence of boreholes in the Kandelaars River and neighbouring boreholes water levels. However, it is concerning that access was denied for the hydrocensus and user survey on all the properties to the north of Kellershoogte as the impacts on those boreholes will remain unknown as this is done to determine the influence of the new boreholes in the neighbouring boreholes water levels.	This constraints has been acknowledged in the assessment as well as the specialist reports. To address this gap in the knowledge, the Applicant on instructions of the geohydrological specialist, drilled additional borehole on his property specifically for testing as a measure of substituting the data that could not be obtained from a complete hydrocensus. The boreholes have been fitted with meters and abstraction volumes are recorded.
	3. The abovementioned activities were confirmed during a site investigation conducted by the officials of the BGCMA, on 23 February 2021 at Farm Kellershoogte 172/4 and 170/19, Oudtshoorn, where the two new boreholes were drilled and equipped for abstraction within the regulated area of a watercourse located within an agricultural land of the farm170/19 including installation of the river crossing pipeline through a non-perennial stream, a tributary of the Kammanasie River. These activities are defined as water uses in terms of Section 21(a), (c) and (i) of the NWA without a water use authorisation. A notice on intention to issue a directive dated 31 May 2021 was issued and responded to in a representation letter dated 15 June 2021 with the request to continue taking the existing farm registered water allocation and installed meters while the status of verification and validation was still pending. The applicant informed BGCMA that he initiated the application process for the water use licence. A Geohydrological study preliminary report was also received with the recommendations to monitor water levels and conduct a	Noted. The formal request by the Applicant for permission to continue abstracting water from the new boreholes is subject to him not exceeding the total volume of 147 000 m^3 per annum for which he is currently registered. In addition, the Applicant undertook to also not abstract water from the Kandelaars River during the investigation period. The Applicant is therefore not abstracting any more water than for what he is currently registered. To comply with the monitoring requirements, the Applicant installed flow meters at all boreholes which readings have been verified by Confluent Consulting as part of

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	hydrocensus for the boreholes impacts to the Kandelaars River and neighbouring boreholes.	the ongoing monitoring stipulations. By April 2022, the Applicant had abstracted a total volume of 86 401 m^3 from all boreholes over a period of 12 months. By February 2023 the applicant had abstracted 73 763 m^3 over a period of 10 months as measured. These volumes are well below the total registered volume of 147 000 m^3 and continues to monitor water abstraction within his permissible volume of water. It must be noted that this volume of water applies to both the lucern, as well as the new orchards (combined volumed).
	4. In light of the above, the BGCMA will continue with the enforcement process to monitor compliance on this matter until the applicant is complying fully with the NWA.	The Applicant is committed to ensure compliance with the conditions set for continued use of water to ensure that the investment already made into the agricultural venture is not at risk.
Heritage Western Cape 17 November 2023 Robin George	There is no reason to believe that the proposed development of Portion 4 of Kellershoogte 172 will impact on heritage resources. No further actions are required under Section 38 of the National Heritage Resources Act. Should any heritage resources be discovered during the execution of the activities above, all works must be stopped immediately and HWC notified without delay.	Noted. The EMP contains this specific condition and the Applicant is obliged to adhere to said condition.
Western Cape Government Department of Agriculture 30 January 2023 Cor van der Walt	Please note that consent in terms of the Conservation of Agricultural Resources Act No. 43 of 1983 must also be obtained. The Department reserves the right to revise initial comments and request further information based on the information received.	This comment is noted. Communication has been made with the George: LandCare office with regard to the CARA consent required and the necessary CARA permit will be obtained.

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CapeNature 21 February 2023 Megan Simons	Following a review of theS24 report and specialist reports CapeNature wishes to make the following comments: 1. Ostrich grazing has transformed the vegetation at the property overtime. The botanical specialist categorised the already developed area as low sensitive while the proposed expansion area was categorised as moderate sensitivity. These findings are acceptable to CapeNature.	This comment is noted. Historical aerials and verbal confirmation from the Applicant confirms a level of disturbance over an extended period of time which is associated with historical wheat farming as well as grazing for ostriches.
	2. CapeNature will not support loss to areas that were identified as sensitive, and we therefore support the recommendation by the botanical specialist that highly sensitive area must not be developed.	The recommendation by the botanist has been considered in the preferred alternative of a reduced 56ha. The preferred alternative does not include the high sensitivity areas within the proposed development footprint.
	3. The watercourse at the property must not be contaminated by pollutants, and measures must be placed to prevent erosion and increased stormwater runoff impacting on watercourses and the integrity of riverbanks. Thus, the 5m aquatic buffer is supported by CapeNature to maintain corridors and ecological processes.	Noted. The tributaries identified by the aquatic specialist and botanical specialist needing a 5m buffer have been excluded from the preferred 56ha development area. The EMP stipulates that erosion along these tributaries must be monitored on an annual basis to ensure that sediment does not end up in other tributaries leading to the Kandelaars River. It is further noted that only drip irrigation is implemented for this project. The range of irrigation is therefore limited and typical over-reaching that can happen with irrigation (leading to increased erosion and extended impacts of herbicide affecting surrounding and downstream areas) are therefore reduced.
	4. In terms of the Alien and Invasive Species regulations, specific alien plant species are either prohibited or listed as requiring a permit; aside from restricted activities	Noted.

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	concerning, inter alia, their spread, and should be removed. All Invasive Alien Plant species must be removed from the vicinity of the site and their further spread prevented. The eradication and monitoring of the spread of invasive alien species should follow the National Environmental Management: Biodiversity Act (Act No.10 of 2004). Control methods for the eradication of alien invasive species must be implemented in such a way that it prevents harm to the surrounding environment.	The EMP in specific addresses invasive alien vegetation eradication in the vicinity of the development area.
	5. An Environmental Control Officer (ECO) should be appointed to oversee the process and to ensure the implementation of the mitigation measures and to identify any harmful activities.	Noted. Section 5.3 of the EMPr (Appendix I of the S24G Report) addresses the need for an ECO to be appointed to oversee implementation of the project should it be authorised, as well as long-term monitoring and auditing as well.
	In conclusion, CapeNature does not object to the completion of the proposed activity. We do recommend the ECO mitigate potential negative impacts to the environment and that the mitigation measures from the specialists (i.e., 5m buffer and avoid highly sensitive area) are strictly adhered.	This comment is noted. Specialist recommended mitigation measures have been outlined in Section F (7) of the S24G Report. Section H also recommends that the mitigation measures provided by specialists must be implemented. Section 4 of the EMPr also includes the mitigation measures to be adhered to.

2. Comments submitted by Interested and Affected Parties

Interested & Affected Party	Comment submitted	Response
Calitzdorp Export Agri Hub 04 January 2023 G. Meyer	I wish to hereby express our support for the abovementioned applications. The applicant is one of a number of farms in the Oudtshoorn area who has joined the Karoo Wonderful pomegranate project. The aim is to establish 50% of SA's Wonderful pomegranate cultivar in the greater Oudtshoorn area. This area is perfectly suited, due to its unique climate and are already producing the best quality pomegranates in South Africa. Furthermore pomegranates are also an extremely waterwise crop, with the lowest water requirements of all fruit trees. This project is also a priority project for the Garden Route District Municipality, who financially supports research and infrastructure upgrades to contribute to the establishment of a HUB where the harvested pomegranates will be packed for export and also where all value added activities, such as juice and oil will be processed. This has and will lead to many seasonal and permanent new jobs created in this rural area. Full agri processing value will be added at source, which is in line with the Government's vision for rural development. All fruit produced are exported. Based on the existing international demand for pomegranates from this area, we have also registered a new trade mark, Karoo Wonderful Pomegranates which will be used exclusively for pomegranates from this region. The applicant has already been allocated a 10 ha quota in phase one and the granting of the license and approvals required, will add another 30 ha of pomegranate trees and will ensure that we reach our goal of producing 50% of the country's Wonderful Pomegrantes in this region. As for the applicant's contribution to this bigger project, we can confirm, as supported by Hortgro ,that the anticipated 40 ha which will be developed upon granting the licenses and approvals, will create 60 permanent jobs. Hortgro supports 1.5 workers per 1 ha of fruit trees.	Noted. The application is for cultivation (for a combination of Almond orchards) – it is noted that the submission refers to pomegranates. The matter has been referred back to the stakeholder for clarification.

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	As mentioned this applicant is part of this sizeable project, by far the biggest agricultural project in many years in this region .On completion it will create a total of 600 permanent and more than 800 seasonal jobs, plus be an annual foreign exchange earner in excess of R 200 m. A 100 ha BEE component as well as a 600 home Agri village supported by the Garden Route District Municipality, where each worker will own his house, are all part of this project. We therefore support this application as it will contribute to job creation on a sustainable scale in an area which has some of the highest unemployment rates in SA.I would also like to point out that Agriculture is the sector who can absorb low schooled workers and provide the rural growth which is part of the National Governments focus.	
Kandelaars River Water Users Association (Cullinan&Associates) 01 March 2023	1. We represent The Kandelaars River Water Users Association ("our client"), an association of landowners who farm downstream alongside the Kandelaars River in the Armoed District of Oudtshoorn, Western Cape. The chairperson of our client is Mr Bartel du Toit ("Mr du Toit") and his duly authorised representative Mr Laubscher Coetzee ("Mr Coetzee"). 2. Our client's members own different portions of land dotted around the Kandelaars river but more specifically downstream of the applicant's property. They are registered as interested and affected parties in their own personal capacity as well as part of the Kandelaars Water Users Association and have provided their objections, in their respective capacities, to the s24 G rectification draft application for various reasons which will be more fully detailed below.	Noted.
	3. The applicant for the s24G rectification application is Mooiplaas Trust duly represented by the Trustee Mr Viljee Keller ("the applicant") who is the owner of Portion 4 of Farm 172 Kellershoogte ("Kellershoogte"). 4. Kellershoogte is located directly adjacent to the R328, approximately 13.5km southwest of the town of Oudtshoorn.1 Portion 4 of Farm 172 ("the Subject property") and its associated activities include boreholes on Portion 19 of Farm	These points are noted.

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	Gamtoosberg 170 with a water pipeline traversing Remainder Farm 172, Portion 11 of Farm 170 and Portion 3 of Farm 172 to supply water to the planned orchards on the study site approximately 56 ha. North of portions 7, 8, 11, 12, 13, 14, 15 of Farm 171 Paardendrift and portion 2 of Farm Kellershoogte3 together with the aforementioned portions of each respective farm form the subject of an application in terms of section 24G of the National Environmental Management Act, 1998 ("NEMA") under the abovementioned reference number ("the Subject Property" and "the section 24G application" respectively). 5. At the outset, we wish to confirm that this letter and/or any of its appendices, which contain our client's response and scientific findings, are not intended to be exhaustive of all material issues related to this issue / subject matter. Our client hereby reserves its rights to supplement this response letter and/or produce other necessary expert findings, at the appropriate time and in the appropriate forum, should it become necessary.	
	Insufficient water 6. Our client's members operate a number of farms along the Kandelaars River. This river is non-perennial and water only reaches the lower farms after the rain has fallen in the river's catchment area, the Outeniqua Mountains. During most years, there is insufficient water available for the existing farming operations along the Kandelaars River. 7. As you know, the applicant wishes to apply for a water use licence over and above the section 24G application. We are advised that when the applicant bought the Subject Property the applicant never had any water use licenses in place nor were any water use licenses transferred to the applicant upon sale. Therefore, the applicant utilizes water from the Kandelaars River and continues to pump borehole water, unlawfully, despite an application process underway in respect of the section 24G application and Water Use License Application. This action is in and of itself unlawful and by virtue of the contents contained further in this correspondence the actions of the applicant should cease until a revised	Response provided by Confluent Consulting responsible for the WULA: 1. Noted. 2.The applicant is currently operating in terms of his Existing Lawful Use (ELU) whilst allowing for the Water Use License (WULA) to be finalised. In response to the BOCMAs correspondence alerting to the unregulated activities the Applicant formally requested permission to continue abstracting water from the new boreholes, on condition that he not

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	section 24G report is furnished and the decision of the water use license application is made. We are advised further, that the applicant bought the Subject property to establish 56-hectare almond and pecan nut orchards on the Subject Property despite the fact that approximately only 5 ha of the Subject Property is irrigable5. The significant amount of water required for the cultivation and growing of the pecan and almond trees will significantly deplete the water in the Kandelaars River and adjacent groundwater, leaving the downstream users of the Kandelaars River with little to no water to irrigate their farms which have a much higher irrigable size than the Subject Property. 8. If the applicant is permitted to establish the proposed large almond and pecan nut orchards upstream of our client's members, the increased abstraction of water necessary to sustain those orchards will significantly reduce the water available to downstream users and ecosystems. It is likely to deplete the available groundwater, cause boreholes to run dry and increase salination. This will have very substantial negative impacts on our client and other neighbours.	exceeds the total ELU volume of 147 000 m^3 per annum for which he is currently registered. The applicant is therefore not abstracting any more water than for what he is currently registered for under his ELU. The applicant installed flow meters at all boreholes. By April 2022, the applicant had abstracted a total volume of 86 401 m^3 from all boreholes over a period of 12 months (7200m^3/month). By February 2023 the applicant has abstracted 73 763m^3 (7373m^3/month)over a period of 10 month. These volumes are representative of water used for both existing lucern lands (not forming part of the S24G) as well as the 7ha of almond orchard. These volumes are well below the total registered volume of 147 000 m^3 and amounts to roughly a 50/50 split between the lucern and the orchards amounting to an estimated 3650m^3 / ha for the orchards (noting that the trees are still young and their water demand has not yet reached optimal volumes which will be closer to 6000-7500m^3/ha/month). 8. The groundwater study completed by Groundwater Complete indicates that abstraction from the two new deeper

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		boreholes will have no effect on surface water volumes in the Kandelaars River. Furthermore, the study indicates that there is no alluvial aquifer present in the study area implying that abstraction of water from the new boreholes will therefore not affect the availability of water in the furrow system (which is derived from surface water flows in the Kandelaars River). Furthermore, the groundwater study indicated that extensive pump testing showed that although long-term abstraction will undoubtedly cause wider effects, the impact is expected to remain very limited given the distance from surrounding users and the poor interconnectivity of the aquifers – or the fracture systems within the fractured rock aquifers. None-the-less time-series monitoring is recommended to verify the data captured between the 2020-2022 study time and the applied-for volume must be amended if evidence requires an adjustment to protect the rights of lawful water users.
	Inadequate information in draft section 24G application 10. The information provided in the draft section 24G application is inadequate. As the GEOSS report (annex A) makes clear, it is important that all raw data is supplied to enable experts appointed by interested and affected parties to be able to interrogate the validity of the findings and recommendations of the applicant's experts.	Groundwater Complete submits that a dedicated borehole was drilled with the dual purposes of (1) observing the interaction between the shallow- and deep aquifers and (2) the interaction of the surface water (Kandelaars River) and groundwater and pump tests were undertaken to determine the degree of connectivity with, or recharge from, the Kandelaars River to the tested borehole. The study confirms that there is no alluvial aquifer around the Kandelaars River in the

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		study area and there is no base flow interaction between the groundwater source for the new boreholes and the Kandelaars River meaning that groundwater abstraction from the specific aquifer has no influence on the hydrology of freshwater ecology of the river.
	Section 24G process 11. We have been instructed by Messer's du Toit and Coetzee to address various inadequacies and substantive concerns our client has with the section 24G application process to date. Our client is particularly concerned that the applicant is seeking to use the section 24G application in a manner that is contrary to the principles of integrated environmental management and the environmental impact assessment provisions contained in chapter 5 of NEMA. 12. NEMA requires persons wishing to undertake a listed activity to undertake an environmental impact assessment ("EIA") process as to obtain an environmental authorisation prior to commencing that activity. The section 24G process may only be used to obtain retrospective rectification of the unlawful commencement of a listed activity in circumstances where it is not possible to undertake an EIA process. As we explain below, the section 24G process is not a substitute for undertaking an EIA process where that its possible. 13. The purpose of the EIA system is to identify and assess the potential environmental impacts of proposed activities that may be environmentally harmful ("listed activities"), and the feasible alternatives (including the alternative of not proceeding (the "no go option") so that the decision-maker has the necessary information to determine whether or not to permit the proposed activity. In other words, it is inherently preventive in nature and in that regard is consistent with the principles in Section 2 of NEMA. The commencement of a listed activity without an environmental authorisation has always been an	Circular EADP0024/214 first defined 'commencement' as (when used in Chapter 5 of the NEMA) *"…the start of any physical activity on the site in furtherance of a listed activity"*, then the definition was amended (2008) to read *"…the start of any physical activity, including site preparation and any other activity on the site in furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed or specified activity".* This definition was again amended (2013) to read *"…the start of any physical implementation in furtherance of a listed activity or specified activity, including site preparation and any other action on the site or the physical implementation of a plan, policy, programme or process, but does not include any action required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.*"

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	offence, but difficulties were encountered in how to authorise listed activities that have been applied for rectification under section 24G.	It is confirmed that there must be evidence that there is some reasonable direct connection between the physical activity and the 'listed activity'. It is submitted that the Applicant specified and installed his infrastructure to provide for the planned 70ha of cultivation and he commenced with physical clearing/preparation/planting of orchards on 13ha. Whether someone has 'commenced' with an activity depends on, amongst others, the following criteria: • Is a 'listed activity' involved. YES. • Was any physical action, started. YES. • Was the physical action undertaken on the site? YES. • Was the physical action undertaken on the site in furtherance of the listed activity? YES The Applicant 'commenced' with implementation of a plan that required physical implementation through the undertaking of an action in furtherance of said plan. Implementation of the waterline and electrical cabling for the planned 70ha is included with the area set aside for the activity (cultivated areas). When planning and

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		designing the irrigation system the Applicant recorded the intended 70ha. The planting of the 13 ha is *in furtherance* of the total area of (originally 70ha) mitigated 56ha, to be developed into orchards since the start of a physical action anywhere on the area identified for the development, namely on the area set apart for that purpose, constitutes starting that physical action 'on the site' and according to the Circular this will be the case even if that action is to be undertaken at a number of places on the site. In terms of the Circular provision is also made for 'continuation of construction' (now described as 'development' ito the 2014 Regulations), where a site was set apart for a particular purposes (70ha orchards serviced with associated infrastructure) and where the person (Applicant) started the physical action (then stopped on account of Notices issued by the DEADP and BOCMA) but the Applicant intends to, within the confines/parameters of the original setting aside of the site (70ha unmitigated, 56ha mitigated), for that particular matter (orchards), continue with that particular purpose. Although the Applicant had not yet cleared 20ha (Listing Notice 2, Activity 15), the physical activity of preparing for implementation of the planned 70ha

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		(mitigated 56ha), constitutes the start of a physical action on the site which was in furtherance of the listed activity in question i.e. in furtherance of the clearing of vegetation. It is submitted that Listing Notice 2, Activity 15 is therefore applicable.
	14. One of the consequences of this is that the EIA regime did not cater for the authorisation of listed activities that had been unlawfully commenced before an environmental authorisation had been granted. In a 2002 judgment, the Western Cape High Court ruled that it could not order a person who had commenced a listed activity without an environmental authorisation, to undertake an ex post facto EIA process. This means that there was no procedure for obtaining an environmental authorisation for an activity that had already been commenced.	Noted. The Applicant's intention is to cultivate an areas exceeding 20ha (70ha unmitigated, 56ha mitigated). Installation of services accounts for the planning and implementation. Therefore Listing 2, Activity 15 is deemed applicable albeit that further clearing will take place should retrospective approval be granted.
	15. Section 24G was introduced to resolve that problem. By its nature, it regulates listed activities that have already occurred, and in our view should not be used to authorise activities that have not yet occurred. It is an anomaly within an EIA system designed to improve decision-making so that harm can be avoided Environmental law experts have repeatedly pointed out the anomalous nature of the section 24G procedure, the serious flaw in it, and how it can be abused to undermine environmental protection.	As with a typical EIA process, the S24G must also consider the definition of 'commencement' as well as 'in furtherance' and although the Applicant decided to cease all activities (including continuing with development as intended) the activity commenced and although not completed, is assessed as such.
	16. The purpose of section 24G is therefore to provide a procedure for evaluating whether activities that have already occurred (and consequently cannot be the subject of an EIA) should be stopped, or authorised subject to appropriate conditions. It is not intended to be an alternative way of authorising activities that have not yet occurred and consequently are still capable of being assessed and evaluated by means of the usual EIA process.	
	17. One of the important reasons for not allowing the section 24G process to be used to authorise developments that have not yet occurred is that it precludes	The S24G report has in fact considered alternatives in this application. Alternative 1 is

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	the consideration of alternatives and of public participation in that regard. This also means that the competent authority is not in a position to determine the "best practicable environmental option"8 as required by section 2(4)(b))(b) because it is limited to considering the implications of what has already occurred.	the initial proposal to clear 70 ha for the development of orchards on the subject property. However, through the 24G process, an alternative was formulated that considers specialist's input and resulted in a reduced 56ha orchard area. The outcome of the specialist investigations confirms that the potential impacts will be within acceptable limits and therefore the No-Go option of not proceeding with the development at all) is not the preferred alternative. The alternative of the status quo has been introduced for the already transformed 13ha.
	18. Section 23(4)(b)(i) of NEMA provides that procedures for the investigation and assessment of impacts of an activity on the environment 'must include an investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity.' This can be done in relation to activities that have not yet occurred but not in the context of a decision as to whether or not to allow an existing state of affairs to continue.	The potential impacts of alternatives have been considered and the preferred alternative with a reduced footprint has been recommended against the planned 70ha footprint as well as the No-Go alternative which would imply removal of the planted 7ha and rehabilitation of the 7ha and 6ha transformed areas.
	19. In this case, the relevant listed activities include: 19.1. the removal of 300 m2 or more of indigenous vegetation in this ecosystem (Activity 12, Listing Notice 3, GN R. 324 of 07.04.2017); 19.2. the clearance of an area of 1 hectares or more, but less than 20 hectares, of indigenous vegetation (Activity 27, Listing Notice 1, GN R. 327, 07.04.2017); and	This activity has been included in the revised report. it should be noted that at the time the reports were written, the NEMBA (2021) list of protected ecosystems was not yet adopted. The activities of 19.2 and 19.3 are included in the report although it is submitted that Listing Notice 2, Activity 15 and not Listing Notice I Activity 27 is applicable to this Section 24G

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	19.3. the clearance of an area of 20 hectares or more of indigenous vegetation (Activity 15, Listing Notice 2, GN R. 325, 07.04.2017).	assessment since the activity was implemented in furtherance of 70ha at the time of commencement.
	20. In our view the draft section 24G application is fatally flawed because it not only seeks rectification of the unlawful clearing of 13 ha of vegetation (Activity 27, Listing Notice 1) which has already occurred but also an environmental authorisation in respect of the future clearance of an area of more than 20 hectares indigenous vegetation (Activity 15, Listing Notice 2) which has not commenced. Seeking to use the exceptional S24G process to circumvent the scoping and environmental impact assessment process that must be undertaken prior to commencing activities listed on Listing Notice 2) is an abuse of process and contrary to the principles of integrated environmental management and the environmental impact assessment provisions contained in chapter 5 of NEMA.	The planting of the 13 ha is deemed to be *in furtherance* of the total area of 56 ha to be developed into orchards (originally 70ha). Therefore, the application is submitted for the rectification of the unlawful commencement of the development of 56 ha resulting in the loss of more than 300 m^2 (Activity 27 of Listing Notice 1), and 20ha of indigenous vegetation (Activity 15 of Listing Notice 2). As noted on page 11 of the report "Assessment of the remaining 43ha together with the 13ha (56ha – 13ha) is being undertaken since the initial clearing (of 13ha) was done in furtherance of the listed activity for exceeding 20ha." The S24G Assessment is not omitting any information on either the Applicant's intentions, the impacts, nor specialist assessments/findings and is submitted in a transparent manner that cannot be deemed contrary to the principle of integrated environmental management. Feedback and comment in response to the pre-application S24G have been considered and the 13ha status quo acknowledged albeit not the preferred alternative.

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	Customary practices within the region 21. In order to contextualise our client's concerns, we first set out the customary practice relevant to the section 24G application. 21.1. Historically Oudtshoorn and surrounding areas have followed water allocation principles established during the 1880s, which take into account the fact that the Kandelaars River is non-perennial. Water from the river canals and furrows which serve more than one landowner is allocated by allowing each user to take water for these furrows for a certain time duration per hectare of irrigable land. In other words, the greater the area of irrigable land on a farm, the longer the time allocated to the owner to abstract water to irrigate it. 21.2. We are advised that it is of utmost importance to note that for centuries the above principle has been in existence. At the time the principle came into existence one must bear in mind that there were no pipeline infrastructure or pumps so the only way the land could be irrigated would be if the land was below a furrow. This is because there existed no means to pump the water out and into the land to irrigate it as we do nowadays. In essence, everything below the furrow was irrigable which is why the irrigable portions now are smaller in size in relation to the rest of the owner's land. But the irrigable land is the portion which now lies alongside the Kandelaars River (on either side). Our client and its members have been able only to irrigate alongside the Kandelaars River since the applicant started unlawfully pumping underground water resources not aligned with the above customary practice and, therefore, damaging and drying up one of the boreholes already.	21.2 Based on geohydrological specialist investigation done jointly with an aquatic specialist investigation, it was determined that water abstraction from the two (2) new boreholes cannot impact on available water in the Kandelaars River, nor other groundwater aquifers to the extent where it can have a detrimental impact on other lawful water users. Pump tests that were undertaken during 2021 and 2022, alongside water abstraction/usage monitoring data, verifies that the Applicant is not utilising more water than available under his ELU despite irrigation of approximately 7ha of orchard. Since the Applicant has ceased abstraction from the Kandelaars River altogether (until such time as the WULA can be finalised) in favour of continued abstraction from the two new boreholes as per agreement with the BOCMA, as well as the fact that there is no inter-relationship between abstraction from the two boreholes and the Kandelaars River, or other known boreholes of lawful water users in the study area. Unfortunately the geohydrologist could not complete a comprehensive hydrocensus, however additional measures to compensate for the gap in data were implemented successfully. The findings are that abstraction from the two new boreholes is unlikely to be the cause for downstream water users

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		experiencing water shortages now or in future should the project be authorised.
	21.3. The land purchased by the applicant has approximately 5 ha of irrigable land, which is less than the area of irrigable land on downstream farms. Therefore, based on the allocation principle described above, the applicant would only be entitled to take water from the furrow for a short time before being required to open up the channel to allow the water to flow to his downstream neighbours who have larger areas of irrigable land. 21.4. This allocation principle also applies to boreholes. However, in 2020 after the applicant became the owner of the Subject Property he pumped the boreholes all night which had a direct negative impact on our client's groundwater resources. The two boreholes closest to the applicant's properties immediately weakened and one became absolutely dry. These groundwater impacts are further elaborated within the attached reviews "A" and "B".	Considering that the BOCMA issued a Notice of Intent to issue a Directive, the Applicant has been instructed to implement monitoring by means of metering. The latter must be recorded and submitted to the BOCMA for verification. Confluent Consulting has since submitted three sets of monitoring results for abstraction from the boreholes which confirm that the Applicant is not exceeding his ELU volumes. The claims made that the Applicant is pumping excessive amounts at night times cannot be substantiated as part of this process. Meters were installed only after the BOCMA issued instructions in this regard. Monitoring is however now being done continuously.
	Conclusion 22. The applicant is well aware that if he complied with the law by undertaking an EIA process to obtain an environment authorisation for clearing a further 56 ha of vegetation, the application is likely to have been refused. Consequently, the applicant unlawfully cleared 13 ha of vegetation for pecan and almond nut tree growing and proceeded to plant 7 ha notwithstanding having not obtained the necessary authorisation to do so but now seeks to use the section 24G procedure not only to authorise that unlawful clearance but also to authorise the clearance of the entire 56 ha of which makes up the Subject Property. 23. It is imperative that Environmental Assessment Practitioners prevent the section 24G process from being used to authorise activities that have not yet occurred (i.e. for prospective rather than retrospective authorisation) If this abuse of process is permitted, others will follow suit in circumventing the EIA	The S24G process is proof that the Applicant commenced with unlawful activities. Likewise the different Department's responses with instructions and conditions pertaining to said investigations are proof that the Applicant commenced with unlawful activities. The investigations that have followed to inform both the S24G and the WULA have not only considered the 13ha already transformed. The investigations have considered both the already transformed, as well as the remainder of the planned 70ha impacts. Suffice to say

Interested & Affected Party	Comment submitted	Response
	process. The developers of big projects will happily pay the section 24G administrative penalties in order to reduce the risk of having an authorisation application refused, and expedite the completion of their projects. 24. For the reasons set out in this correspondence, and in the appendices attached as "A" and "B" together with the ancillary annexes "C" to "E" we are of the opinion that the draft section 24G application is fatally flawed and our client and its members object to it.	that the activities, as a whole, have been considered and assessed. The process of conducting an integrated assessment serves to inform both stakeholders, Authorities as well as the Competent Authority on what the planned (and recommended) activity entails.
Kandelaars River Water Users Association (Cullinan&Associates) 01 March 2023 **Annexure B**	**3. INADEQUACY** The review reflects on the adequacy of the s24G environmental assessment. Information, analysis and/or assessment are viewed as 'inadequate' if: • Substantively inconsistent with legal requirements; • The contextual implications of the receiving environment have not been factored into the identification of constraints to the proposed development; • Potential environmental receptors and impacts have not been identified and assessed; • Information is incomplete, inaccurate or contradictory; and/or • Proposed mitigation and monitoring measures are unsuitable. **4. KEY CONSIDERATIONS TAKEN INTO ACCOUNT BY REVIEW** Given that the viability of the proposed development is acutely dependent on the availability of sufficient water of a good enough quality to maintain almond trees in production, the review concentrates on: • Climatic constraints on the availability of water for irrigation; • The potential impacts of climate change (chiefly increased warming and drying) on water availability and the longer term viability of the development;	The review of the pre-application S24G Assessment Report has been noted and efforts made to update and improve the Draft S24G Assessment Report accordingly where applicable.

Interested & Affected Party	Comment submitted	Response
	• A potentially high risk of salinisation that may have an adverse effect on almond yields and the quality of produce; • Potential environmental impact arising from high salinity water being released into vulnerable water resources, through leaching and discharge of water contaminated by enhanced levels of dissolved salts; • The restoration potential of transformed habitats under semi-arid conditions vulnerable to the negative effects of climate change; and • The potentially adverse effects of the proposed development on local ecosystems and neighbouring farms.	
	5. NON-INCLUSION OF ENVIRONMENTAL MANAGEMENT PROGRAMMES IN DRAFT ENVIRONMETNAL ASSESSEMNT The draft s24G environmental assessment (Cape EAPrac, 2022) does not appear to include an environmental management programme (EMPr). Neither has an EMPr been uploaded on the EAP's website. Environmental assessments prepared in support of NEMA s 24G applications must, in terms of NEMA s 24G (b)(vii), include an EMPr. The application is consequently understood to be substantively incomplete and potentially in contravention of NEMA.	The draft EMPr will be available for public review and comment alongside the updated Draft S24G Application & Impact Assessment report.
	6. INADEQUATE DESCRIPTION OF REGIONAL ENVIRONMENT The s24G environmental assessment (EA) does not introduce the biophysical environment and its attendant opportunities and constraints that need to inform decisions about the potential sustainability and agricultural viability of almond production on Kellershoogte 4/172. Significant gaps in this regard are the failure to describe the interaction between local geology, soils and climate, each of which sets the 'environmental stage' for the development and, interpreted collectively, includes clues to potential	The updated S24G Impact Assessment report has been expanded to include reference to the aspects highlighted in the review and following submissions from stakeholders.

Interested & Affected Party	Comment submitted	Response
	resource-related constraints as well as impact receptors to guide the impact assessment. Neither are the anticipated effects of climate change on the viability of large-scale almond production presented.	
	7. INCORRECT IDENTIFICATION OF ECOSYSTEM THREAT STATUS OF AFFECTED VEGETATION The ecosystem threat status of the affected vegetation type – Eastern Little Karoo (SKv 11) – is erroneously given as being of 'Least Concern' whereas the Eastern Little Karoo vegetation type is listed as 'Endangered' by the latest – revised – list of Threatened Ecosystems in Need of Protection (GN 2747 of 18.11.2022).	At the time when the pre-application S24G Application & Assessment Report was compiled and distributed for comment and review, the 2011 Ecosystem Treat Status was applicable listing the status as 'least concerned'. The newly Gazetted 2021 (published 2022) ecosystem threat status has now been considered and the applicable listed activity reflected in the updated draft S24G Application & Assessment Report.
	7.1 Additional listed activity triggered: Removal of ≥300 m^2 of indigenous vegetation in this ecosystem constitutes a listed activity that is subject to mandatory environmental authorisation (cf. Activity 12, Listing Notice 3, GN R. 324 of 07.04.2017). 7.1.1 The unauthorised clearing of c. 13 ha of indigenous vegetation reputedly commenced in or about March 2020,3 thereby 'triggering' the following listed activity: Listing Notice 1, GN R. 327, 07.04.2017 (subject to mandatory basic assessment) 27: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation (exclusions do not apply).	The newly Gazetted 2021 (published 2022) ecosystem threat status has now been considered and the applicable listed activity reflected in the updated draft S24G Application & Assessment Report. It is submitted that the Applicant commenced with the clearing of vegetation with the full intention of cultivating 70ha, thus Listing Notice 2, Activity 15 is applicable in addition to Listing Notice 1, Activity 27.
	7.1.2 Listed activities 'triggered' by proposed clearance of indigenous vegetation The Applicant proposes expanding the existing, unlawful, almond	It is submitted that the Applicant commenced with the clearing of vegetation with the full

Interested & Affected Party	Comment submitted	Response
	orchard by another 46 ha, which would 'trigger' the following listed activity: Listing Notice 2, GN R. 325, 07.04.2017 (subject to mandatory scoping and environmental impact assessment) 15: The clearance of an area of 20 hectares or more of indigenous vegetation (exclusions do not apply).	intention of cultivating 70ha, thus Listing Notice 2, Activity 15 is applicable in addition to Listing Notice 1, Activity 27. It must be noted that the Applicant stopped the activity only upon receipt of Notices issued to him by the DEADP and BOCMA otherwise he would have continued with the construction/development to the full extent of 70ha.
	8. INCONSISTENCY OF DEVELOPMENT WITH WESTERN CAPE SPATIAL DEVELOPMENT FRAMEWORK The consistency of this illegal and proposed activities with provincial spatial planning policy must be evaluated against the objectives of the Core 1 spatial planning category as defined by the Western Cape rural land-use planning guidelines published in terms of the 2014 Western Cape Provincial Spatial Development Framework (DEADP, 2019). Core 1 areas are those parts of the rural landscape required to meet targets/thresholds for biodiversity pattern and/or ecological thresholds. They include habitats in Endangered ecosystems. The provincial land-used guideline for rural areas considers Core 1 areas to be 'no-go' areas for development (DEADP, 2019). The s 24G environmental assessment needs to reflect the implications of these provincial plans and policies for the proposed development, its consistency with the Western Cape Biodiversity Spatial Plan (CapeNature, 2017), and desirability as defined by the Western Cape guideline on 'need and desirability' (DEADP, 2013).	Additional input has been incorporated to the updated Draft S24G with regards to the Rural Land-use Planning Guidelines. It is noted from the same Guidelines that the location of agricultural activities will be (should be) dictated by local on-farm agro-climatic conditions (e.g. soils, slope, etc.), but wetlands, floodplains and important vegetation remnants should be kept in a natural state. In this instance specialists have considered that greater 70ha area set aside by the Applicant for cultivation and they determined the areas that must be excluded, as well as the ecological importance of environmental features including remnant natural vegetation. The mitigated development footprint of 56ha avoids the areas of High and Very High sensitivity, it avoids surface washes, it avoids steep slopes thereby ensuring that the agricultural activity can be supported in its current location.

Interested & Affected Party	Comment submitted	Response
		It is noted from the comments submitted that agriculture as an important industry in terms of supporting the food industry, our economy, as well as livelihoods dependent thereon, appears to be perceived as detrimental to the receiving environment when in fact the WCPSDF, the Rural Guideline and the Oudtshoorn SDP/IDP acknowledge its importance alongside the need to conserve biodiversity. It is therefore important to ensure that a balanced approach is applied when considering the activity without compromising environmental outcomes.
	8. FAILURE TO DISTINGUISH BETWEEN IMPACTS ON INDIGENOUS VEGETATION: ILLEGAL AND PROPOSED ACTIVITIES The s 24G impact assessment (Cape EAPPrac, 18.11.2022) apparently only assesses and evaluates the impacts potentially arising from a 56 ha development (the preferred option), but not those that resulted from the illegal, original clearance of c. 13 ha of indigenous vegetation. Also, the environmental assessment does not explain (unlike the case of impacts on the aquatic environment) (Dabrowski, 2022) the protocol by which the significance of impacts on indigenous vegetation was derived.	The draft S24G Assessment Report has been expanded to address this concern.
	9.1 Obfuscation of significance of impacts resulting from illegal removal of indigenous vegetation The impact assessment is limited to assessing the impacts of two alternatives on indigenous vegetation, i.e. a 70 ha option, and the preferred alternative comprising a total of extent of 56 ha respectively. The impacts of illegal vegetation clearance, amounting to c. 13 ha, are not reported by the s 24G	The draft S24G Assessment Report has been expanded to explain this aspect in more detail. The Status Quo scenario of the 13ha has been incorporated albeit not the preferred alternative in terms of the outcome of the S24G Assessment.

Interested & Affected Party	Comment submitted	Response
	environmental assessment; they are, however, reported in the terrestrial biodiversity assessment (Hoare, 2022). This confounds a critical, comparative understanding of the respective environmental implications of the illegal activities and those activities which have yet to commence. Each development option should have been presented as a distinct alternative, informing distinct authority responses, viz. that relating to the environmental significance of impacts incurred as result of a c. 13 ha unauthorised development, and the significance of impacts potentially associated with the clearance of an additional 46 ha of indigenous vegetation. It is otherwise impossible to determine the significance of impacts associated with the illegal clearance of vegetation versus the potential impacts on indigenous vegetation of what, presumably, could constitute lawful agricultural expansion if authorised by the Department of Environmental Affairs and Development Planning.	
	9. INADEQUATE TREATMENT OF ALTERNATIVES As noted by Preston et al. (1996, p 756), The identification and examination of alternatives provide a basis for choice among options available to the decision-maker, and is therefore a fundamental component of all impact assessment. As matters stand, the s 24G environmental assessment does not provide decision-makers with the opportunity to make an informed choice as to the 'sustainability' of the respective alternatives, including which alternative – if any – would constitute the best practicable environmental option for the purposes of decision-making that is informed by all relevant factors as required by NEMA s 24O. The 'best practicable environmental option' is defined by section 1 of NEMA as constituting "the option that provides the most benefit or causes the least	The draft S24G Assessment Report has been expanded to address this aspect in more detail.

Interested & Affected Party	Comment submitted	Response
	damage to the environment as a whole, at a cost acceptable to society, in the long term as well as the short term." The primary mechanism for identifying the best practicable environmental options is through the identification and examination of alternatives that provide a basis for choice among options available to the decision-maker (Preston et al., 1996).	
	10. NEED TO REVISIT SEVERITY OF IMPACTS ON INDIGENOUS VEGETATION The assessment and evaluation of impacts on Eastern Little Karoo vegetation must be revised to reflect the threatened status of this ecosystem, and on the strict understanding that loss of intact vegetation in a threatened ecosystem is a priori highly undesirable. Such impacts should be rated as being of High magnitude, with a National extent and Long-term duration.	The newly Gazetted 2021 (published 2022) ecosystem threat status has now been considered and the applicable listed activity reflected in the updated draft S24G Application & Assessment Report.
	11.1. Reported evaluation of impacts arising from the clearance of 56 ha of indigenous vegetation (i.e. impact 'significance') The affected vegetation type is described as 'succulent karoo plains habitat' (Hoare, 2022) which, in terms of the national vegetation map (Mucina et al., 2005), would be embedded in Eastern Little Karoo (SKv 11), assessed as an Endangered, unprotected ecosystem in terms of the revised list of threatened ecosystems published in November 2022 (see above, Section 7). The impact assessment did not distinguish between impacts on indigenous vegetation incurred by the preferred option (Alternative 1: 56 ha) and the larger, original option (Alternative 2: 70 ha). As indicated, only the impacts on vegetation of the 13 ha, illegal development were assessed by the biodiversity specialist (Hoare, 2022). However, the s 24G impact assessment appears to have extrapolated the latter impacts to the environmental effects of implementing the preferred, 56 ha alternative without these impacts having been systematically assessed, analysed and evaluated by a biodiversity specialist.	The newly Gazetted 2021 (published 2022) ecosystem threat status has now been considered and the applicable listed activity reflected in the updated draft S24G Application & Assessment Report.

Interested & Affected Party	Comment submitted	Response
	According to the s 24G impact assessment (Cape EAPrac, 2022; p 49), the irreversible loss of 56 ha of 'succulent karoo plains habitat' would be of 'Low' (presumably negative) significance. In that the extent of this impact is defined as 'Low', the duration as 'Medium' and the intensity or magnitude as 'Low'. The specialist biodiversity assessment (Hoare, 2022) assessed the loss of c. 13 ha of previously-impacted vegetation (i.e. the vegetation displaced by the illegal orchard) as being of 'Low' significance owing to its poor condition, the limited extent of transformation and potential for recovery to its (degraded) pre-transformation state. According to the findings of the site sensitivity verification process, the undeveloped plains within Farm 4/172 (i.e. the potential environmental receptor of a 56 ha development) supported natural habitat of 'medium' ecological importance. This, however, needs to be revised to 'High' ecological importance due to the Endangered status of the affected vegetation.	
	11.2. Mis-reporting of potential duration of impacts If the impact is 'irreversible', as recorded by Hoare (2022), it cannot be medium-term' – 'long-term' would be the appropriate measure of the duration of the impact, specifically so because most Succulent Karoo plant communities recover very slowly, if ever, after disturbances such as soil-ripping and ploughing (Milton and Dean, 2015; Helme, 2016). A distinction also needs to be drawn between the post-transformation recovery potential (with and without rehabilitation) of the loss of highly degraded habitat within the existing orchard footprint, versus loss of intact habitat as would occur as result of expanding the orchard footprint by 46 ha into largely intact vegetation.	Noted. The updated Draft S24G Assessment Report addresses this aspect in more detail.
	11. FAILURE TO SUBSTANTIVELY ADDRESS OR REPORT PROPOSED REHABILITATION GOALS, MEASURES OR MONITORING	The updated Draft S24G and EMPr will be subjected to a further 30-day comment and

Interested & Affected Party	Comment submitted	Response
	Because an EMPr has not been made available for public comment, it is not possible to review how the applicant proposes undertaking rehabilitation arising from the different alternatives. As indicated, this is a fatal flaw – legally and in terms of best environmental practice. Rehabilitation or the repair of environmental damage should be guided by desired goals or outcomes adapted to the context and societal value of the affected area/s (Esler et al., 2014; Gann et al., 2019). Such goals are not recorded, neither are the differences between 'rehabilitation' and 'restoration' explained as each has substantive environmental implications (Gann et al., 2019), and which would apply to areas taken out of active almond production as well as the 46 ha earmarked for additional development. The s 24G environmental assessment offers no insight how rehabilitation success would be measured and monitored, relative to rehabilitation or restoration objectives, or thresholds of potential concern, or what procedures would be put in place in support of adaptive management (Johnson, 1999; Keith et al., 2011; Rist et al., 2013; Esler et al., 2014).	review period following acknowledgement of receipt of same report by the Competent Authority.
	12. POOR PROSPECSTS OF REHABILITATION SUCCESS Effective recovery of heavily transformed soil and vegetation in semi-arid conditions would be hampered by the effectively permanent loss of soil structure and natural infiltration processes, vulnerability to colonisation by invasive plant species and erosion due to soil denudation. Natural aridity, potentially compounded by the effects of climate change – increased temperatures, less and/or more unpredictable rainfall – would present a severe if not insurmountable constraint on attempts to promote vegetation recovery to even a near-natural condition (Milton and Dean, 2021). Rehabilitation of areas disturbed by former almond production would require a sustained investment in measures such as treatment of soils with gypsum, mitigating salinisation, improving soil permeability through mulching, capturing	In considering the 13ha transformed areas it is acknowledged that effective rehabilitation is highly unlikely. This is evident in the level of transformation still evident in the older wheat field and where ostriches grazed prior to transformation of the 13ha. The outcome of the specialist investigations have confirmed that development as planned (56ha) and implemented (13ha) will not affected areas deemed to have high or very high environmental constraints.

Interested & Affected Party	Comment submitted	Response
	surface run-off and re-seeding rehabilitation sites with locally-collected indigenous seed and applying vegetative cover material to protect soils against dislodgement and dispersal by rainfall (Beukes and Cowling, 2003; Esler et al., 2006; Milton and Dean, 2021).	The proposal to cultivate the mitigated 56ha area can be supported from a biophysical perspective and the already transformed areas fall within this mitigated development area. Based on the outcome of the investigation thus far, there is no reasonable motivation for said areas to be rehabilitated/resorted under the No-Go alternative.
	13. LOSS OF INDIGENOUS VEGETATION IN ENDANGERED ECOSYSTEM MUST BE COMPENSATED BY BIODIVERSITY OFF-SET Loss of indigenous vegetation in Endangered ecosystems should be strongly discouraged, and particularly where the prospects for post-disturbance ecological recovery are exceedingly slim. If such loss of Endangered vegetation cannot be feasibly prevented it would be irreversible and a suitable biodiversity offset that adequately compensates for this loss must be viewed as mandatory (DEADP, 2015; Cadman (ed), 2016; DFFE, 2022). Also, it can be reasonably postulated that intact Eastern Little Karoo vegetation would be incorporated into the next iteration of the Western Cape Biodiversity Spatial Plan (CapeNature, 2017) as terrestrial Critical Biodiversity Areas (CBAs), where land would need to be managed in a natural state (if natural) or restored to at least a near-natural condition (Pool-Stanvliet, 2017). Transformation of CBAs would, as not above also be in conflict with the Western Cape PSDF (see Section 6, 'Consistency of development with Western Cape Provincial Spatial Development Framework'). In these circumstances, the unsanctioned destruction of c. 13 ha of indigenous vegetation in EN ecosystem through illegal cultivation must be viewed as highly	At the time of the activity commencing the threat status of the vegetation was 'least concern'. As the time of the S24G Assessment (pre-application stage) the treat status of the vegetation was 'least concern'. The change in ecological treat status has been noted and reflected in the updated S24G Assessment report. Noted that site specific verification of ecological importance of a specific habitat condition remain important to determine the significance of impacts. The ecological importance of the environmental features of the site have however been considered and there is support for the mitigated alternative option of 56ha in favour of the original 70ha area that would have resulted in the loss of high and very high sensitive areas.

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	undesirable – as would the proposed continuation of this ecologically unsustainable activity by adding another 46 ha to the illegally-cleared lands. Informed by the mitigation hierarchy,6 impact avoidance should be the measure of first choice where proposed development may result in the irreversible loss of irreplaceable biodiversity or disturbance to threatened ecosystems	
	14. CLIMATE-RELATED CONSTRAINTS ON AGRICULTURAL DEVELOPMENT The illegally cleared lands and area earmarked for future development are located in the J35B quaternary catchment within the Karoo Rainshadow bioregion of the Succulent Karoo Biome, a semi-arid region with limited but predictable annual (mostly winter) rainfall (Milton et al., 1997; Mucina et al., (eds) 2006). Mean annual precipitation for the subject property amounts to 318 mm p.a. (CFM, 2023), which is lower than the catchment mean of 410.49 mm. Annual mean crop evaporation amounts to 1 304 mm, peaking between October and March (CFM, 2023). Evaporation therefore exceeds precipitation more than four-fold, underscoring the aridity of the area. Climate change is expected to negatively impact the future availability of water in the Little Karoo (Ehlers, 2022). Droughts are not only expected to occur more frequently, but are predicted to increase in duration and intensity. This is paired with an increase in temperature by 2.5-3°C due to a doubling of atmospheric CO2 levels relative to pre-industrial levels, potentially having a negative impact on agricultural production in the Little Karoo region. Increased temperatures coupled to decreasing availability of water for irrigation will negatively impact on phenological processes, the fruiting capacity and composition of fruit trees – factors that have not been addressed in the s 24G environmental assessment.	These comments are noted in the literature and remains a concern for all farmers who depend on water for their operations to be successful. The Applicant is no exception with droughts likely to have an impact on his farming practice in future. That is precisely why this venture incorporates drip irrigation (as opposed to flood irrigation which remains a common practice in the study area) and the use of groundwater as the primary source in order not to be so exposed to the natural risk associated with surface water sources. The draft S24G has been expanded to address the potential aspects associated with climate change on agriculture.

Interested & Affected Party	Comment submitted	Response
	This is highly relevant contextual information that must be reflected in the description of the affected environment, the reality of climate change and how it influences options for development and their management in accordance with the principle that development must seek the best practicable environmental option.	
	15. RESTRICTED WATER RESOURCES Due to the relative aridity of the region, crop production must be supported by irrigation. Non-perennial rivers generally do not provide an assured source of water supply as run-off volumes are low and very variable. Drier catchments in the Little Karoo region have a high percentage of zero flow months, some more than 25% (Le Maitre et al., 2009). The Kandelaarsrivier is a case in point. According to local observations, the river generally flows from April to October, depending on the quantity of autumn rainfall in the Outeniqua Mountains, where it rises. The river is inclined to run dry by December (pers comm., Mr Laubscher Coetzee, 16.02.2023) and it is not unexceptional for the river to carry no water for a period of years (written comment from Mr Bartel du Toit, 30.01.2023). This was reputedly the situation between September 2017 and October 2021, when farmers were apparently unable to take any water from the Kandelaarsrivier when it dried up during an intense, protracted drought in the Klein Karoo at the time. Mr Laubscher (written comment, 30.01.2023) estimates that, due to low or absent river flows, he has only been able to irrigate his 16 ha farm from the river for five seasons in the 40 years that he has farmed in the area.	The proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied with water abstracted from the new boreholes on Portion 19 of Farm 170. Any water abstracted from the Kandelaars River will be done according to the applicants ELU and the long-established turn system that operates in the area. The applicant is therefore not intending to increase abstraction from the Kandelaars River and its associated furrow system. A validation and verification exercise has been completed as part of the WULA and will serve as important input to determining the ELU for water abstracted by the applicant from the Kandelaars River.
	17. EFFECTS OF REGIONAL GEOLOGY ON SOIL AND GROUNDWATER SALINITY **17.1. Soil salinity** Local soils are derived from weathered siltstone, shale and argillaceous (clay-rich) sandstone of the Bokkeveld Group (Lanz, 2022). Soils that support	This input is noted. The Applicant will be applying for a CARA permit and any conditions that may be applicable / set by the Department of Agriculture in this regard must be adhered to.

Interested & Affected Party	Comment submitted	Response
	indigenous dwarf succulent shrublands (such as locally occurring Eastern Little Karoo vegetation) are inclined to be saline or alkaline (Milton et al., 1997) Aridity enhances salinisation by lowering soil moisture through evaporation and suppressing leaching events (e.g. through rainfall) (Perri et al., 2022). Elevated salt levels in soils can be attributed to salt-rich parent material, such as the case with rocks associated with Bokkeveld Group formations (DEADP, 2011; Riaz et al., 2019). Almonds are less salt-tolerant than pecan nuts. In the case of almonds, elevated soil salinity levels can reduce yields and adversely affect fruit quality when soil salinity exceeds 150 mS/m (Phogat et al, 2018). Pecan nuts are also salt-sensitive, but relatively less so than almonds. Pecan nut yields are potentially limited when soil salinity exceeds 190 mS/m (Schmidt, 2021). Irrigation and soil salinisation are controlled activities under the Conservation of Agricultural Resources Act 46 of 1983. Failure to comply with a control measure constitutes an offence under the Act. Regulations published under CARA among others stipulate that agricultural land shall not be irrigated with water with too high a salt content, fertilizer which could contribute towards salination shall not be applied and if the land concerned shows signs of salination, a suitable soil ameliorant shall be applied in order to improve the production potential of that land. A landowner may be compelled, by means of directive, to take additional measures to control soil salinisation if the prescribed control measures are not effective.	The higher levels of salinity in the groundwater has been noted, however the Applicant does have access to low salinity *leibeurt* water that is available from the Kandelaars River (when it is running) and the mitigation of the Applicant is to use this water, when it is available in order, to irrigate the orchards with good quality water as a flushing mechanism. This is to prevent salt build up in the soil. During the recent drought years there has been no water flow in the Kandelaars River but in 2022 the river has flowed again. Application of low salinity water to the saline soil will cause dispersion of clay which will impede water infiltration. With drip irrigation, water infiltration is less of an issue, but it is still recommend that mulch be applied to the tree rows to facilitate water infiltration, which will be important for the infiltration of rain.
	17.2. Groundwater salinity Salty groundwater may also contribute to salinisation (FAO, 1985) and suppression of plant growth or crop yields. In the Little Karoo, much of the groundwater is saline because the geological formations which form most of the aquifers give rise to naturally saline water (Le Maitre et al., 2009; DEADP, 2011).	Dr Lanz (2022) confirms that the higher levels of salinity in the groundwater has been noted, however the Applicant does have access to low salinity *leibeurt* water that is available from the Kandelaars River (when it is running) and the mitigation of the Applicant is to use this water, when it is available in order, to irrigate the orchards with good quality water as a

<table>
<tr><th>Interested & Affected Party</th><th>Comment submitted</th><th>Response</th></tr>
<tr><td></td><td>This applies particularly under low recharge conditions where the extended residence time of the slow-moving groundwater allows for the dissolution of salts which results in higher groundwater salinity (GEOSS, 2023).

The two boreholes that were developed and utilised unlawfully (KBH02 and KBH03) have high salinity levels that exceed the fitness standards for irrigation, viz. 303 and 289 mS/m respectively; that is, water from both of these boreholes fall within Class 4 as defined by the South African Water Quality Guidelines (SAWQG) (DWAF, 1996) as cited by Lanz (2022).</td><td>flushing mechanism. This is to prevent salt build up in the soil.

During the recent drought years there has been no water flow in the Kandelaars River but in 2022 the river has flowed again. Application of low salinity water to the saline soil will cause dispersion of clay which will impede water infiltration. With drip irrigation, water infiltration is less of an issue, but it is still recommend that mulch be applied to the tree rows to facilitate water infiltration, which will be important for the infiltration of rain.

Additional water quality tests have confirmed that the water quality is not as saline as initially indicated from results during the peak of the drought. Considering the updated water quality tests, the geohydrologist has adjusted his findings to ‘marginal’ instead of ‘unacceptable’ for the purposes of this investigation.

Table 1: Water quality guidelines for

<table>
<tr><th rowspan="2">Water quality constituent</th><th colspan="4">Fitness for use for irrigation</th></tr>
<tr><th>Good (Class 1)</th><th>Fair (Class 2)</th><th>Marginal (Class 3)</th><th>Unacceptable (Class 4)</th></tr>
<tr><td></td><td colspan="4">Salinity and sodicity</td></tr>
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<tr><th>Interested & Affected Party</th><th>Comment submitted</th><th>Response</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Electrical conductivity (mS/m)</td><td>0-40</td><td>40-90</td><td>90-270</td><td>270-540</td></tr>
<tr><td>Sodium absorption ratio (SAR)</td><td>0-1.5</td><td>1.5-3.0</td><td>3.0-5.0</td><td>5.0-10</td></tr>
<tr><td></td><td colspan="4">Potentially toxic ions</td></tr>
<tr><td>Chloride (mg/kg)</td><td>0-105</td><td>105-140</td><td>140-350</td><td>>350</td></tr>
<tr><td>Sodium (mg/kg)</td><td>0-69</td><td>69-115</td><td>115-161</td><td>161-207</td></tr>
</table>
<table>
<tr><th>Parameter</th><th>KBH03</th><th>KBH04</th></tr>
<tr><td>EC (mS/m)</td><td>172</td><td>174</td></tr>
<tr><td>SAR</td><td>4.1</td><td>4.1</td></tr>
<tr><td>Cl</td><td>303</td><td>306</td></tr>
<tr><td>Na</td><td>195</td><td>194</td></tr>
<tr><td>Ca</td><td>89.8</td><td>89.9</td></tr>
</table>
It has further been noted that the established orchards (+/-7ha) in the study area have performed well despite the water quality.
</td></tr>
<tr><td></td><td>18. DISCREPANCIES IN SPECIALIST FINDINGS W.R.T. BOREHOLE WATER QUALITY

There appears to be a discrepancy between the specialist findings regarding borehole water quality and its suitability for irrigation:</td><td>Dr Lanz (2022) confirms that the higher levels of salinity in the groundwater has been noted, however the Applicant does have access to low salinity leibeurt water that is available from the Kandelaars River (when it is running) and</td></tr>
</table>

Interested & Affected Party	Comment submitted	Response
	• Unlike the agricultural suitability assessment (Lanz, 2022), neither the groundwater assessment (Steenekamp, 2020) nor the WULA technical report (Dabrowski, 2022) relate the quality of water in the two unauthorised boreholes to the South African Water Quality Guideline as reported in the Irrigation User Manual (WRC, 2020), which makes it difficult to compare the findings on water quality as reported in the groundwater assessment, the WULA technical report and the agricultural suitability assessment respectively. • The WULA technical assessment (Dabrowski, 2022, p 3) maintains that the illegal boreholes yielded groundwater with 'acceptable' salinity without, however, providing analysed water quality readings or authoritative criteria to support this contention. • This is contradicted by the EC readings provided by the groundwater assessment (Steenekamp, 2020) and reported by the agricultural suitability assessment (Lanz, 2022). • Citing the national water quality guidelines (DWAF, 1996) as recorded by the WRC/ARC Irrigation User Manual (WRC, 2020), the agricultural suitability assessment (Lanz, 2022) reported that groundwater obtained from the KBH02 and KBH03 boreholes would not be suitable for irrigation as it exceeded the recommended salinity fitness thresholds as defined by the lowest class of irrigation water, Class 4. Electrical conductivity (EC) is used as a measure of salinity, expressed as milliSiemens per metre (mS/m). The EC readings for the two unauthorised boreholes were 303 mS/m for KBH02 and 289 mS/m for KBH03 respectively (Steenekamp, 2020). The national water quality guidelines stipulate that water with an EC of 270-540 mS/m (viz. Class 4) is not suitable for irrigation; it is therefore evident that water from the KBH02 and KBH03 boreholes does not past the fitness test for irrigation water quality.	the mitigation of the Applicant is to use this water, when it is available in order, to irrigate the orchards with good quality water as a flushing mechanism. This is to prevent salt build up in the soil. During the recent drought years there has been no water flow in the Kandelaars River but in 2022 the river has flowed again. Application of low salinity water to the saline soil will cause dispersion of clay which will impede water infiltration. With drip irrigation, water infiltration is less of an issue, but it is still recommend that mulch be applied to the tree rows to facilitate water infiltration, which will be important for the infiltration of rain. It has further been noted that the established orchards (+/-7ha) in the study area have performed well despite the water quality.
	19. PROPOSED AMELIORATION OF IMPACTS OF HIGH SALINITY BOREHOLE WATER	The use of better quality water for irrigation of the orchards, when available and within the Applicant's ELU, is submitted as a mitigation.

<table>
<tr><th>Interested & Affected Party</th><th>Comment submitted</th><th>Response</th></tr>
<tr><td></td><td>As noted by Lanz (2022, pp 3 & 4), The salinity of both the soil and of the irrigation water is cause for concern. The salinity of the soil is likely to be high… The available borehole water is too saline, if it were the only source of water, to sustain almond production in the long term. However, low salinity leibeurt12 water is available from the Kandelaars River (own emphasis – C de V) and the intention is to use this when it is available in order to irrigate the orchards with good quality water whenever possible. This is to prevent salt build up in the soil.</td><td>To date the trees are performing well and although short-term only, does not appear to be affected negatively by the higher salinity levels.</td></tr>
<tr><td></td><td>19.1. Flushing of saline agricultural soils: Water use implications

The water volumes used for soil flushing should exceed those used for irrigation by 5-20% (CAW, undated). Depending on soil texture (viz. light, medium or heavy), leaching irrigation requires the application of 700 m3/ ha to 1 500 m3/ha to flush excess salts from soil (CAW, undated). Soil flushing should take place at least twice a year, under wetter conditions (Wiesman, 2009).

This begs the questions as to the availability of suitable fresh water to flush soil salts from the existing and planned orchards, for an anticipated lifespan which may extend into decades.

The s 24G environmental assessment does not provide any details on:
• How salinisation would be monitored;
• The thresholds of potential concern for elevate soil salinity levels;
• How salts would be flushed from heavily-salinised areas with the orchards; and
• The security of water of an adequate quality water, in sufficient volumes, to conduct soil flushing.</td><td>Consultation with the geohydrologist and agricultural specialist have been undertaken and the draft S24G updated to address this aspect in more detail.

Considering the additional water quality test results, the likelihood of frequent flushing requirements is reduced and water quality is deemed to be classified under the ‘marginal’ category rather than the ‘unacceptable’ category it was awarded previously during the peak of the drought. This is not to say that future droughts may not result in an increase in salinity levels of the boreholes, however the mitigation of flushing with water from the leibeurt remains an option under management conditions.

Table 2: Water quality guidelines for

<table>
<tr><th rowspan="2">Water quality constituent</th><th colspan="4">Fitness for use for irrigation</th></tr>
<tr><th>Good (Class</th><th>Fair (Class</th><th>Marginal (Class 3)</th><th>Unacceptable (Class 4)</th></tr>
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<table>
<tr><th></th><th>1)</th><th>2)</th><th></th><th></th></tr>
<tr><td></td><td colspan="4">Salinity and sodicity</td></tr>
<tr><td>Electrical conductivity (mS/m)</td><td>0-40</td><td>40-90</td><td>90-270</td><td>270-540</td></tr>
<tr><td>Sodium absorption ratio (SAR)</td><td>0-1.5</td><td>1.5-3.0</td><td>3.0-5.0</td><td>5.0-10</td></tr>
<tr><td></td><td colspan="4">Potentially toxic ions</td></tr>
<tr><td>Chloride (mg/kg)</td><td>0-105</td><td>105-140</td><td>140-350</td><td>>350</td></tr>
<tr><td>Sodium (mg/kg)</td><td>0-69</td><td>69-115</td><td>115-161</td><td>161-207</td></tr>
</table>
<table>
<tr><th>Parameter</th><th>KBH03</th><th>KBH04</th></tr>
<tr><td>EC (mS/m)</td><td>172</td><td>174</td></tr>
<tr><td>SAR</td><td>4.1</td><td>4.1</td></tr>
<tr><td>Cl</td><td>303</td><td>306</td></tr>
<tr><td>Na</td><td>195</td><td>194</td></tr>
<tr><td>Ca</td><td>89.8</td><td>89.9</td></tr>
</table>
</td></tr>
<tr><td></td><td>19.2. Potential contamination of water resources by highly saline irrigation return flows

Surface water quality can also be compromised by irrigation return flows that are contaminated with leached salts and nitrogen- and potassium-based fertilizers</td><td>Input and recommendations noted.

The updated Draft S24G and EMPr reflects on monitoring requirements and the thresholds of potential concern (TPC) to detect unacceptable soil salt concentrations.</td></tr>
</table>

Interested & Affected Party	Comment submitted	Response
	(DWAF, 1996; Le Maitre et al., 2009; Helalia et al., 2021; pers comm. Dr Sue Milton, 16.02.2023). The salinity of particularly non-perennial rivers, such as the Kandelaarsrivier, is liable to become more concentrated as the river lose water and flow rates are reduced in the drier months. The ensuing reduction in water quality presumably would be aggravated by the settling of salt-enriched sediments under low-flow conditions and the addition of saline-rich return flows to these naturally brackish watercourses. It is unfeasible for this site-specific environmental assessment to identify, quantity and assess the cumulative impacts of multiple sources of saline return flows along the Kandelaarsrivier from higher-lying tributaries such as the Groot- and Kleindoring rivers. Water quality, and particularly salinity, can be monitored, however. As depicted by CFM (2023), both of these watercourses are fringed by irrigated pastures, onion plantings and fields of vegetables which would potentially represent sources of salt- and fertilizer-contaminated return flows that could enter the Kalendaarsrivier, thereby further impacting on already-compromised water quality. Potential impacts of return flows on water chemistry in the Kandelaarsrivier are potentially also a matter of ecological concern as the river reaches downstream of the subject property support aquatic Critical Biodiversity Areas (CapeNature, 2017). Salinity levels in the Kandelaarsiriver must be monitored upstream of any points from which water could be abstracted for remedial irrigation to flush accumulated salts from the orchards on Kellershoogte 4/172 Monitoring must incorporate thresholds of potential concern (TPC) to detect unacceptable soil salt concentrations. Remedial flushing of the orchards must be linked to these TPCs.	Remedial flushing of the orchards must be linked to these TPCs. Please do take note of the more recent water quality test results which shows an improvement in water quality.

Interested & Affected Party	Comment submitted	Response
	20. THE POTENTIAL IMPACTS OF CLIMATE CHANGE The Western Cape 'SmartAgri' agricultural climate adaptation project (SmartAgri, 2016) found that the Western Cape was expected to be particularly hard hit by the combination of warming and additional stress on already constrained water supplies Climate change models indicate that the Western Cape faces a warmer future. This alone poses serious threats to a number of agricultural commodities in the province. Changes in mean annual rainfall, the spatial distribution of precipitation, seasonal cycles and rainfall extremes are also likely even if the magnitude and direction of changes are uncertain (SmartAgri, 2016; Ehlers, 2022).	Noted. The draft S24G Assessment report has been updated to address climate change in more detail.
	20.1. The Little Karoo agro-climate zone The Little Karoo represents one of 23 agro-climatic zones identified by the SmartAgri project, which forecast medium (i.e. 2-2.5o C) to high range warming for this zone by mid-century (pers comm., Dr Peter Johnston, Climate Systems Analysis Group, University of Cape Town, 08.11.2021). It was further found that agricultural potential in the Little Karoo agro-climatic zone would remain moderately high as longs as dams fill up (own emphasis, C de V) (SmartAgri, 2016). In this regard, it must be noted that no water appears to be impounded for off-stream storage in the vicinity of the existing and proposed almond developments. A single, small impoundment in the northern extremity of Kellershoogte 4/172 has reputedly been displaced by crop production (Cape EAPrac, 2022). Given that the applicant does not appear to have any available sources of off-stream water storage, it is not clear how the existing and proposed almond developments would be watered during the dry, hot summers and conditions of increasing water deficiency and drought stress.	The Applicant has applied for water rights from the two (2) new boreholes as the primary source for irrigation of the orchards.
	20.2. Climate-related impacts on almond production in the Little Karoo In the Little Karoo, almonds are the most profitable crop and wine grapes the least profitable (Ehlers, 2022). However, almonds need the most water to	Ehlers (2022) acknowledge that not one single crop could fulfil all the aspects needed to produce without any hindrance considering the impact of drought (i.e. water surety of supply) as well as income generation

Interested & Affected Party	Comment submitted	Response
	produce a suitable crop load. The Ehlers study did not address pecan nut production in the Little Karoo. With a predicted decrease in rainfall and increased probability of droughts (SmartAgri, 2016), irrigation will be the limiting factor for crop production in this region. Increased minimum air temperatures will substantially increase the evaporative demand in a region that already experiences high rates of evaporation, thus offsetting increases in summer rainfall and aggravating decreases in winter precipitation (Le Maitre et al., 2009). Run-off in catchments is likely to decrease substantially, except in montane areas that receive higher rainfall. The variability of river flows may increase, with a tendency towards more erratic flows and more frequent floods.	constraints and his research further confirms the importance to consider water use efficient crops hence the proposal to rely on drip irrigation to reduce water losses and conserve/manage the water resource.
	20.3. Effects of climate change on almond production in California, USA. California is a major producer of almonds under Mediterranean-type conditions similar to those experienced in the Western Cape. Parts of the state have also been subject to severe, protracted drought in recent years which has impacted markedly on almond production (Pathak, 2018; Helalia, 2021). Due rising temperatures and reduced winter chill, it was anticipated that the footprint of pecan nut production in California would have to be cut by 22% by 2050 (CalCAN, 2022). Almond yields could be reduced by 20% in the same period. An evaluation of climate change impacts on eight out of the 20 major permanent crops grown in California showed that temperature variations of 2°C were most closely related to yield reductions in almonds, wine grapes, strawberries, hay, walnuts, table grapes, freestone peaches, and cherries. (Pathak et al., 2018). Also in California, poorer quality groundwater is often used during droughts to maintain crops such as almonds, but this use often results in secondary salinisation that requires skilled management (Helalia et al., 2021).	Noted.
	20.4. Potential impacts of climate change on almond production in the Little Karoo	Noted.

Interested & Affected Party	Comment submitted	Response
	Similar pressures on almond and pecan nut production in the Little Karoo can be expected with respect to more frequent, and longer, droughts, erratic rainfall and absence of dry season water storage capacity to meet the irrigation requirements of the illegal and proposed orchards subject to the Kellershoogte s 24G application. A recent agricultural resource economic study on the selection of optimal agricultural enterprises in the Little Karoo in the face of climate change (Ehlers, 2022), found that almonds produce the highest income per hectare but also use the most water: 7 300 m3/ha/annum compared to olives (5 000 m3/ha/annum) and grapes (5 500 m3/ha/annum). In contrast, pecan trees in the warmer, drier western parts of South Africa require up to 15 000 m3/ha (SAPPA, undated). Pecan yields in the drier areas in the Northern Cape range between c. 3 t/ha and c. 5 t/ha. Income per hectare ranges from approximately R70 000 to R80 000 (Botha, 2018), but at high cost for water. The water requirements for almond trees are also most acute in the hottest and driest months of the year, requiring irrigation until January, February, and March, when harvested. Irrigation during January and February is critical for plant health as these months are the hottest throughout the calendar year (Ehlers, 2022). Although pecans have been found to be suitable for cultivation in the drier parts of the Western Cape (e.g. Hermon and Vredendal, in the Drakenstein and Matzikamma municipalities respectively) trees had be irrigated in summer (Oberholzer, 2022).	

	22. CONCLUSION The s 24G environmental assessment that was subject of this review is fatally flawed cannot be accepted as a defensible basis – either legally or in terms of environmental assessment best practice – for informed decision-making as to the potential environmental consequences of the illegal activity or the proposed expansion of almond orchards on Kellershoogte 4/124, OUDTSHOORN.	The pre-application S24G Assessment has been updated to acknowledge and reflect the submissions and input received from participating stakeholders. The draft S24G will be made available for stakeholder review and comment for a further 30-day commenting period.
	22.1. Reasons The grounds for this conclusion are, in summary: a) The report is substantively non-compliant with the legal requirements for environmental assessment and reporting; b) The contextual implications of a climate-stressed receiving environment and consequent deterioration of natural agricultural resources as exemplified by high soil and groundwater salinity and water shortages have not been reported, analysed or assessed with reference to the desirability and 'sustainability' of the activities in question; c) The threatened status of the affected indigenous vegetation or the desirability of its transformation have not been factored into project planning or the assessment and evaluation of impacts on Eastern Little Karoo vegetation (EN); d) Statements regarding the availability of fresh water to irrigate salinised land are not substantiated, neither with reference to the security of yields from the Kandelaarsivier, water quality nor provisions to store such irrigation water off-stream during low-flow periods and drought; e) Potentially significant impacts arising from highly saline irrigation flows entering a vulnerable river system have not been identified, analysed or assessed; and f) Severe limitations on the restoration potential of habitat transformed by agricultural development have not been identified, analysed or assessed.	The pre-application S24G Assessment has been updated to acknowledge and reflect the submissions and input received from participating stakeholders. The draft S24G will be made available for stakeholder review and comment for a further 30-day commenting period. Changes to applicable environmental conditions such as the new Ecosystem Threat Status that came into effect after specialist studies were completed/S24G distributed have been acknowledged and incorporated into the updated draft S24G.

	22.2. Recommendations These shortcomings and lacunae in environmental reporting need to be (a) convincingly addressed by the environmental assessment practitioners in a revised s 24G environmental assessment which (b) has been subjected to independent specialist review and (c) re-issued for scrutiny by registered interested and affected parties. Alternatively, the competent authority must refuse environmental authorisation.	The pre-application S24G Assessment has been updated to acknowledge and reflect the submissions and input received from participating stakeholders. The draft S24G will be made available for stakeholder review and comment for a further 30-day commenting period before the Competent Authority will consider the application.
Annexure C of the KRWUA comment submitted. Mr Du Toit	Die plaas Kellershoogte is nie geregtig volgens hofuitspraak op leibeurt water uit kandelaarsrivier nie.	Die primere bron van water vir die boorde is vanuit die twee nuwe boorgate wat die Aansoeker sonder magtiging gesink het. 'n Waterlisensie aansoek is in proses vir die registrasie van die waterregte. Water water moontlik uit die Kandelaarsrivier gebruik word mag slegs itv die Aansoeker se 'Existing Lawfull Use' volumes wees en ook net om met tye sout uit die landerye te was. Die 'verification & validation' proses wat gevolg is vir die eiendom waar die Aansoeker water onttrek, sal die ELU bevestig en indien nodig sal dit bepalings inhou vir gebruik vir die watergebruik.
	Kandelaarsrivier het sedert 19 September 2017 tot 23 Oktober 2021 (Bon: foskaal van die plaas Armoed) geen leiwater beskikbaar gehad a.g.v die intense droogte wat die Klein Karoo tans beleef.	Die afwesigheid van water in die Kandelaarsrivier is ook opgemerk deur ander rolspelers, die Aansoeker en die spesialiste wat die ondersoeke gedoen het rondom die waterbeskikbaarheid. Vir die amandel projek beoog die Aansoeker om water vanuit twee nuwe boorgate te gebruik wat deur 'n geohidroloog ondersoek is en bevind is dat

		daar nie ’n interverwantskap is tussen die diep akwifer en die Kandelaarsrivier. Die verwagting is dus dat daar nie ’n negatiewe impak hetsy op die watervlak van die Kandelaarsrivier (wanneer die vloei) of bestaande wettige watergebruikers wat afhanklik is van grondwater behoort te wees nie. Monitering van grondwatervlakke in die boorgate en toetsgat sal wel moet voortgaan vir die duur van die projek.
	Op bladys 4 van bylaag genaamd “Agricultural Suitabiliity Assessment” word dir uitgelig dat die project net lewensvatbaar is indien “low salinity leibeurt” uit Kanderlaarsrivier so dikwels moontlik gebruik word om die opbou van soute ute te was. Met geen water beskibaar soos in beswaar 2 uitgewys is daar dus nie water beskikbaar vir die proses nie.	Die primere bron van besproeingswater vir die amandelbome sal uit die twee nuwe boorgate wees. Sou dit nodig wees om die boordgrond te spoel om soute uit te was, sal die Aansoeker water via die leibeurt gebruik alleenlik vir hierdie doel en ook slegs op grond van die bestuursmaatreels wat die nodigheid van sulke spoel geleenthede sal voorskryf.
	Droogtes is siklies in die Klein Karoo. So het ons in my leeftyd erge droogtes gehad vanaf 1968 tot 1973. So ook vanaf 1986 tot 1993 en nou weer vanaf 2016 tot op hede. Tussen in was nog droeë jare met korter intervalle. Gegewe ‘n Amandelboord se leeftyd, hoe gaan die aansoeker onder sulke omstandighede die soute uitwas?	Sou dit nodig wees om die boordgrond te spoel om soute uit te was (wat op hierdie stadium die aanvaarde praktyk blyk te wees), sal die Aansoeker water via die leibeurt gebruik alleenlik vir hierdie doel en ook slegs op grond van die bestuursmaatreels wat die nodigheid van sulke spoel geleenthede sal voorskryf.
	Die bestande besproeibare oewergrond op please met waterregte uit Kanderlaasrivier het die afgelope 6 jaar soos ‘n woestyn vertoon omrede geen besproeingswater beskikbaar was nie. As die skaars hulpbron water nog toegeken word aan veld grond met geen bestaande waterregte sal dit ’n negatiewe impak he.	Die primere bron van besproeing vir die amandelboorde is uit die nuwe twee boorgate. Die water hieruit is onderhewig aan ’n Waterlisensie en dit is nie ’n gegewe dat die waterregte toegestaan sal word nie alhoewel die ondersoeke bepaal dat daar voldoende water gepomp kan word uit die gate sonder om ander wettige watergebruikers, of die

		Kandelaarsrivier te benadeel. Water uit die Kandelaarsrivier (leibeurt) sal slegs aangewend word sou dit nodig wees om die boorde te spoel.
	Arbeiders getalle op plase het met tussen 30% en 50% verminder weens die droogte. Baie plase werk ook net ‘n 4 dag werksweek met verminderede arbeiders. Nog plaaswerkers gaan hul werk verloor as die aansoek toegestaan word.	Indien die voorgestelde projek ’n direkte impak op die waterregte van wettige waterverbruikers sou he, sal so ’n situasie ’n moontlikheid wees en dit sou dienooreenkomstig nie ondersteun kon word nie. Die aanduidings van die spesialiste wat tot dusver gekyk het na die grondwater en ook die verwantskap tussen die grondwater en Kandelaarsrivier, is dat die boorgate voldoende water sal kan lewer vir die boorde sonder om ander wettige waterverbruikers te benadel. Die projek op die skaal waarop dit ondersoek is sal uiteraard ook op sy eie werkskepping bevorder wat hopenlik die verlies aan werke waarna daar verwys word in ’n mate kan teewerk.
	Kellershoogte staan bekend in die omgewing as ‘Brakpoort’. Ek lees op bl.3 van die bylaas genaamd “Agricultural Suitability Assessment” insake die ontleding van die boorgatwater dat: “Both the boreholes fall into Class 4, for all four of the parameters in Table 2. Class 4 is the lowest quality water and is considered unsuitable for irrigation”. Op bl.6 van dieselfde document lees ek: “The soil as well as the borehole water that is partly used for irrigation has salinity limitations. F this were the only available water for irrigation, it would have considerable risk for the sustainability of the almond orchards.” Wel, soos uitgewys in beswaar 4 is droogtes siklies in die Klein Karoo en gebeur dit met reëlmaat en nie slegs by uitsondering dat Kandelaarsrivier vir jare nie vloei nie.	Die waterkwaliteittoetse wat oorspronklik geneem is, was ten tye van die droogte en die kwaliteit op daardie stadium is aangedui as nie geskik vir besproeing. Op die stadium is daar egter voorsiening gemaak vir mitigerende maatreels dat sou dit nodig wees vir die boorde om gespoel te word, die leibeurtwater vir die doeleinde gebruik sou kon word op voorwaardes. Die geohidroloog kon intussen egter nog waterkwaliteittoetse doen in May 2023 en die resultate is aansienlik beter met meeste van die parameters binne aanvaarbare

Gegewe die feit dat die boorgatwater onbruikbaar bevind is vir besproeiing tesame met die feit dat droogtes dikwels vir lang periodes voorkom, hoe kan die boord enigsins lewensvatbaar wees?

standaarde wat die versekering van waterkwaliteit verbeter.

Table 3: Water quality guidelines for

Water quality constituent	Fitness for use for irrigation			
	Good (Class 1)	Fair (Class 2)	Marginal (Class 3)	Unacceptable (Class 4)
	Salinity and sodicity			
Electrical conductivity (mS/m)	0-40	40-90	90-270	270-540
Sodium absorption ratio (SAR)	0-1.5	1.5-3.0	3.0-5.0	5.0-10
	Potentially toxic ions			
Chloride (mg/kg)	0-105	105-140	140-350	>350
Sodium (mg/kg)	0-69	69-115	115-161	161-207

Parameter	KBH03	KBH04
EC (mS/m)	172	174
SAR	4.1	4.1
Cl	303	306
Na	195	194
Ca	89.8	89.9

		Mg 48.3 48.5
	Op bl.6 van die “Agricultural Suitability Assessment” word genoem dat die boorgatwater net “partly” gebruik word. Indien Kanderlaarsrivier water dan reeds gebruik word, word dit onwettig gedoen.	Water vanuit die leibeurt mag slegs gebruik word in terme van die ‘existing lawful use’ op voorwaarde dat enige gebruik beperk word tot die ELU volumes. Rekord word tans gehou van watergebruike via meters en die data word voorgele aan die Departement Waterwese as deel van hulle monitering rondom die kwessie van watergebruike sonde ’n Waterlisensie.
	Op 25 Mei 2021 het die BGCMA ‘n bevindng gemaak en ek haal aan: “I have reasonable grounds for believing that you have commenced with activities defined as water use in terms of Section 21 (a), (c) and (i) of the NWA without a water use authorisation”. Ek vind geen bewys van ‘n waterlisensie, selfs tydelike, ingebind in die dokumente nie!	Die Waterlisensie waarna verwys word word deur Confluent Consulting gefasiliteer en is in proses. Die water van die twee nuwe boorgate mag slegs permanent gebruik word vir die boorde ingeval die WULA wel toegestaan word. Tot tyd en wyl mag die Aansoeker slegs water gebruik binne sy ELU.
	Opsommend: Om water uit ‘n bron,Kandelaarsrivier, toe te ken aan “veldgrond”, kellershoogte” wat nog nooit aanspraak gemaak het op besproeiingswater uit Kandelaarsrivier terwyl daar vir 49 maande nie eers water uit die kanderlaarsrivier beskikbaar was om 1ha te besproei van beskikbare oppervlakte wat wel geregtig is op besproeingswater tot Kandelaarsrivier is definitief onsinnig. Om ‘n projek goed te keur vir ‘n Amandelboord op grond waar die monster ontledings bevestig die “salinity” van die grond is te hoog, terwyl die monster ontledings ook bevestig die boorgatwater se “salinity” is ook te hoog, is ook onsinnig. Dit terwyl ‘n artikel oor Amandelverbouing in die Klein Karoo in die Landbouweekblad van 26 Januarie 2023 uitwys op bl.44 en ek haal aan:	Die Aansoeker se bedoeling is nie om water uit die Kandelaarsrivier te gebruik vir besproeing van die amandelboorde nie. Die primere bron van water vir besproeingsdoeleindes is vanuit die twee (2) nuwe boorgate wat onderhewig is aan ’n Waterlisensie. Sou dit toegestaan word, is die bevinding van die geohidroloog en landbou spesialiste dat die amandelboorde volhoubaar bestuur kan word sonder om ander wettige waterverbruikers in die stelsel te benadel. Die nuwe boorgate is geboor tot onder andere 210m en 300m en onttrekking hieruit behoort nie ’n impak te he op die Kandelaarsrivier of ander wettige boorgate in die studiearea nie.

	"Soos met die meeste gewasse is waterbestuur 'n groot factor. Produsente besef nie hoeveel water Amandels nodig het nie…Ons het genoeg grond maar nie water nie". Die artikel se statistieke gaan oor die plaas Memel in Overhex naby Worcester. 'n Gebied wat oor veel meer water beskik as Oudtshoorn se distrik. Die artikel lig ook uit on bl.44 en ek haal aan: "Amandels gebruik meer water as wingerd". Ek self het met 60ha wingerd geboer. Ek moes alles staak en uithaal a.g.v nie genoegsame water vir besproeiing. Hoe op deesdae sien die aansoeker dan kans om ± 60 ha Amandels te boer as Amandels meer water nodig het as wingerd en niemand meer met wingerd kan boer langs Kandelaarsrivier. Die artikel sluit af op bl.45 en ek haal aan: "Hy voorsien dat boere in die suide van die San Joaquin-vallei in Kalifornië, waar water baie duur is, waarskynlik amandels gaan vervang mer kontantgewasse soos katoen of lusern." Hoe kan iemand dan langs Kandelaarsrivier waar water baie skaars is en dikwels skoonop raak weens droogte nog kans sien om amandels te plant?	
Mr Laubscher Coetzee	With this, I object to the application by Mr. Keller regarding the aforementioned development of an additional nearly 60 hectares of land that has never had any water rights from the Kandelaars River for the past 371 years. My objection is primarily regarding the availability of water for this additional nearly 60 hectares. Firstly, with regards to the availability of water from the Kandelaars River, most of us landowners who farm downstream alongside the river are without any water from the river for most of the year, as it is a long and non-sustaining river. Therefore, there must be enough rainfall in the rivers'' catchment area, namely the Outeniqua mountains, before any water reaches the lower farms. I have been farming along the Kandelaars River for over 40 years and can count on one hand how many times there was enough water to irrigate my entire 16-hectare farm from the river.	The concern about allocating and using water that is already a scare resource in the study area is duly noted. However, the proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied predominantly with water abstracted from the two (2) new boreholes on Portion 19 of Farm 170 that forms the subject of a Water Use License (WULA).

	Another very important aspect regarding the allocations from the river MUST, and therefore cannot be disregarded. The allocations from all the canals/furrows, as well as a furrow that is served by more than one owner under such a furrow, are granted based on a certain time duration per hectare, so the more hectares an owner possesses the longer time allocated to him. This principle is very old and for this specific river, it was established in the early 1880s. This principle is widely applied throughout Oudtshoorn and surrounding areas. The piece of land purchased by Mr. Keller only has approximately 5 hectares of irrigable surface. Therefore, he has a relatively short period of time to extract water from the furrow before he has to open up for his lower neighbours, who have significantly more hectares. The main question remains: how will he irrigate approximately 60 additional hectares with water from the furrow in the short time frame in which he is entitled to do so. The other two owners from the same furrow own a total of approximately 60 hectares. This simply does not align with the existing system that has been in place for over a century. Another important aspect and application of the system is that once a landowner has irrigated their portion from the furrow, they open up the water to the next owner. This is a very important principle, as water often flows strongly for a short period of time, in many cases only between 24 to 48 hours. This arrangement ensures that more owners have the opportunity to irrigate their land as well. If Mr. Keller were to irrigate an additional 60 hectares, it would obviously mean that those downstream would no longer have the same rights as they currently do. In short, irrigable land with water usage rights over a century old is essentially being deprived of their established use and rights.	Groundwater and not water from the Kandelaars River will form the main irrigation source for the orchards. Water from the Kandelaars River will only be used periodically to irrigate to leach salts from the soil if deemed necessary. According to Confluent Consulting, the Applicant is entitled to an allocation of water from the Kandelaars River based on the turn system described by Mr. Coetzee. The Applicant will continue abstracting water from the Kandelaars River according to this long-established turn system and will not increase his time on the turn system for the new orchards. The applicant will therefore not increase abstraction from the Kandelaars River and its associated furrow system for this project implying that the project will not have an impact on the water volumes available to lawful water users that rely on this system. The geohydrologist responsible for investigating the groundwater aquifer and yield from the boreholes, also confirmed that abstraction from the two new boreholes (drilled 210m and 300m deep respectively) will not impact on the Kandelaars River since

		there is no inter-connecting relationship between these two systems at the study area.
	The other source of water along the Kandelaars River is the underground boreholes. As previously mentioned, I have been farming for over 40 years on the same farm just north of Mr. Keller. My neighbour, Mr. Hein Schoeman, and I have been irrigating lucern from the boreholes on our respective properties. In the first 37 years that we have been farming across from each other and pumping, we have never encountered any problems with our boreholes. Both of us have used the boreholes with great responsibility and caution; never pumping continuously for more than 6 hours. Adequate rest periods between pumping sessions have been allowed to allow the boreholes to recover. This principle is still strictly applied. Since 2020, when Mr. Keller became the new owner, the situation has changed dramatically. He has pumped from his boreholes for many longer hours, sometimes all night. This had an immediate and direct negative impact on my underground sources. The two boreholes closest to his property immediately began to weaken, to the point that one of the boreholes has become dry. To support the above, it is relatively easy. The Eskom connection that supplies Mr. Keller with electricity was cut off for several months, for whatever reason. Within a few weeks, I was able to use the borehole that was almost dry, as in the past. Based on my personal experience, I cannot agree with the hydrological reports that indicate that Mr. Keller's deeper drilling boreholes have no impact on surrounding underground sources. This has not been proven, as no one has tested the flow from boreholes downstream of Mr. Keller. Mr. Keller claims that I refused to have my boreholes tested, but he does not mention the reasons for this. The reasons why tests were not conducted on my property are as follows: 1. The testing officer did not, or was unwilling, to indicate the precise reasons for testing.	It is uncertain to which 'testing officer' Mr. Coetzee is referring to. It is especially to the neighbouring users' advantage that their boreholes are available for monitoring in the pump test process and hydrocensus, precisely so that the claims made by Mr. Coetzee can be verified and/or investigated. According to Dr. Gerhard Steenekamp (Groundwater Complete), who undertook the groundwater study and hydrocensus for the project, he was refused access to Mr. Coetzee's property with no reasons provided. The claims made by Mr. Coetzee can therefore not be verified with any degree of certainty. However to counter this gap in the data a designated test hole was drilled on The Applicant's property to help with draw down testing. Based on the findings of the Geohydrological Study it is unlikely that the boreholes on Mr. Coetzee's property will be affected by the boreholes considered in this application. In the event that Mr Coetzee is able and willing to allow pump tests to be undertaken as an additional measure it will greatly help with

	2. The boreholes on my property are sealed and do not have a monitoring pipe, which as a result the testing officer indicated he would not be able to test.	clarifying the uncertainty and concern he has about the matter. It is further noted that the Applicant was obliged to fit the boreholes with meters and for said metering to be taken and submitted to the Department of Water Affairs as part of the monitoring and compliance process he is subjected to currently and can be used to supplement data for any additional borehole pump tests for Mr Coetzee's holes.

PUBLIC PARTICIPATION: COMMENTS AND RESPONSE REPORT

Kellershoogte

Prepared for Viljee Keller Trust

by

James Dabrowski

Confluent Environmental (Pty) Ltd

Tel: 083 557 5688

Email: james@confluent.co.za

Comment Received from Cullinan & Associates	
Comment No.	**Response**
7. As you know, the applicant wishes to apply for a water use licence over and above the section 24G application. We are advised that when the applicant bought the Subject Property the applicant never had any water use licenses in place nor were any water use licenses transferred to the applicant upon sale. Therefore, the applicant utilizes water from the Kandelaars River and continues to pump borehole water, unlawfully, despite an application process underway in respect of the section 24G application and Water Use License Application. This action is in and of itself unlawful and by virtue of the contents contained further in this correspondence the actions of the applicant should cease until a revised section 24G report is furnished and the decision of the water use license application is made. We are advised further, that the applicant bought the Subject property to establish 56-hectare almond and pecan nut orchards on the Subject Property despite the fact that approximately only 5 ha of the Subject Property is irrigable. The significant amount of water required for the cultivation and growing of the pecan and almond trees will significantly deplete the water in the Kandelaars River and adjacent groundwater, leaving the downstream users of the Kandelaars River with little to no water to irrigate their farms which have a much higher irrigable size than the Subject Property.	Water currently used to irrigate crops on Portion 4 of 172 is obtained from the new boreholes located on Portions 6 and 9 and 19 of Farm 170 Gamtoosberg. The combined total registered water volume for these properties is 147 000 m^3. This is made up of 19 500 m^3 from a borehole and 127 500 m^3 from the Kandelaars River. A request to Validate and Verify these water uses has been formally submitted to the BGCMA and CSIR and is pending. The existing boreholes (covered under the water use registration) are shallow, with a depth of approximately 40 to 50 m. Due to the extended drought, water levels dropped and the boreholes were no longer able to yield sufficient water. Alleged unlawful dams located further upstream of the farm in the Kandelaars River, in combination with the drought meant that the landowner was not able to reliably abstract water from the river (which accounts for the majority of his registered water use). The landowner therefore drilled two new boreholes to a depth of 300 m and 210 m (which are the subject of the WULA and S24G), respectively. In the June 2021 response to the pre-directive issued by the BGCMA for drilling and abstracting from these new boreholes, the applicant formally requested permission to continue abstracting water from the new boreholes, **not exceeding the total volume of 147 000 m^3 per annum for which he is currently registered.** The applicant also undertook not to abstract water from the Kandelaars River during the period. The applicant is therefore not abstracting any more water than for what he is currently registered. The applicant installed flow meters at all boreholes. By April 2022, the applicant had abstracted a total volume of 86 401 m^3 from all boreholes over a period of 12 months. By February 2023 the applicant has abstracted 73 763 m^3 over a period of 10 months. These volumes are well below the total registered volume of 147 000 m^3. The groundwater study completed by Groundwater Complete indicates that abstraction from the new deeper boreholes will have no effect on surface water volumes in the Kandelaars River. Furthermore, the study indicates that there is no alluvial aquifer present. Abstraction of water from the new boreholes will therefore not affect the availability of water in the furrow system (which is derived from surface water flows). Finally, the groundwater study indicated that extensive pump

	testing showed that other groundwater users will not be significantly affected by abstraction from the boreholes.
8. If the applicant is permitted to establish the proposed large almond and pecan nut orchards upstream of our client's members, the increased abstraction of water necessary to sustain those orchards will significantly reduce the water available to downstream users and ecosystems. It is likely to deplete the available groundwater, cause boreholes to run dry and increase salization. This will have very substantial negative impacts on our client and other neighbours.	The groundwater study completed by Groundwater Complete indicates that abstraction from the new deeper boreholes will have no effect on the surface water volumes in Kandelaars River. Furthermore, the study indicates that there is no alluvial aquifer present. Abstraction of water from the new boreholes will therefore not affect the availability of water in the furrow system (which is derived from surface water flows). Finally, the groundwater study indicated that extensive pump testing showed that other groundwater users will not be significantly affected by abstraction from the boreholes.
21.1. Historically Oudtshoorn and surrounding areas have followed water allocation principles established during the 1880s, which take into account the fact that the Kandelaars River is non-perennial. Water from the river canals and furrows which serve more than one land owner is allocated by allowing each user to take water for these furrows for a certain time duration per hectare of irrigable land. In other words, the greater the area of irrigable land on a farm, the longer the time allocated to the owner to abstract water to irrigate it.	The proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied with water abstracted from the new boreholes on Portion 19 of Farm 170. Any water abstracted from the Kandelaars River will be done according to the applicants ELU and the long-established turn system that operates in the area. The applicant will therefore not increase abstraction of water from the Kandelaars River and its associated furrow system.
21.2. We are advised that it is of utmost importance to note that for centuries the above principle has been in existence. At the time the principle came into existence one must bear in mind that there were no pipeline infrastructure or pumps so the only way the land could be irrigated would be if the land was below a furrow. This is because there existed no means to pump the water out and into the land to irrigate it as we do nowadays. In essence, everything below the furrow was irrigable which is why the irrigable portions now are smaller in size in relation to the rest of the owner's land. But the irrigable land is the portion which now lies alongside the	When conducting the hydrocensus for the study, the geohydrologist was refused access to boreholes on neighbouring properties to the north. This would have provided an ideal opportunity to assess the impact of the new boreholes on boreholes located on adjacent properties. These claims can therefore not be verified. Results from the geohydrological study however indicate that abstraction of water from the deep boreholes will have no significant immediate effects on groundwater availability of nearby groundwater users or lasting adverse impacts on the groundwater system.

Kandelaars River (on either side). Our client and its members have been able only to irrigate alongside the Kandelaars River since the applicant started unlawfully pumping underground water resources not aligned with the above customary practice and, therefore, damaging and drying up one of the boreholes already.	
21.3. The land purchased by the applicant has approximately 5 ha of irrigable land, which is less than the area of irrigable land on downstream farms. Therefore, based on the allocation principle described above, the applicant would only be entitled to take water from the furrow for a short time before being required to open up the channel to allow the water to flow to his downstream neighbours who have larger areas of irrigable land.	The applicant intends on irrigating orchards on Portion 4 of 172 with water abstracted from the boreholes located on Portion 19 of Farm 170. Any water abstracted from the Kandelaars River will be done according the applicants ELU and the long-established turn system that operates in the area. The planned irrigation will therefore have no additional effect on current water allocation distributed through the furrow system.
21.4. This allocation principle also applies to boreholes. However, in 2020 after the applicant became the owner of the Subject Property he pumped the boreholes all night which had a direct negative impact on our client's groundwater resources. The two boreholes closest to the applicant's properties immediately weakened and one became absolutely dry. These groundwater impacts are further elaborated within the attached reviews "A" and "B".	When conducting the hydrocensus for the study, the geohydrologist was refused access to boreholes on neighbouring properties. This would have provided an ideal opportunity to assess the claims that neighbouring boreholes weakened and became absolutely dry. These claims can therefore not be verified. Results from the geohydrological study however indicate that abstraction of water from the deep boreholes will have no significant immediate effects on groundwater availability of nearby groundwater users or lasting adverse impacts on the groundwater system.
Comments Received from Bartel Du Toit	
Beswaar 1: The farm Kellershoogte is not, according to a court finding entitled to water abstracted from the Kandelaars River furrow system.	The proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied with water abstracted from the new boreholes on Portion 19 of Farm 170. Any water abstracted from the Kandelaars River will be done according to the applicants ELU and the long-established turn system that operates in the area. The applicant is therefore not intending to increase abstraction from the Kandelaars River and its associated furrow system. A validation and verification exercise has been completed as part of the WULA and will serve as important input to determining the ELU for water abstracted by the applicant from the Kandelaars River.
Beswaar 2: No water has been available in the Kandelaars River furrow system from 19 September 2017 to 23 October 2021 as result of the intense drought in the Klein Karoo.	It is understood that the Kandelaars River has prolonged periods of no flow.

Beswaar 3: On page 4 of the Agricultural Suitability Assessment it is indicated that the project is not sustainable unless low salinity furrow water abstracted from the Kandelaars River is used as often as possible to leach salts out of the soil.	The proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied with water predominantly abstracted from the new boreholes on Portion 19 of Farm 170. According to the geohydrological study there is sufficient water available for this purpose. Any low salinity water abstracted from the Kandelaars River will be done according to the applicants ELU and the long-established turn system that operates in the area – no additional water will therefore be abstracted from the Kandelaars River. Furthermore, additional sampling has confirmed that the salinity in the borehole fluctuates and the latest samples indicate that water quality falls within a more acceptable 'Marginal' range (see response to Beswaar 7).
Beswaar 4: Given the frequency of droughts in the area (1968-1973, 1986-1993 and 2016 till present) and the lifetime of an almond orchard, how will the applicant wash salts out of the soil during these periods.	Managing salinity in soils is practiced throughout agricultural areas in the Little Karoo and is not unique to this farm. Salinity levels in the soil will be intensively monitored. In the event of a drought and a lack of water in the Kandelaars River, irrigation of orchards will be reduced with the aim of reducing build-up of salts in the soil, while providing enough water to keep the trees alive (maintenance irrigation). The primary aim will therefore be to manage salt levels in the soil and maintain the health of trees until such time as conditions improve, when normal irrigation practices can be resumed.
Beswaar 5: Farms that have legal water rights to water from the Kandelaars River currently do not have sufficient water for irrigtation. These farms (with established water rights) will have even less water available water from the Kandelaars River is allocated to the Kellerhoogte Farm	The proposed irrigation scheme on Portion 4 of Farm 172 Kellerhoogte is to be supplied with water abstracted from the new boreholes on Portion 19 of Farm 170. Water from the Kandelaars River will be used to leach salts from the soil periodically, but water will be abstracted from the furrow according to the long-established turn system for the area. The applicant will therefore not increase the volume of water abstracted from the river. The applicant is therefore not intending to increase abstraction from the Kandelaars River and its associated furrow system.
Beswaar 6: Labour number have decreased by between 30 to 50 % as a result of the drought. Some labourers are now only employed on a 4 day week. More farm workers will lose there jobs if this application is approved.	It is unclear how the approval of the irrigation will result in a decrease in work opportunities. Given that water will be supplied from boreholes it is unlikely that drought periods will affect the viability of the project and no decrease in labour is anticipated. In contrast the expansion of the irrigation project is likely to result in an increase in labour requirements and in increase work opportunities associated with the expansion of the Agri-Hub. Furthermore, the project will not impact on water availability to downstream users and therefore no loss of work opportunities are expected as a result of approval of this project. • Expected value of employment opportunities for the first 10 years is calculated at approximately R2 640 000.00.

	• The expected yearly income/ contribution to the economy that will be generated by the pomegranate orchards through job creation and income is estimated at R14 000 000. R12 000 000 would be from foreign currency associated with exports. • Stimulated employment creation during construction, approximately 30 direct employment opportunities. • Operational phase has permanent employment opportunities for 20 persons, as well as seasonal employment for approximately 150 persons. All spaces will be taken up by residents from the rural areas surrounding Calitzdorp (Eden District Municipality) which will therefore create a reduction in the unemployment figures for the local economy.
Beswaar 7: Kellershoogte is known in the area as 'Brakpoort'. Page 3 of the Agricultural Suitability Assessment indicates that *"Both the boreholes fall into class 4, for all four of the parameters in Table 2. Class 4 is the lowest quality water and is considered unsuitable for irrigation."* On Page 6 of the same document it states that *"The soil as well as the borehole water that is partly used for irrigation has salinity limitations. If this were the only available water for irrigation, it would have considerable risk for the sustainability of the almond orchards."* As indicated in Beswaar 4, drought cycles occur frequently and for long periods, during which time no water is available from the Kandelaars River. Given the poorquality borehole water and the fact that droughts occur frequently and for long periods of time, how will the orchard be sustainable?	While it is acknowledged that the borehole water has a relatively high salinity, the same report also states on Page 4 that "*It should be noted that the young orchard has performed well, despite having been irrigated predominantly with borehole water that has high salinity".* Furthermore, the report states the following: *The soil as well as the borehole water that is partly used for irrigation has salinity limitations. If this were the only available water for irrigation, it would have considerable risk for the sustainability of the almond orchards. However, low salinity leibeurt water is available from the Kandelaars River. The use of this water to irrigate the orchards whenever possible is likely to prevent salt build up in the soil and thereby ensure the sustainability of the orchards.* *The sustainable yield of available borehole water was determined to be 422,750m^3/year. This is a sufficient quantity of water for the irrigation of the application area, especially since additional water will be applied from the river.* *The site is considered suitable for orchard establishment in terms of soil, climate, slope and the availability of irrigation water. From an agricultural suitability point of view, it is recommended that the application be approved.* It should also be noted that the water quality analysis presented in the Agricultural Sustainability Assessment represents a brief snapshot of conditions at that time. Subsequent analysis of water

samples (see below) indicates that most water quality parameters from both boreholes falls within the 'Marginal' class, and represents a substantial improvement in quality (parameters measures in previous samples all fell within the 'Unnacceptable' Class.

Table 1: Water quality results from water samples collected in May 2023

Parameter	KBH03	KBH04
EC (mS/m)	172	174
SAR	4.1	4.1
Cl	303	306
Na	195	194
Ca	89.8	89.9
Mg	48.3	48.5

<table>
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Table 2: Water quality guidelines for

Water quality constituent	Fitness for use for irrigation			
	Good (Class 1)	Fair (Class 2)	Marginal (Class 3)	Unacceptable (Class 4)
	Salinity and sodicity			
Electrical conductivity (mS/m)	0-40	40-90	90-270	270-540
Sodium absorption ratio (SAR)	0-1.5	1.5-3.0	3.0-5.0	5.0-10
	Potentially toxic ions			
Chloride (mg/kg)	0-105	105-140	140-350	>350
Sodium (mg/kg)	0-69	69-115	115-161	161-207

While droughts are likely to occur in the area

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<tr><td>Beswaar 8: On Page 6 of the Agricultural Suitability Assessment it is mentioned that borehole water is being partly used. If water is from the Kandelaars River is being used to irrigate these orchards then it is being done so illegally.</td><td>The applicant has an ELU to abstract water from the Kandelaars River and no additional water will be abstracted from the river. The applicant is entitled to use this water on Portion 4 of Farm 172 Kellershoogte as long the volumes abstracted do not exceed the ELU volumes.</td></tr>
<tr><td>Beswaar 9: On the 25th of May 2021 the BGCMA made the following finding:

“ I have reasonable grounds for believing that you have commenced with activities defined a water use in terms of section 21 (a), (c) and (i) of the NWA without a water use authorization.”</td><td>The applicant did commence water use activities without authorisation, and as advertised in the Public Participation advertisement is applying for a WULA to authorise these water uses. In the June 2021 response to the pre-directive issued by the BGCMA for drilling and abstracting from these new boreholes, the applicant formally requested permission to continue abstracting water from the new boreholes, not exceeding the total volume of 147 000 m^3 per annum for which he is currently registered. The applicant is therefore not abstracting any more water than for what he is currently registered. The applicant installed flow meters at all boreholes. By April 2022, the applicant had abstracted a total volume of 86 401 m^3 from all boreholes over a period of 12 months. By February</td></tr>
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I have found no evidence of a water use license (even current) included in the documents.	2023 the applicant has abstracted 73 763 m^3 over a period of 10 months. These volumes are well below the total registered volume of 147 000 m^3.
Conclusion	The IAP makes the assumption that the almonds will only be irrigated with water abstracted from the Kandelaars River. This is an incorrect assumption. Almonds and pomegranates will primarily be irrigated using water abstracted from deep lying boreholes. No additional water will be abstracted from the Kandelaars River as the applicant will continue abstracting water based on the long-established turn system for the area. Furthermore, the irrigation of almonds and pomegranates under drip irrigation (at a rate of approximately 5 000 m^3/ha/year) represents a far more efficient use of water than irrigating lucerne via flood irrigation at a rate of approximately 10 000 m^3/ha/year.
Comments Received from Laubscher Coetzee	
With this, I object to the application by Mr. Keller regarding the aforementioned development of an additional nearly 60 hectares of land that has never had any water rights from the Kandelaars River for the past 371 years. My objection is primarily regarding the availability of water for this additional nearly 60 hectares. Firstly, with regards to the availability of water from the Kandelaars River, most of us landowners who farm downstream alongside the river are without any water from the river for most of the year, as it is a long and non-sustaining river. Therefore, there must be enough rainfall in the river1s catchment area, namely the Outeniqua mountains, before any water reaches the lower farms. I have been farming along the Kandelaars River for over 40 years and can count on one hand how many times there was enough water to irrigate my entire 16-hectare farm from the river. Another very important aspect regarding the allocations from the river MUST, and therefore cannot be disregarded. The allocations from all the canals/furrows, as well as a furrow that is served by more than one owner under such a furrow, are granted based on a certain time duration per	The proposed irrigation scheme on Portion 4 of Farm 172 is to be supplied predominantly with water abstracted from the new boreholes on Portion 19 of Farm 170. This will form the main irrigation source for the orchards. Water from the Kandelaars River will only be used periodically to irrigate and to leach salts from the soil. The applicant is entitled to an allocation of water from the Kandelaars River based on a turn system described by Mr. Coetzee. The applicant will continue abstracting water from the Kandelaars River according to this long-established turn system and will therefore not increase his time on the turn system. The applicant will therefore not increase abstraction from the Kandelaars River and its associated furrow system.

hectare, so the more hectares an owner possesses the longer time allocated to him. This principle is very old and for this specific river, it was established in the early 1880s. This principle is widely applied throughout Oudtshoorn and surrounding areas. The piece of land purchased by Mr. Keller only has approximately 5 hectares of irrigable surface. Therefore, he has a relatively short period of time to extract water from the furrow before he has to open up for his lower neighbours, who have significantly more hectares. The main question remains: how will he irrigate approximately 60 additional hectares with water from the furrow in the short time frame in which he is entitled to do so. The other two owners from the same furrow own a total of approximately 60 hectares. This simply does not align with the existing system that has been in place for over a century. Another important aspect and application of the system is that once a landowner has irrigated their portion from the furrow, they open up the water to the next owner. This is a very important principle, as water often flows strongly for a short period of time, in many cases only between 24 to 48 hours. This arrangement ensures that more owners have the opportunity to irrigate their land as well. If Mr. Keller were to irrigate an additional 60 hectares, it would obviously mean that those downstream would no longer have the same rights as they currently do. In short, irrigable land with water usage rights over a century old is essentially being deprived of their established use and rights.	
The other source of water along the Kandelaars River is the underground boreholes. As previously mentioned, I have been farming for over 40 years on the same farm just north of Mr. Keller. My	It is uncertain to which 'testing officer' Mr. Coetzee is referring to. It is especially to the neighbouring users' advantage that their boreholes are available for monitoring in the pump test process and hydrocensus, precisely so that the claims made by Mr. Coetzee can be verified and/or investigated. However, according to Mr. Gerhard Steenekamp (Groundwater Complete), who undertook the

neighbour, Mr. Hein Schoeman, and I have been irrigating lucern from the boreholes on our respective properties. In the first 37 years that we have been farming across from each other and pumping, we have never encountered any problems with our boreholes. Both of us have used the boreholes with great responsibility and caution; never pumping continuously for more than 6 hours. Adequate rest periods between pumping sessions have been allowed to allow the boreholes to recover. This principle is still strictly applied. Since 2020, when Mr. Keller became the new owner, the situation has changed dramatically. He has pumped from his boreholes for many longer hours, sometimes all night. This had an immediate and direct negative impact on my underground sources. The two boreholes closest to his property immediately began to weaken, to the point that one of the boreholes has become dry. To support the above, it is relatively easy. The Eskom connection that supplies Mr. Keller with electricity was cut off for several months, for whatever reason. Within a few weeks, I was able to use the borehole that was almost dry, as in the past. Based on my personal experience, I cannot agree with the hydrological reports that indicate that Mr. Keller's deeper drilling boreholes have no impact on surrounding underground sources. This has not been proven, as no one has tested the flow from boreholes downstream of Mr. Keller. Mr. Keller claims that I refused to have my boreholes tested, but he does not mention the reasons for this. The reasons why tests were not conducted on my property are as follows: 1. The testing officer did not, or was unwilling, to indicate the precise reasons for testing.	groundwater study and hydrocensus for the project, he was refused access to Mr. Coetzees property. The claims made by Mr. Coetzee can therefore not be verified with any degree of certainty. Based on the findings of the Geohydrological Study it is unlikely that the boreholes on Mr. Coetzee's property are affected by the boreholes considered in this application

2. The boreholes on my property are sealed and do not have a monitoring pipe, which as a result the testing officer indicated he would not be able to test.	
Comments Received from Western Cape Department of Agriculture	
There are three drainage lines running adjacent and through the proposed development area. Appendix B1 Preferred Alternative show that two of these drainage lines stop in the middle of the development and no provision is made to safely discharge the runoff in a river or stream. The drainage lines must be extended to a point where they can safely discharge into a stream or river. The runoff in the drainage line will increase if they construct storm water furrows above the proposed development, therefore the drainage lines must not be disturbed and they must promote the growth of vegetation to decrease the flow velocity in the drainage line. This drainage line must not be used as access roads. If it is not possible to safely use the drainage lines, they will have to design and construct waterways to safely discharge the runoff. They will also have to make provision for a buffer area of minimum 3 m around the drainage lines of waterways.	Only one drainage line stops in the middle of the development (referred to as KH2 in the freshwater assessment report) – all other drainage lines discharge pass under the R328 and drain into the non-perennial tributary of the Kandelaars River (referred to as KH1 in the freshwater assessment report). KH2 is a very small, narrow watercourse that only receives intermittent, short-term flows (no more than a few days at a time) following heavy rainfall. Given the aridity of the region, the watercourse will therefore seldom flow. The primary ecological function of the watercourse is to deliver periodic surface water flows to downstream water resources (as opposed to sustaining aquatic fauna and flora within the stream reach). This drainage line was historically disconnected from the broader hydrological network and used to terminate into a furrow/canal that fed a dam on the property. Runoff from the watercourse did therefore not reach any natural watercourse and there is no culvert that can convey discharge from the KH2 drainage line to the north of R328 and into KH1. Following the establishment of the new agricultural fields, the remaining portion of the drainage line now terminates and discharges into the fields, further up along its course. Periodic runoff from the undisturbed section of the drainage line is currently discharging into the prepared fields and creating a new channel. This channel will be allowed to re-establish through these fields (which are currently not planted). A 5 m buffer will be established along this channel to allow water to flow freely (and avoid further erosion to fields and damage to crops). Once the watercourse reaches the currently planted orchard area, runoff will be channelled through the orchard via an artificial channel. After passing through the orchard water will naturally drain along the southern edge of the R328 in an easterly direction, through a culvert under the Mount Hope road and discharge into the non-perennial tributary of the Kandelaars River (i.e. along the route of the pipeline that transfers water from the boreholes, across the non-perennial tributary of the Kandelaars River and to the orchards).

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Confluent Environmental (Mr. James Dabrowski)

Cape EA Prac (Me. Louise-Mari van Zyl)

Dear Madam and Sir

RESPONSE TO COMMENTS RECEIVED ON THE KELLERSHOOGTE GROUNDWATER REPORT FOR 21.A APPLICATION

This memorandum is provided in response to comments received from GEOSS on behalf of The Kandelaars River Water Users Association on a groundwater study report compiled by Groundwater Complete for Viljee Keller Trust. The project will in the remainder of this response be referred to only as Kellershoogte while we will refer to GEOSS as the commentator.

1. Introduction

We wish to state from the onset that Groundwater Complete always welcomes constructive comments on our studies and reports because it assists us in improving the quality of our work and thus better serving our clients and the deciding authorities. As such, we are thankful for a number of aspects pointed out such as references we could add or raw data that we could include and also for alternative opinions provided on approaches and methodologies. Even if we do not always agree on all of these, it contributes to improve the groundwater science we serve.

The list of comments received is quite extensive but as we see it they can be grouped in five broad categories:

1. Comments indicating errors or shortcomings in terms of spelling, units used, aspects indicated on maps and so on. *(We corrected these and amended the report with the information where necessary and feasible.)*
2. Opinions on alternative methodologies or interpretations used on important aspects of the study such as aquifer recharge and pump test interpretation. *(Brief responses or motivations were provided in response to such comments to state our opinions on the matters.)*
3. Similar comments were made on other study aspects that do not have any real bearing on the study scope (for example the groundwater quality, sampling methodology etc.). (*We provided brief responses on these as well.*)
4. Finally, a number of comments were made that showed that the commentator made assumptions on very important aspects of the study without verifying the facts or

understanding the context – this includes comments on the surface-groundwater interaction, the primary aquifer, riparian zone, high yields calculated for the post-wet period pump tests. *(Responses were provided to point out, provide context or motivate our findings based on facts from the study.)*

5. Finally, comments were made and opinions offered on more than one occasion only to provide comments later that are directly contradictory to the initial comment, unless we totally misunderstand them.

The received comments were numbered for ease of cross-referencing and are posted below. We added a column on the right-hand side where we provide our responses on the comments.

In summary we can state the following:
Although the list of comments is long, very few **touch on the core issue**, namely:

- the recommended sustainable yield of the Kellershoogte boreholes; and
- the potential impacts the boreholes may have when pumped at the sustainable yields.

Where the comments do touch on the core issues, nothing is provided that could constitute a flaw in the methodology or final results to put into question the outcomes of the study. In fact, some assumptions are made based on misreading the report or on blatant errors in assumption or interpretation.

2. Response to Comments

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Nr.	Heading	GEOSS Comment	Groundwater Complete Response
1	Introduction	*page 7. "Two deeper boreholes (KBH02 and KBH03) were drilled in the vicinity of the existing boreholes with the aim of accessing the deeper aquifer that is not exploited by nearby groundwater users"*	
		All of the boreholes are located within 100 meters from the riparian edge of the Kandelaars River and requires a detailed groundwater surface water interaction assessment to assess the impact of groundwater abstraction on the surface water resource.	Agreed. KBH07 was drilled specifically for this purpose and assessment was made in Section 6. (*It should be noted that several of the other user boreholes to the south – and we expect the same would apply to the north – are also situated in same 100m zone.)*
2	Geographical setting	*page 9. "The Kandelaars River in the project area is non-perennial and only experiences flow in the wet season or for limited periods after rainfall events. It has not had regular flow for the last three years"*	
a		On what data is this based? The author does not provide a reference for this.	It was based on anecdotal data considered plausible by the extreme drought experienced during the time of study. This is further corroborated by DWA Flow Guage J3H017 which was added as reference in Section 2.
page 9. At Kellershoogte the river does not receive any groundwater baseflow – it is a losing stream in the project area as will be shown with discussion of water levels in sections 4 and 6."			
b		Is there any recent monitoring data for river flow? (i.e., flow measurements at a weir) From this one should be able to plot a hydrograph where a separation can be made from quick flow (flow after rainfall events) and baseflow during dryer periods. All rivers do have a baseflow component, however this can be seasonal. Rivers can be characterised as gaining, losing or disconnected from or to an aquifer. Furthermore, this interaction can vary, depending on the stage of the river. It might be a gaining river upgradient and losing further down the course of the river.	There is a weir located near Kellershoogte (DWA J3H017), however, unfortunately the monitoring only occurs in monthly intervals in recent data, which is of limited use. The Kandelaars River has a relatively small catchment in a dry area and only flows after significant rainfall events and for limited periods of time. While we agree that all rivers do have base flow they do not receive their base flow along its entire course. At Kellershoogte itself the water level information proved that there is no base flow whatsoever. Thus, the river is not constantly fed by a shallow water table which is in turn connected to the groundwater, which was the point of the statement.

2.2	Climate	*page 11. "The effects and implications of (1) the severe drought and (2) the good rainfall of the end of 2021 on groundwater availability will be indicated clearly in the pump test analysis and sustainable yield recommendation."*	
		The drought conditions are noted in the climate section. The 2021 rainfall season is considered an outlier and it is recommended that the analysis and management is based on the drought conditions discussed in succeeding sections.	Strongly disagree. The drought preceding the study was an extreme event. While we always err towards conservative recommendations, it is nonsensical to recommend according to a severe drought. We did recommend a varied use approach based on the rainfall season as indicated by aquifer water levels because of the exceptional difference in water levels before and after rainfall events.
3	Scope of Work	*page 7. "The main aims of this study are to:* *• determine the long-term sustainable yields of all the boreholes intended for future sources of groundwater supply; and* *• estimate the potential impact of the sustainable use of the boreholes on the groundwater availability of nearby lawful users."*	
		The aim of the study focuses on the determination of long-term sustainable yields of the boreholes part of the current and future groundwater supply. Estimate the impact of the groundwater use on nearby existing lawful groundwater users. The scope of works does not clearly make provision for the investigation the potential impact of groundwater abstraction on surface water resources (the Kandelaars River) in the study area. Considering the close proximity of the boreholes to the river this should be addressed.	This was addressed by drilling of borehole KBH07 and discussion in Section 6. A shortcoming of our report is a lack of photo records. On-site inspection shows that there is no surface water or weathered zone moisture or riparian moisture of any kind near the tested boreholes. The riverbed is a channel scoured into the solid shale bedrock. Further evidence of this is that BH07 (situated approximately 3 m higher than the riverbed bottom intersected solid shale within 1 meter below surface. The source of the Kandelaars River lies further south where rainfall is higher and where it receives some base flow after rainfall events. **At Kellershoogte, the Kandelaars River is strictly a losing stream and the groundwater cannot have any effect on surface water users.**
4	Methodology	The author follows a logic format for discussing the methodology followed for the geohydrological assessment. The pumping test methodology is not very clear. Especially for assessing groundwater surface water interaction and how the sustainable yields have been calculated for each borehole.	

4.2	Hydrocensus	*page 21. "Groundwater Complete was refused access to the properties to the north of Kellershoogte by the owners, thus there is no hydrocensus information available for the properties to the immediate north."*	
a		This makes it difficult for the author to understand the extent and amount of groundwater use in the area. The more borehole information obtained the higher the potential for a more accurate conceptual understanding of the geological setting.	Agreed. It is especially to the neighbouring users' advantage that their boreholes are available for monitoring in the pump test process.
		page 21 "The national groundwater archive (NGA) was consulted for groundwater information around the project area and the result is presented in Figure 10. The data from NGA is outdated, as most of the boreholes were last measured in the 1970's."	
b		Reference is made to the NGA database and borehole locations are shown on the map (figure7). However, no data or information discussed is shown in the report, nor attempted to confirm if these actually exist. This must be shown.	The NGA as a source is considered outdated and only provides a general background picture of groundwater levels.
c		The site specific hydrocensus boreholes details are shown in the report in table 4. The borehole yields are largely unknown which makes it difficult to quantify the groundwater use within the area.	Agreed, but getting such information is beyond our control.
4.4	Drilling and siting of boreholes	Mention was made of a single monitoring borehole that has been drilled with the purpose of monitoring the interaction between the deep and shallow aquifers present in the study area. Furthermore, the potential for groundwater surface water interaction between the abstraction boreholes and the Kandelaars River. This monitoring borehole was named KBH07. There are no borehole logs included in the report.	Borehole logs are described shortly in Section 6 as was deemed relevant to the study. A log for BH07 has been added.
4.5	Aquifer testing	The following has relevance pertaining to the aquifer testing:	
a		• The author clearly describes the analysis tools used and the set of assumptions. The software tools used by the author are current and commonly applied for the	

		estimation of aquifer parameters and the calculation of abstraction yields for boreholes.	
b		• The testing methodology is not clear. The durations seem to be random and (76 hours, 127 hours etc.). None of the tests completed seems to be done according to South African National Standard (SANS 10299-4:2003, Part 4 – Test pumping of water boreholes. There is no step test data in any of the tests completed which is part of the minimum requirements.	The aquifer tests were conducted using the existing installed pumps, which do not possess variable speed drives and therefore could not conduct step tests. Because of the abovementioned shortcoming long duration pump test were conducted using the existing equipment to ensure the yield of the boreholes. It should be noted that several tests were conducted at various rates by controlling the outlet valves of the boreholes. All these tests were not **discussed but we will suffice to state that the various tests conducted for long durations at various pump rates far exceeded the scientific value obtained from step drawdown tests** as set out in the SANS guidelines. For example, **SANS set a minimum duration of 24 hours for a constant rate test. We conducted several pump tests ranging from 4 hours and 12 hours, far exceeding the SANS step tests by measuring longer term impacts on the observation boreholes.** The constant rate tests of 72 hours or longer should be commended rather than varying durations questioned.
c		• The graphs for the testing data does not have units consistently Graphs do not have consistency with units.	Comment unclear.
D		• No pump installation depth during the testing is communicated	Amended
E		• No observation boreholes were monitored during the longer post wet season tests.	Because of low recharge and the aquifer storage being depleted the drawdown during dry period tests – both in pumped and observation boreholes – were much more significant. We considered it fair to use the drawdown during dry tests as the worst case scenario and base recommendations on that.

F		• It is likely that the boreholes were tested with pumps installed, however, not stated in the methodology. None of the tests indicate rest water levels and to where in relation to the rest water level the water levels recovered after pumping was stopped.	Information provided in amended report
G		• The Cooper Jacob fit to the drawdown curves for some of the boreholes tested does not make sense.	Response at more specific comments below.
		The borehole testing or aquifer testing as referred to by the author is discussed below:	
		Aquifer testing discussion:	
		KBH02 (Post dry period testing) – page 35 -37	
H		• No raw data is presented or included in the report.	Information provided in amended report
I		• From the data presentation and discussion, it seems like the borehole was tested at a rate of 5.12 L/s. However, not clearly indicated. Based on the analysis the author recommended a sustainable yield of about 3 L/s for 24 hours per day.	Recommended pumping rate was obtained from the Cooper Jacob fit while accounting for boundaries in the FC-Method program.
J		• In the discussion there is no indication of the test pump depth installation. Furthermore, no reference water levels are communicated or evident in the graphs presenting the data. It is difficult to gauge whether the water level recovered fully or not. It is assumed that KBH02 has a rest water level of 51.4 mbgl (table 4). The graphs used to present the data shown in figure 17 and figure 18 does not have any units or reference for the amount of drawdown or to where the water level has recovered. However, very small, there is clear interaction between KBH02 and KBH03.	Added in the amended report for both dry and wet period testing. Yes, there is a definite interaction between KBH02 and KBH03. A much more significant interaction was expected given the depths and proximity of the boreholes. The interaction – however small – was factored into he recommendation.
K		• In table 6 the author refers to a KBH2 where is this borehole or is this KBH02?	It is KBH02. Correction made in the report.
L		• The Cooper Jacob fit of the author to the drawdown curve seems to be good. It shows a rapid drawdown towards pump inlet. The Theis fit to the recovery data is good.	
		KBH02 (Post wet period testing) – page 38	

M		• The yield test was completed at a rate of 11.1 L/s. A transmissivity of 38.2 m2/s? was calculated. Shouldn't it be 38 m2/d.	Yes, corrected
N		• The C-J fit to the drawdown data curve is completely unrealistic. It has been fit to 90 minutes of the total 72 hours of pumping? This early time data is rather representative of well bore storage or storage in the damaged/ fractured zone surrounding the borehole.	The C-J fit was on the early drawdown period instead of the later matrix flow period is not conventional. The only alternative was to fit it on the later fracture flow period, which would have resulted in a much higher T and therefore a much higher sustainable yield (which would have been unsustainable. **The early data is definitely not representative of well bore storage**. Simple calculations show that for 6 meters of drawdown (after 100 meters of pumping) the total storage volume in a 16 inch diameter well is 75 litres. At 11.1 l/s all well storage is pumped out within less than 7 seconds. Though it is difficult to pinpoint, we attribute the initial higher drawdown rate (with lower transmissivity) to the low initial storage coefficient due to the high piezometric head. The drawdown rate (specific storage) then decreases as fracture (radial) flow starts to dominate.
O		• The recommend yield is 8.9 L/s higher than the rate at which the test was completed at. What proof is there that the aquifer would be able to sustain this yield? Based on experience there is potential that the aquifer would be able to achieve pumping rates of 20 L/s even though the actual test was completed at 11.1 L/s.	The 20 l/s is obtained from aquifer parameters obtained from pump test data – that is the way to determine sustainable yield. In fractured rock aquifers we also need to consider flow boundaries and also the effective recharge. The tests were conducted for much longer durations than SANS minimum requirements to account for boundaries as far as possible. <u>Please consider the context that we never suggested or recommended that KBH02 can sustain 20 l/s over the long term:</u> While the 'theoretical' sustainable yield of KBH02 from the pump test data after the wet period is 20 l/s, **the final**

			recommended sustainable yield is 175 200 m^3/a, or 5.56 l/s. This is only 50% of the tested rate of 11.1 l/s and 28% of 20 l/s.
P		However, the transmissivity is quite low and from the test it seems like the storativity is also quite low. Therefore, the water level might drop to pump inlet after a few hours - days of pumping at this high rate. If not, it is highly likely that the water level will just drop over time as the aquifer storage is being depleted at this high pumping rate. In other words, depletion of the resource over time. Then one will be back to the "post dry period" pumping rate scenario and potentially over the long-term result in aquifer deterioration in terms of yield.	See previous response: 20 l/s was never put forward as a recommended sustainable yield.
Q		• The water levels in the proximal boreholes (KBH03, KBH04 and PP03) were not monitored during the testing where they were monitored during the post dry period.	See response 4.5.E.
R		Recommendation:	
S		• It is recommended that the raw data is communicated and presented in the report. This includes, test pump installation depths, rest water levels in the testing section, flow rates for the testing, step test data (if not completed it must be motivated why), a graph showing the drawdown curve along with the recovery curve and an evaluation of the water level recovery percentage. A review must be completed of the data analysis within the software used by the author.	Final data as used in the report was added to the final report.
T		• It is recommended that a plot of the first and second derivative data of the drawdown curve is included in the report for both the post dry period and post wet period tests completed. This to determine flow characteristics of the aquifer considering the fact that it is located in close proximity to a river. It is very likely that the post wet period	The derivatives were assessed and will be added to the final report. No recharge boundary is indicated, only the dewatering of various fractures during the post-dry period tests. The river has (as expected) no measurable influence on the deep aquifer abstraction.

		test will show a first derivative plot curve indicative of a recharge boundary (recharge from the river).	
U		• It is further recommended that the author clarifies the extrapolation time for calculating the sustainable yield for the post wet period testing. There is concern for the high flow rates that will cause a gradual if not rapid decline in water levels within the aquifer that could potentially permanently damage the aquifer.	See response 4.5.N. The 20 l/s was obtained from long-duration pump test data. The comment is way out of context and the 20 l/s yield was never put forward as safe yield for the borehole.
V		KBH03 (Post dry period testing) page. 39 – 40.	
W		• The test was completed at 3.6 L/s. Transmissivity was calculated to be 2.1 m2/d and the storativity 0.05.	
X		• The pump installation depth is unknown.	
Y		• The recommended yield 2.4 L/s for 24 hours per day. The recommended 12-hour pumping rate is 4.8 L/s again higher than that of the tested rate. As discussed with KBH02 (post dry period testing) there are is risks involved with this recommendation.	Please read the recommended rate in context with the post-wet period test to consider the major effect that aquifer recharge proved to have on sustainable yield at the deep boreholes of Kellershoogte.
Z		• The Cooper Jacob fit to the drawdown data curve makes sense. The Theis fit to the recovery curve makes sense (late time fit).	
Aa		• The author	
		KBH03 (Post wet period testing) page. 40.	
Bb		• The test was completed at a rate of 9.1 L/s.	
Cc		• The transmissivity calculated based on this testing data is much higher than the post dry period test.	Please refer to responses 4.5.N and U and Y.
Dd		• On what is the sustainable yield based? To what time was the testing data extrapolated? 1 week, 1 month, 1 year, 2 years?	It was extrapolated to infinity – that is our understanding long term (permanent) sustainable yield in a Section 21.a. application as obtained from the FC-Method and other

			pump test analysis algorithms that also consider the effective annual recharge.
Ee		• The recommended sustainably yields is more than double of the rate at which the borehole was tested? The Cooper Jacob fit to the drawdown curve is completely unrealistic. There is 40+ hours of testing data and it has been fit to 3 data points that do not follow the drawdown trend over time.	Please read context and refer to responses 4.5.N and U and Y. For KBH03, the longterm sustainable yield was 197 100, or 6.25 l/s. This is lower than the 9.1 l/s of the long duration pump test.
		Recommendation:	
Ff		• It is recommended that the raw data is communicated and presented in the report. This includes, test pump installation depths, rest water levels in the testing section, flow rates for the testing, step test data (if not completed it must be motivated why), a graph showing the drawdown curve along with the recovery curve and an evaluation of the water level recovery percentage. A review must be completed of the data analysis within the software used by the author.	The raw data of the final tests will be added to the report. As for the recommended review, the relevant deciding authorities can consider our responses with context provided in this memo and decide if they wish to conduct a peer review of the recommendations.
Gg		• It is recommended that a plot of the first and second derivative data of the drawdown curve is included in the report for both the post dry period and post wet period tests completed. This to determine flow characteristics of the aquifer considering the fact that it is located in close proximity to a river. It is very likely that the post wet period test will show a first derivative plot curve indicative of a recharge boundary (recharge from the river).	The derivatives were assessed and will be added to the final report. No recharge boundary is indicated, only the dewatering of various fractures during the post-dry period tests. The river has (as expected) no measurable influence on the deep aquifer abstraction.
Hh		• It is further recommended that the author clarifies the extrapolation time for calculating the sustainable yield for the post wet period testing. There is concern for the high flow rates that will cause a gradual if not rapid decline in water levels within the aquifer that could potentially permanently damage the aquifer.	Please read context and refer to responses 4.5.N, U, Y and Ee. **The high flow rates referred to were not in the final recommendation.**
		KBH04 (Post wet period testing) – page 42 - 44	

ii		• The rate at which the test was completed is unknown?	The pump rate was 4.17 l/s. Will be added to the report.
Jj		• A Sustainable yield of 1.6 L/s was recommended for 24 hours per day pumping and 3.2 L/s for 12 hours per day. A t-value of 4.3 m2/day was calculated.	
Kk		• The Cooper -Jacob fit to the drawdown data curve is unrealistic. It has been fitted to 20 minutes of pumping and the 76th hour (only two points). This will result in a skewed interpretation of the data and completely inaccurate aquifer parameters. It would be a lot more realistic to fit it to the steep slope towards the end of the test as the water level is clearly rapidly dropping towards pump inlet. The same goes for the Theis fit to the recovery curve it seems to be at random and not representative of the aquifer. Maybe the wrong graphs were included here or not updated?	Please read the second paragraph of Section 4.5.3 for context. We state clearly that the final part of the graph was not used for the curve fitting since the pump rate was increased after 24 hours to stress the borehole. The increased drawdown was considered to fit a lower T-value and make the recommended yield lower than the actual performance during the test. If only the first 24-hour test data was used at 4.17 l/s the fitted T would have been 71 m^2/d and corresponding sustainable yield would have been 10 l/s. **This should be adequate proof that our sustainable yield recommendations were very conservative.**
		• page 42."Firstly, the fact that there is no drawdown in KBH03 during the pump test on KBH04 confirms that the two boreholes are developed in two different aquifers separated by aquitards."	
Ll		Considering the borehole depths, it is rather likely that KBH04 is not deep enough to intersect those same fractures as that in KBH03 and there are not two different aquifers, rather just different depths.	
Mm		• page 42."Secondly, it provides information on the recharge mechanism to the aquifer intersected by KBH03, namely that it receives recharge from a distance away and the recharge takes a few months to reach the water table through the unsaturated zone. By far the most significant rainfall event prior to the pump testing occurred in February 2021. The thunderstorm also caused runoff in the Kandelaars River for a few hours. The continuous increasing water level in KBH03 is interpreted as being a response to this rainfall event that had a lag time of approximately 2 months in recharge to the deeper aquifer intersected by KBH03."	
Mm		This is very contradicting. The fact that one sees a rapid rise in the water level at KBH03 shortly after a rainfall event where surface runoff is evident, clearly shows a high degree	**Strongly disagree**. The runoff in the Kandelaars River literally occurred for a few hours. The water level increases in the underlying aquifers occurred over several (6 or more)

		of connectivity between streamflow and the underlying fractured aquifer.	weeks – refer to Figure 25. There is no evidence of a primary alluvial or phreatic aquifer that could store the run-off for recharge to the deeper aquifers over such a long time.
Nn		• There are no time units in Figure 25, however, it is assumed that this could be minutes.	Yes, the time unit is minutes. Corrected in report.
Oo		Recommendation:	
Pp		• It is recommended that the raw data is communicated and presented in the report. This includes, test pump installation depths, rest water levels in the testing section, flow rates for the testing, step test data (if not completed it must be motivated why), a graph showing the drawdown curve along with the recovery curve and an evaluation of the water level recovery percentage. A review must be completed of the data analysis within the software used by the author.	Ditto to response 4.5.Ff
Qq		• It is recommended that a plot of the first and second derivative data of the drawdown curve is included in the report for both the post dry period and post wet period tests completed. This to determine flow characteristics of the aquifer considering the fact that it is located in close proximity to a river. It is very likely that the post wet period test will show a first derivative plot curve indicative of a recharge boundary (recharge from the river).	The derivatives were assessed and will be added to the final report. No recharge boundary is indicated, only the dewatering of various fractures during the post-dry period tests. The river has (as expected) no measurable influence on the deep aquifer abstraction.
Rr		• It is further recommended that the author clarifies the extrapolation time for calculating the sustainable yield for the post wet period testing. There is concern for the high flow rates that will cause a gradual if not rapid decline in water levels within the aquifer that could potentially permanently damage the aquifer.	Please read context and refer to responses 4.5.N, U, Y, Ee, Hh and Kk. **The high flow rates referred to were not in the final recommendation.**

4.6 a	Sampling and chemical analysis	The method for sampling the boreholes is mentioned in the report. To obtain an accurate sample, representative of the aquifer one should purge the borehole. Water samples were taken from KBH02, KBH03, Berg, Voerkraal, Peartree and Lusern stoor boreholes and submitted for analysis. There is no indication on whether the samples were submitted to a SANAS accredited laboratory. There are no laboratory results of the parameters tested for in the report or appendices.	Boreholes were sampled by owners before the study and chemical sampling itself was not part of the scope of the report. These boreholes were all sampled during or shortly after use and therefore have essentially been purged.
page 31. "These variances are interpreted as typical of the heterogeneity in secondary aquifers. Every major fracture system intersects a certain geological composition and has its own recharge area, which results in its unique water quality – including the temporal variation thereof."			
b		The author mentions that each major fracture system intersecting different geological formations has its own recharge area and this results in the unique chemical composition seen in the quality of the groundwater (Table 5, Figure 15 and Figure 16). However, the highly fractured nature of the bedrock in the study area (Referred to by the author in section 4.2) would likely be associated with a good connected fractured network. Where the geological contact zones between different formations would not necessarily act as a boundary for groundwater flow. Yes, due to the physical characteristics of certain formations matrix would act as a confining unit, however, where these are cross cut by a fractured zone the formation can still act as a conduit for groundwater flow through the fractures.	The differing chemistries measured in the boreholes and the lack of interference during aquifer tests indicate that the fracture systems (i.e. aquifers) between different boreholes generally are not well connected.
page 31. "It follows from the figure that the electrical conductivity (EC) varies between 119 and 680 mS/m in the area with the lowest EC values measured in boreholes Berg and Lusernstoor. Interestingly, both the highest and the lowest salinities are measured in the shallow aquifer."			

c		It is likely that the boreholes were not purged or sampled correctly during the sampling run resulting in the highly variable salinity across the study area. Another reason could be that the boreholes where the highest and lowest EC values were measured are drilled into completely different geological formations and are spatially quite far apart. KBH06 is drilled into shale, siltstone and minor sandstone of the Traka Formation towards the north where direct vertical recharge is lower and the VoerkraalBH is drilled into mudstone, siltstone and subordinate sandstone of the Tra-Tra Formation, located higher up, closer to the mountainous area where direct recharge is expected to be higher.	While not knowing the sampling methods (we strongly suspect they were purged since all the sampled boreholes area equipped and in use) we agree that the changes are probably results of various aquifers in a heterogeneous environment. This comment, however, seemingly directly contradicts comment 4.6.b (with cross-cutting faults etc etc), pointing to the commentator being on a fault-finding mission rather than considering context and considering the essence of the report.
p*age 31. "The general tendency of groundwater salinity is to increase with depth below surface due to increasingly stagnant conditions. The longer the residence time of groundwater in the aquifer, the longer the time for natural ion exchange reactions to occur and the groundwater salinity to increase. The salinity of the groundwater in the two deep boreholes is, however, moderate, if compared to the shallow aquifer salinities. The reason assumingly lies in the fact that a more sandstone-dominated aquifer is intersected by the two deep boreholes that do not cause the same extent of groundwater salinity as the shales intersected by the shallow aquifer boreholes."*			
d		The author must provide a reference for the statement that groundwater salinity increases with depth. The reviewer has got numerous examples where this is not the case. Especially in geological settings where bedrock of the Table Mountain Group is present.	Statement was qualified to indicating salinity increase in the same geological layer, i.e. the same aquifer. We are fully aware of the water quality differences in the various TMG layers as discussed widely in this report. As far as references go, we can add the commentator as reference with comment 4.7b where he confirms the general trend of salinity increase with depth.
e		The fact that the two deeper boreholes have lower salinities proves that the authors first statement is wrong.	Strongly disagree. The two deeper boreholes sources water from more arenaceous layers in the Bokkeveld Group rather than the argillaceous layers, which have completely different effects on groundwater quality.
4.7 a	Groundwater recharge calculations	The author approached literature and different recharge estimation techniques to calculate recharge for the study area. Furthermore, calculated the recharge based on the	Yes.

		average rainfall for the area. The chloride method used to calculate a local recharge percentage is based on actual local data.	
page 15. "The chloride method may not be very applicable in this specific case since the Bokkeveld Group of predominantly shales occurring at Kellershoogte is known for high groundwater salinity – specifically in terms of sodium-chloride salinity."			
b		This is speculative. The Bokkeveld Group comprises of several Formations consisting of alternating shale/siltstone/mudstone and sandstone/wacke/greywacke layers. The Bokkeveld Group is associated with a generally higher salinity, however, there are case studies across the Western Cape, especially in higher rainfall areas and groundwater recharge is higher and groundwater from theses formations is of good quality in terms of salinity (ECs <50 mS/m). It is rather due to the fact that the residence time of the slow-moving groundwater allows for the dissolution of salts (containing chloride) into the groundwater, resulting int he higher salinity. In other words, recharge is low. One must however be mindful that the samples taken for the chloride method to calculate recharge were clustered, targeting a very small area and likely more representative of the local recharge than that of the larger study area. The regional settings recharge can be better understood by building on this with more samples further afield.	The comment about the composition of the Bokkeveld Group is clearly illustrated in our discussion of the geology as well as in the conceptual model. The discussion of the cause of increasing salinity in the aquifer due to long residence time is agreed with. What is not said is that the said chloride and sodium must come from somewhere before it can be exchanged. These ions occur in more abundance in the argillaceous Bokkeveld layers while less available in the sandstone/arenaceous layers. Salt water is heavier than fresh water. In a very stagnant environment it is therefore common sense that the more saline water will tend to be towards greater depth. The concept of salinity stratification in groundwater is common. This statement thus contradicts the commentator statement made in comment 4.6 d) and agrees with our statement after qualified as the said salinity trend generally occurring with depth <u>in the same aquifer</u>.
page 16. "Given the dramatic water level response after good rainfall in October-December 2021, it is our opinion that the actual effective recharge at Kellershoogte is more in the order of 2 to 3% of rainfall such as estimated in Table 1."			

c		One can apply a larger recharge value assuming that this occurs over a larger area and is not limited to the local setting. The fact that the groundwater levels show a "dramatic water level response" after the good rainfall period shows that the geological setting comprises of a good fractured network where the degree of direct connectivity between surface water features (Kandelaars River) and underlying fractured bedrock aquifers is expected to be high.	The runoff in the Kandelaar River occurred for less than a day. The recharge effect (causing increasing groundwater levels) occurred over the span of several weeks. As indicated previously there is no evidence of an alluvial aquifer below the Kandelaars River at or around Kellershoogte. Runoff itself occurs over relatively impervious Bokkeveld layers. While the surface water run-off surely contributed to recharge, the comparative contribution to the general rainfall recharge had to be absolutely minimal.
4.8	Groundwater modelling	Not applicable. A conceptual model is included in the study by the author.	
4.9a	Groundwater availability assessment (page 19 – 20)	The author used a simple box model approach for groundwater availability assessment. It is a straightforward water balance estimation and considered standard practice. However, there is no reference to the literature of the methodology used. It is also not clear where the annual recharge used of 5.6 % comes from used in table 3 (page 19). The reader is referred to section 3.5, however, this recharge value is not evident in that section or anywhere else in the report.	The report shows that the recharge figure is **5.6mm/a**, not 5.6%. That calculates to 0.025%, which is the average percentage agreed upon by various literatures references.
b		The exploitation potential for the area was calculated for the whole of quaternary catchment J35B and the author did not consider a groundwater response unit (GRU) or the source catchment zone. A GRU is a more localised representation of the aquifer. This considers hydrological and geohydrological boundaries (catchment boundaries, rivers, topographical highs, distinct geological features etc). The output is a polygon with a surface area that can be used to calculate the exploitation potential within the more localised and conservative GRU. This will then likely constitute a larger percentage.	Different sources will often return different results. A larger potential recharge supports higher sustainable yields. It would thus to some extent counter comment 2.2 that the extreme dry period recharge must be used.

5	Prevailing groundwater conditions	See comments below	
5.1 a	Geology (Regional and local)	In general, the geological is well written and reference is made to the comprehensive investigation completed at Blossoms towards the east of the study area. The conceptual description of what constitutes an aquifer, an aquitard (aquiclude) and the groundwater flow controlling mechanisms characteristics of the geological setting discussed by the author is speculative and there is no conclusive data in the report to support this. Aquitards are associated with lower transmissivities and storage, however, does not necessarily act as a boundary for groundwater flow. Considering the folded nature of the geological setting it is expected that lithologies (i.e., shale/mudstone/siltstone) often referred to as aquitards are fractured and can constitute an aquifer. However, the matrix of this type of bedrock will not have a high storage capacity and will be associated with a low permeability (low transmissivity).	The only way to determine if layers are hydraulically connected is to conduct aquifer testing. The extensive testing conducted at Kellershoogte provide clear evidence that there is little to no interconnectivity between the deep boreholes (KBH02 and KBH02) and the shallower boreholes operated by the nearby users.
page 25. "Due to these geological variations, aquifers are often isolated from each other vertically in a hydraulic sense since they are separated by impervious layers. Shaly or silty aquicludes alternate with fractured sandstone. This results in very little to sometimes no interaction whatsoever between boreholes situated close together o surface but drilled to various depths."			
b		The author assumes that the layers aquicludes acts as confining layers suggesting that local vertical exchange (recharge from top to bottom layers) is essentially zero between the sandstone type and shale type. However, the author asserts that the area is deformed through folding. In highly folded geological setting one often finds local stress related fault structures, normal faults, reverse faults, open fractures and single fractures that can act as conduit zone within the bedrock and are not limited to a single formation.	The confining nature of the layers is not primarily based on assumptions, but on results of the pumping tests as illustrated in the conceptual model. Also refer to response 5.1.a.

		This then acts as preferential flow path for groundwater. The areal extent of these geological structures can be several kilometres on surface and range from a few meters to several hundred meters below the surface, and can be continuous in extent through different (shale and sandstone) lithologies.	
5.3	Hydrogeology	Discussed below	
5.3.1 a	Unsaturated zone	This section is quite vague and does not consider the alluvial material surrounding the Kandelaars River. The author indicates that the unsaturated zone is highly variable across the study area in terms of depth to the water table. There is no divide between fractured aquifer and the alluvial aquifer. The alluvial material surrounding the river will constitute an aquifer during the wet periods. Once saturated after a rainfall event the alluvial material will become saturated and will be able to sustain the baseflow component of river flow.	Site observation, flow records of the Kandelaars River and dedicated drilling information shows that the unsaturated zone it has little or no bearing on the groundwater regime except as a pathway for recharge. **Please note that the statement on saturation of alluvial aquifer and base flow is a glaring misconception and factually incorrect and surfaces as an erroneous narrative throughout the comments. No such aquifer exists and neither was there any base flow whatsoever during the study period.**
b		There will also be a direct interaction between the alluvial material and the underlying fractured bedrock. The alluvial material will act as storage for water as surface water slowly seeps through this into the underlying open fractures over time if it does not flow down gradient as surface water or removed from the vadose zone through evapotranspiration.	**Disagree. There is no alluvial material that could constitute a primary or even a temporary phreatic aquifer. Please also refer to the misconceived comments in 5.3.1.b and other similar comments on the topic.**
5.3.2	Saturated zone		
5.3.3	Hydraulic conductivity	*page 34. "Due to a highly varying and heterogenic geological system the hydraulic conductivities calculated for each borehole differs from the next and are only representative of the specific aquifer it penetrated."*	

		This statement is true to some extent. But I don't think there are that many different aquifers in this setting. Groundwater in this secondary fractured aquifer occurs in narrow openings called fractures and is stored in the bedrock matrix and smaller fractures. The T and S values calculated are rather representative of aquifer characteristics proximal to the borehole or the conduit zone. It seems like the author estimated the aquifer parameters (T and S) by fitting the Cooper Jacob to the drawdown response curve in the borehole being pumped and not to the response in observation boreholes. This as there was minimal response in the observation holes.	We are not sure how to respond to this. We arrived at hydraulic parameters as measured from the tests. We are fully aware that the ideal way to measure hydraulic parameters is to fit the curve(s) on observation boreholes. If we did this for the Kellershoogte boreholes, we would have calculated infinitesimally high T-values. Since the **fractures form the aquifer** in a secondary aquifer environment and the **fractures**(according to the commentator) are **not interconnected**, then our statements of the **aquifers not being interconnected** should surely be correct?
5.4	Groundwater levels	Groundwater levels were measured at boreholes, where available. Water levels have been indicated as static water levels; however, it is not clear whether the boreholes that were visited were pumping shortly before the site visit and still busy recovering.	Numerous tests were conducted on each borehole but only one test was shown and discussed. Each test was preceded by at least 24 hours of recovery.
5.5	Groundwater potential contaminants	Potential contamination sources have not been identified.	This is a technical study for a Section 21.a water use and no contamination sources occur in the area.
5.6	Groundwater quality	*page 31. "Every major fracture system intersects a certain geological composition and has its own recharge area, which results in its unique water quality – including the temporal variation thereof."*	
a		It is highly unlikely that a fractured zone or system as it is referred to by the author would have a unique type/signature groundwater. Certain geological formations/lithological units will be associated with likely higher salinities than others, but will not be completely isolated.	Refer to comment/response 4.6 b, c and d and 4.7.d about water quality and salinity.
page 31. "The general tendency of groundwater salinity is to increase with depth below surface due to increasingly stagnant conditions."			

b		Reference?	Refer to comment/response 4.6 b, c and d and 4.7.d. Statement made as general trends based on widely accepted principles of ion exchange and stratification.
page 31. "The reason assumingly lies in the fact that a more sandstone-dominated aquifer is intersected by the two deep boreholes that do not cause the same extent of groundwater salinity as the shales intersected by the shallow aquifer boreholes."			
c		Are there any borehole logs showing that these holes intersected shales? This report does not include any borehole logs to substantiate statements on borehole depths, anticipated geological conditions or constructions.	We were appointed after drilling of the boreholes and samples at specific depths were not available. We can, however, confirm that nearly every bit of rock chip around the boreholes is dark grey shale.
d		There is no chemical analysis of KBH04 to assess chemical differences/similarities between the shallow and deep boreholes.	Correct.
6	Aquifer Characterization	Discussed below.	
6.1	Groundwater vulnerability	*page 49. "The Groundwater Vulnerability Classification System used in this investigation was developed as a first order assessment tool to aid in the determination of an aquifer's vulnerability/susceptibility to groundwater contamination. This system incorporates the well-known and widely used Parsons Aquifer Classification System as well as drinking water quality guidelines as stated by the Department of Water Affairs and Forestry."*	
		Reference is made to Parsons and DWAF, however, no actual reference has been included in the report. The criteria for the vulnerability rating are not explained well. What does depth to groundwater mean? What about groundwater quality? What about the aquifer type? My personal preference is applying the DRASTIC model which allows you to be a bit more site specific with the vulnerability rating. However, I suppose this will suffice.	Noted, but it remains a matter of preference. Numerous similar technical reports have been accepted based on this method.
6.2	Aquifer classification	Reference is made to Parsons (table 16 – page 50) however, no actual reference included in the report. This classification focuses more on the use of the groundwater than the physical characteristics of the aquifer.	Will be added to the amended report.

6.3	Aquifer protection classification (page 51)	There is no reference for the methodology used. Reference? The author classifies the aquifer as medium in terms of protection.	Will be added to the amended report.
7	Groundwater modelling	A conceptual model was compiled for the study area	
7.1	Software model choice	The conceptual model refers to aquifers and aquitards. Where the sandstone type bedrock is considered an aquifer and the shale type bedrock an aquitard. There is no conclusive evidence that the shale bedrock acts like a boundary. It can rather be considered as a confining unit within the confined aquifer. The assumption that there is no baseflow interaction in the river based on a single hole drilled is speculative. **The river will likely have a baseflow** component depending on the river states. The fact that the yields of the boreholes tested post the wet periods increase significantly raises concern for the potential of having a recharge boundary during the time of the testing. In other words, the potential for a direct connection between the Kandelaars River and the underlying fractured aquifer is high. It is recommended that a detailed analysis is completed of the derivative curve plot from those specific tests.	Please see previous responses (5.3.1.a, b) to the question of base flow, the river being a recharge boundary and the river having a high influence on recharge. These comments are based on erroneous assumptions and counter to facts from the study.
		Throughout the report the author keeps referring to "different aquifers" in which the boreholes area drilled and considers them being isolated from one another. However, considering the geological setting, the physical characteristics of the formations, the fractured nature of the bedrock due to folding and recharge mechanisms to the area it simply does not conceptually make sense that some many isolated systems could exist. Especially where the boreholes where borehole penetrate bedrock, fractured zones in bedrock and in some places the same geological	Please refer to response 5.3.3 on different fracture zones constituting different aquifers. In terms of over-abstraction, please refer to various responses on how very conservative the final recommended abstraction rates were in relation to the pump test results.

		formations???. Should over abstraction take place within the groundwater response unit (GRU) from either one, two, three or 10 boreholes, the water levels in the secondary fractured aquifer will drop as storage is being depleted. Imagine a swimming pool being the aquifer storage and boreholes are represented by straws. As more straws are added sucking water from the swimming pool the storage will be depleted more rapidly.	
		Geohydrological Impacts	
8.1	Construction phase	Discussed below	
8.1.1	Impacts on Groundwater Quantity	The author considers the abstraction sustainable and for this reason the risk for aquifer deterioration in terms of groundwater quality low. However, the fact that there is such a large seasonal fluctuation in terms of potential yield that can be abstracted from the aquifer from individual borehole evident in the testing data the risk for over abstraction is high should recharge not be sufficient. It is clear that rainfall is generally low in the area and has been experiencing more drought conditions than good rainfall events. In other words, recharge is generally low. Therefore, if one abstracts groundwater at high volumes there will be a trend of dropping water levels and declining yields over time if recharge remains low. The author does not provide a clear criterion for the impact rating. No mitigation measures, minimisation of impacts or rehabilitation plans have been mentioned. The probability, extent, duration or intensity of the impact has also not been addressed.	The conservatively estimated sustainable yields have been discussed nearly exhaustively and that is the only real mitigation measure: pump at recommended limits, monitor water level reactions and adapt if necessary.

8.1.2	Impacts on Groundwater Quality	*page 55. "Kellershoogte will not discharge any waste/process water and thus will not alter the ambient quality of the groundwater. Thus, no adverse impact is foreseen on groundwater quality from Kellershoogtes's activities."*	
		This is not sufficient. Over abstraction can result in deterioration of groundwater quality. The salinity will increase as soon as aquifer storage is depleted. Irrigation with slightly saline water can also result in the salinization of soils and river beds.	See response 8.1.1. No over-abstraction should occur.
8.2.3a	Groundwater Management	The groundwater management plan is not sufficient. It is generic and not site specific. No plans of action have been included to actually manage the resource based on actual data. No mentioned is made of the installation of groundwater level monitoring equipment, water quality monitoring, chemical parameters to be tested for once the water has been submitted to a laboratory. There is no mention of monitoring frequency in the management plan.	Disagree. Monitoring is recommended in Section 9. The method or equipment type is not prescribed as long as the data is gathered and reported to the regulating authority.
b		Groundwater monitoring system (page 56)	
9.1	Groundwater monitoring network	The author indicates that all production boreholes must be monitored. None of the hydrocensus boreholes have been included.	We did not consider it fair or practicable to prescribe monitoring on neighboring properties where the applicant has not control or jurisdiction. Most of the neighbors didn't even allow access for the hydrocensus!
9.1.1	Source, plume, impact and background monitoring	Reference is made, but not discussed in detail.	This heading is included for the sake of completeness of the GN267 format but no detail discussion is included because it has nearly no applicability to this study.
9.1.2	System response monitoring network	Yes, but very brief. This needs to expanded on.	See response 9.1.1.
9.1.3	Monitoring frequency (page 56)	A monthly water level monitoring is recommended. However, considering the fact that this is a drought-stricken area water levels should be monitored at least daily. The	While we agree that an automated monitoring system is the first prize, we consider daily monitoring in a farming setup impracticable. If the monthly data is checked and acted upon it will have more value than an automated system.

		installation of automated water level monitoring equipment is highly recommended.	We disagree that irreparable damage can be done to the aquifer in one month if every month's monitoring results are duly considered.
9.2	Monitoring parameters	Water level monitoring and flow rate monitoring have been recommended. However, no chemistry parameters have been listed, nor the frequency for monitoring thereof.	The study is a for a section 21.a application.
9.3	Monitoring boreholes	Monitoring of production boreholes is mentioned.	
12a	Conclusion and Recommendations	The author constantly refers to poorly connected or completely disconnected aquifers The assumption that there are several isolated secondary fractured aquifers needs to be proved. All of the formations within the geological setting are highly fractured due to folding/faulting etc. However, considering the highly fractured nature of the geological setting this cannot be the case. The aquicludes would likely act as confining units, but where a fractured zone cross cuts this unit into that of the "aquifers" the systems will be highly connected.	Disagree. Proven untrue by numerous aquifer tests conducted for long durations where boreholes had no effect on neighbouring boreholes. Refer to numerous other responses on different aquifers and fracture systems.
b		It is of my opinion that the higher yields recommended based on the post wet season testing will result in declining water levels, aquifer depletion and aquifer deterioration in terms of groundwater quality.	**As mentioned in several responses, the higher yields were not recommended for abstraction at all.** They were simply stated to show how significant the aquifer parameters (and thus the theoretical sustainable yields) were before and after the wet period. **The final recommended yields as included in the Executive Summary and the Conclusions and Recommendations (Section 9) of the report were much lower**.

Conclusion:	
GEOSS Conclusions	**Groundwater Complete Response**
In summary, it is apparent that the specialist report provided fails to provide the necessary information to evaluate the potential impacts of the borehole abstraction on the aquifer, other groundwater users and the Kandelaars River. There is also a lack of understanding of the methodology of completing pumping tests on boreholes according to the national standard (SANS, 2003). The pumping test data which forms the core of the investigation is poorly communicated and the authors interpretation of the data on the behaviour of groundwater flow in a fractured aquifer once pumped is concerning. The report does address the potential for groundwater surface water interaction, however, requires a revised methodology and a more in depth investigation.	**Strongly disagree**. As indicated in the responses in this memo, the study did more than enough to address the core issues. The field work was extensive and impacts (or the lack thereof) were quantified on nearby users where access was allowed. Strongly disagree. We have a perfect understanding of SANS requirements. While the practical constraints did not allow a conventional step drawdown test, we conducted several tests on each borehole at various rates by manipulating the valves on the pumps. In the end, we **far exceeded the SANS requirements of a 4-5 hour step test and 24 hour recovery test**. While there is in the geohydrological science – especially in secondary aquifers – always value in more in-depth investigation, an applicant for a Section 21.a WUL cannot be expected to fund PHD level studies. As indicated above, we have already exceeded study requirements with the core field work aspects.
In our scientific opinion, we recommend the following information must be provided:	
• Drill certificates and borehole logs for the production boreholes.	Borehole logs are not available for KBH02 and KBH03. A log for KBH07 will be added to the final report.
• SANS10299-Part 4: Test pumping of water boreholes for all boreholes used for production by Viljee Keller Trust.	SANS pump testing requirements were far exceeded.
• It is recommended that the raw pumping test data is communicated and presented in the report. This includes, test pump installation depths, rest water levels in the testing section, flow rates for the testing, step test data (if not completed it must be	The raw pump test data will be added.

motivated why), a graph showing the drawdown curve along with the recovery curve and an evaluation of the water level recovery percentage. A review must be completed of the data analysis within the software used by the author.	Where the commentator queried fitted curves it was indicated that he misread the information provided in the report. For the remainder of the interpretations there was agreement, which in our view renders a review unnecessary.
• It is recommended that a plot of the first and second derivative data of the drawdown curve is included in the report for both the post dry period and post wet period tests completed. This to determine flow characteristics of the aquifer considering the fact that it is located in close proximity to a river. It is very likely that the post wet period test will show a first derivative plot curve indicative of a recharge boundary (recharge from the river).	Such plots were discussed in earlier responses and will be included in the report. The derivative plots confirmed that there are **no recharge boundaries** present and further supports the lack of surface-groundwater interaction.
• It is further recommended that the author clarifies the extrapolation time for calculating the sustainable yield for the post wet period testing. There is concern regarding the high flow rates, that could cause a gradual if not rapid decline in water levels within the aquifer that could potentially permanently damage the aquifer.	It was shown that the high pump rates stated after the wet period were theoretical only to show the dramatic change in yield after recharge occurred. **The high yields were never put forward as recommended for the project** and were far lower then the post-wet period yields and closer to the dry period test results.
• The massive seasonal change in potential yields needs to be investigated through the re-analysis of the pumping test data or by completing pumping tests according to the correct methodology.	The implication here is that step drawdown tests will change the outcome of the 72-hour pump test results, which is nonsensical to say the least.
• A more in-depth assessment of groundwater surface water interaction needs to be completed. It is recommended that piezometers are installed in the banks of the river and in the river for water level monitoring during the use of production boreholes.	**This comment (and refrain on the same subject) puts serious doubt over the competence of the commentator to provide legitimate comments on the study as a whole.** To recommend piezometers **in the banks of the river** (where a 30m borehole remains dry) and **in the river** where it is so strongly non-perennial that monthly records have shown no record at all over recent years is **nonsensical and impracticable**. (Just consider for a moment the environmental authorization process and repercussions to (1) construct access for a drill rig – even a small one – into the river and (2) then drill boreholes (listed activity in this zone) in the river and riverbanks and (3)

	construct structures to keep the holes open and available for monitoring and safe from flood damage!)
• Chemistry sampling, including inorganic chemistry and isotope sampling of the boreholes and river, with the locations of sampling points. This must be done during the wet season or when the river is flowing.	**See previous response.**
• Identifying all water users down gradient. Assess and incorporate the volumes of all groundwater use and adjust the water balance (availability) for the area.	Only executable if downstream users allow access. This comment should rather be addressed to The Kandelaars river Water Users Association.
• Modelling of the resource and supply (analytical or numerical).	We already did the analytical model as indicated by the commentator.
• A comprehensive groundwater management plan and monitoring plan needs to be included with mitigation measures to ensure that the resource	A monitoring plan was recommended. The boreholes should be managed to remain below the recommended sustainable yields. If such monitoring is done and actions taken based on the water level response, no damage to the resource should occur.

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3. Conclusion:

It is our impression that the commentator is adept academically but may lack the acuity or experience to consider practical constraints and adapting a study accordingly.

Three main themes were repeatedly commented upon and in the end these themes were put forward as reasons why the study falls short in quantifying potential impacts of the Kellershoogte abstraction on nearby users and the groundwater regime as a whole. The main themes are listed below and our reaction (as motivated repeatedly through the responses) are summarized at each.

Theme 1: The absence of step drawdown tests and varying constant rate test durations not adhering to SANS10299 and therefore the tests must be repeated.

The value of step drawdown tests in determining sustainable yield is limited. The main value of a step drawdown test is to determine the optimal pump rate at which to conduct the constant rate test. Due to various reasons it was not practicable to conduct step drawdown tests, but instead we compensated by conducting numerous 'multi-rate' pump-and-recovery tests at various rates by using valves in the pipeline. The tests were conducted from a few hours to more than 24 hours duration.

Discussion of each and every of these tests would have been exhaustive and we provided only the final sets of long-term constant rate pump tests. The water levels during these long duration tests were measured at 2-minute intervals by automatic level recorders, which again provided much higher data frequency than stipulated in SANS10299. Just including all the raw data of all the tests would constitute tens of pages of data. The testing was thus much more extensive than the SANS10299 standard tests in both duration, variety and data density.

We therefore wish to state that putting forward the absence of step drawdown tests as a major shortcoming speaks of:

- **a strictly academic view of evaluating field work and practicable execution;**
- **a very narrow consideration of standards without considering the actual extensive work conducted; and**
- **looking to find fault without weighing up and considering the context of the work conducted.**

Theme 2: Assessing surface-groundwater interaction and the major effect of the Kandelaars River must have on the groundwater (e.g. recharge) and depletion of the aquifer will have on base flow and surface water availability downstream

From start to finish the commentator places is a lot of emphasis on this aspect where – again – we did what was reasonably required and showed that no surface/groundwater interaction existed, even after three months of rainfall which caused the groundwater levels to rise dramatically in the deep boreholes.

The comments states for a fact that surface-groundwater interaction **must** occur and that there **must** be a major interconnectivity between a primary/alluvial aquifer below the Kandelaars River and the river itself. Groundwater abstraction from the Kellershoogte **must** therefore have an influence on the downstream surface water use and alluvial aquifer. **The facts from the field observations made during the study show that these assumptions are factually incorrect:**

- The river flowed for less than a day in the entire evaluation time of nearly a year.
- The dry riverbed is made of exposed shale – there is no alluvial aquifer present.
- KBH07 drilled on the terrace more than 2 meters higher than the riverbed intersected shale after one meter of drilling – no alluvium occurs. No water level formed in the borehole down to 30 meters below surface even after the wet period when water level in the deep boreholes increased by more than 30 meters.
- The first and second derivatives in FC Method were evaluated and added to the report and confirm that no recharge boundary exist.

These comments should thus be considered as glaring errors by the commentator and recommendations on installation of piezometers in the river and river banks should be considered serious cause for concern by regulating environmental authorities.

Theme 3: Recommended yields of the post-wet period are too high and will not be sustainable over the longterm

The sustainable yields as calculated from the pump test results after the wet period are much higher than for the pre-wet period tests. These yields are questioned throughout with statements that these yields are too high (and often higher than the constant rate maintained during the pump testing) and will not be sustainable over the long term.

We agree with this and never put these high yields forward as rates to use by the applicant. It seems that I the quest to find fault with our report the commentator simply chose to interpret these otherwise and ignored the recommended sustainable rates clearly recommended in both the Executive Summary and the Conclusions and Recommendations in Section 9.

The overall conclusion is that – apart from some omissions of data and units not being included – there is no merit in any of the comments in disputing the findings of the study in terms of sustainable borehole yield and the associated impact on groundwater or surface water availability of surrounding users.

Please let me know with any queries.

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