The Organised Expansion And Permanent Settlement Of People In Boesmanland In Correlation With Accessible Water Sources: 1760 – C.1960

by
Heléne F. Klopper

Thesis presented in fulfilment of the requirements for the degree of Master of Arts in the Faculty of Arts and Social Sciences at Stellenbosch University

Supervisor: Prof Wessel P. Visser

March 2020

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

March 2020

ABSTRACT

The purpose of this study was to examine the permanent expansion and settlement of humans in Boesmanland through research of available literature and archival sources on water. Despite nutrient rich vegetation for the rearing of small livestock, a lack of surface water made the permanent utilisation of the area for agricultural purposes impossible. With the relatively low annual rainfall, perennial subsistence was not possible until the invention and acquisition of the technology to tap into the underground aquifers arrived in the mid-nineteenth century. However, this did not prevent humans from moving through the area. Transhumant pastoralist groups such as the Khoikhoi lived in the area for thousands of years. The Khoikhoi thus moved through Boesmanland for thousands of years in small groups but could not permanently settle in fixed locations for long periods of time due to a need to find water and food sources elsewhere. It was only when the colonial authorities began selling of Crown land and serious prospecting for water took place that private ownership of farms started in c.1760.

In 1760 the first farms in Boesmanland were allocated near the Kammies Mountains. This marks the beginning of permanent human settlement in Boesmanland. After this date, wells were dug and later boreholes drilled to develop farms. Farmers spent a huge amount of time, labour and money on digging wells and later drilling boreholes on their farms. The amount of money spent on water prospecting often exceeding the original purchase price of the farm because without reliable, permanent water sources, the farm was useless for stock farming.

By 1960 the technology to drill boreholes was available to farmers of the area, making continuous settling in fixed geographic areas the norm. The low-technology windmill accompanied the high-technology drill machine and borehole. Oral interviews offer insight into *boormanne* and windpump technicians. The town of Springbok provided an example how small infrastructure like water tanks and pumps were installed at the start of the twentieth century. The case study of Carnarvon, in turn, showed the development of a typical Boesmanland town.

OPSOMMING

Die doel van hierdie studie was om die uitbreiding en vestiging van mense in Boesmanland volgens beskikbare waterbronne te ondersoek. Ten spyte van hoë kwaliteit weiding vir die doel van kleinvee boerdery, het 'n gebrek aan oppervlakwater die permanente benutting van die gebied vir landbou doeleindes onmoontlik gemaak. Met die relatief lae jaarlikse reënval was permanente boerdery nie moontlik, totdat die tegnologie om ondergrondse waterbronne te benut beskikbaar geword het nie. Dit het nie verhoed dat mense vroeër deur die gebied beweeg nie. Jagter-versamelaarsgroepe het duisende jare lank in die omgewing gewoon. Die Khoikhoi het dus vir duisende jare deur Boesmanland beweeg in klein groepies, maar kon nie permanent in vaste plekke vestig vir lang tye as gevolg van die behoefte om water en voedselbronne elders te vind nie. Dit was eers toe die koloniale owerhede begin om Kroongrond te verkoop en daar ernstig geprospekteer word vir water wat permanente vestiging plaasgevind het.

In 1760 is die eerste plase in Boesmanland naby die Kammiesberge toegeken. Dit is die begin van uitbreiding en permanente menslike vestiging in Boesmanland. Na hierdie datum is putte gegrawe en later boorgate geboor om plase te ontwikkel. Boere het 'n groot hoeveelheid tyd, arbeid en geld spandeer aan die grawe van putte en later boorgate op hul plase. Die hoeveelheid geld wat aan waterprospektering bestee was, het dikwels die oorspronklike koopprys van die plaas oorskry. Die rede hiervoor was, sonder betroubare, permanente waterbronne, was die plase nutteloos.

Teen 1960 was die tegnologie om boorgate te boor beskikbaar vir boere van die gebied, wat dit die norm gemaak het om voortdurend te vestig in vaste geografiese gebiede. Met die bekendstelling van boormasjiene en boorgate het die nederige, maar noemenswaardige windpomp gekom. ‘n Onderhoud met Leon Swanepoel het insig gegee aan boormanne en windpomptegnici. Die dorp Springbok het 'n voorbeeld gegee van die proses om klein infrastruktuur soos watertenks en pompe aan die begin van die twintigste eeu te installeer. Die gevallestudie van Carnarvon het op sy beurt die ontwikkeling van 'n tipiese Boesmanlandse dorp gewys.

DEDICATION

To my parents, for believing in me, even though they had no idea what I was doing, and Gustav, for doing the same.

ACKNOWLEDGMENTS

Completing an endeavour such as this is impossible without the generous support of many people, a few of whom I would like to thank here. I'm grateful to each of you beyond words.

My supervisor, Professor Wessel Visser: Thank you for all your support, patience, encouragement and guidance. I sincerely appreciate your input and your genuine interest and investment in what I attempted to achieve in this work.

The staff of the History Department at Stellenbosch University, thank you for assisting me in the final submission of this thesis and generally supporting me throughout this study.

The staff at the Cape Town Archives Repository: Thank you for assisting me throughout the study and allowing me to photograph valuable material for this study.

Everyone who participated in interviews for this study: Thank you for sharing your experiences with such enthusiasm and openness. I've learned a lot from each of you and consider your insights on Boesmanland water procurement some of the most valuable contributions to this study.

My parents, André and Chrisna, without your financial support this study would have been impossible, despite the fact that you endured a prolonged Boesmanland drought for the entirety of this study. Thank you sincerely for all your love, support, encouragement and a total unwavering belief in my capabilities. I could never do any of this without you. Thank you for encouraging me to be honest, curious and mindful of the impact I have of the natural environment we live in.

My husband, Gustav, who has shown such rich support in so many ways. You enable, encourage and inspire me daily and I appreciate you more than I can say. Thank you for keeping me mostly sane throughout this study. You lifted me up and reminded me of why I took on this project in the first place. Your grace and generosity enable me to follow my dreams.

Finally, to the people of Boesmanland: Your kindness, humour and perseverance in the face of immense and ongoing challenges make you at once extraordinary and utterly relatable. I hope this study reveals a small part of the world you painstakingly eked out.

TABLE OF FIGURES

Figure 1 : Approximate boundaries of Boesmanland for the purpose of this study.....12
Figure 2 : Acocks's estimation of the veld types of South Africa, c. 1400.....14
Figure 3 : Acocks's estimation of the veld types of South Africa, c. 1400.....14
Figure 4 : A map of the outcrops of the Karoo Supergroup rocks in Southern Africa.16
Figure 5 : Flat topped hills (called Karoo Koppies).....17
Figure 6 : Sunset in the Great Karoo, near Sutherland, showing a wind pump.....18
Figure 7 : Map showing the location of Boesmanland within South Africa, as well as all the towns in Boesmanland.....19
Figure 8 : Surface water sources as mentioned by Van der Merwe.....30
Figure 9 : Map showing an area of unallocated crown land.....36
Figure 10 : Map of farms in the Division of Boesmanland, 1975.....37
Figure 11 : Original purchase prices of Boesmanland farms.....41
Figure 12 : Map of Boesmanland farms in the Springbok district, 1975.....42
Figure 13 : A sketch of previously unused crown land suggested for water prospecting in Boesmanland, 1909.....44
Figure 14 : Graph showing the annual wool production and precipitation in South Africa, 1910 -1961.....49
Figure 15 : Karoo Groundwater Atlas: Interpolated depth to groundwater level.....60
Figure 16 : An illustration of a *rolput*, or hand crank well.....63
Figure 17 : Illustration of a *wipput*, or shaduf.....64
Figure 18 : An entire wind pump head and frame loaded onto a vehicle in front of Leon Swanepoel Wind pump Repair Services.....70
Figure 19 : Windpump course for upcoming farmers on the Research Farm, Carnarvon. 2014.....72
Figure 20 : Swanepoel removes tree roots from a borehole on the farm Eendefontein, Carnarvon. 2014.....72
Figure 21 : A Jumper drill.....73
Figure 22 : Two jumper drill tips.....74
Figure 23 : A dill tip and bailer.....75
Figure 24 : The bottom of a bailer.....75

Figure 25 : The top of a bailer.....75
Figure 26 : Attachable jumper drill bits used to lower the drill tip into the ground as it drills.....75
Figure 27 : Measuring instrument used to ensure the borehole remains the same diameter throughout.....76
Figure 28 : Drill tip catcher, used to attach the drill bit.....76
Figure 29 : A bellows used to heat the drill tip. The tip is heated and hammered to sharpen it and create the desired diameter.....76
Figure 30 : Jacks used to ensure the jumper drill is level.....76
Figure 31 : An air-pressure drill.....77
Figure 32 : The tower of an air-pressure drill.....77
Figure 33 : Distribution of registered boreholes.....81
Figure 34 : A *stamperboor* with a wooden frame from the early 1900s.....82
Figure 35 : A *Steyn's Stamperboor*.....82
Figure 36 : Geology of the Karoo.....83
Figure 37 : Schietfontein, located 3km outside modern day Carnarvon.....90
Figure 38 : A dwelling in Schietfontein, c. 2019.....93
Figure 39 : A stone dwelling in Schietfontein, c. 2019.....93
Figure 40 : An extension of the Carnarvon Municipality Water Supply Scheme.....96
Figure 41 : Roof placed on Carnarvon Reservoir, 1911.....100
Figure 42 : Sketch of Springbokfontein by Hendrik Claudius in 1685 with Simon van der Stel's visit to Namaqualand.....102
Figure 43 : Simon van der Stel's camp site near Springbok in 1685.....103
Figure 44 : Springbokfontein in 1852.....104
Figure 45 : Piet Cloete, owner of Springbokfontein in 1852.....105
Figure 46 : Springbokfontein in 1854.....106
Figure 47 : Mining activity in Springbokfentein in 1870.....107
Figure 48 : The village of Springbokfantein, c. 1878.....107
Figure 49 : Springbok during the South African War.....108
Figure 50 : Schematic of water pump installed at fountain near Springbok.....109
Figure 51 : Springbok in 1933.....111
Figure 52 : Springbok in 1963.....111
Figure 53 : Springbok in 2000.....112

Figure 54 : Original hand pump and irrigation channel in the back.....113
Figure 55 : Diagram illustrating the dam wall built over the existing wooden pipe....115
Figure 56 : The Loxton flood of 1961.....116
Figure 57 : An aerial view of the Loxton flood of 1961.....116
Figure 58 : A bridge destroyed by the Loxton floodwater.....117
Figure 59 : The collapse of Loxton dam wall.....118
Figure 60 : Another aerial view of the Loxton flood of 1961.....118
Figure 61 : Floodwater damage to buildings.....119
Figure 62 : The Loxton flood of 1961 seen from eyelevel.....119
Figure 63 : Floodwater sweeping through a railway bridge.....120
Figure 64 : Extensions of Loxton Water Supply, 2015.....121
Figure 65 : Schematics for the water tanks installed to store water for Loxton public supply, 2015.....122

TABLE OF CONTENTS

DECLARATION ii

ABSTRACT iii

OPSOMMING iv

DEDICATION v

ACKNOWLEDGMENTS vi

TABLE OF FIGURES vii

TABLE OF CONTENTS x

CHAPTER ONE 1

CONTEXTUALIZING THE HISTORICAL EXPANSION AND SETTLEMENT OF HUMANS IN THE BUSHMANLAND THROUGH WATER EXPLOITATION 1

1.1 Introduction 1

1.2 Water Historiography 5

1.3 Methodology, research strategy and challenges 9

1.4 Demarcating the region of Bushmanland 11

1.5 Climate and Geographical features of Boesmanland 14

1.6 A brief description of early human settlement in a parched interior 20

CHAPTER TWO 26

HUMAN EXPANSION AND SETTLEMENT IN BOESMANLAND, c. 1875 – 1960 26

2.1 Introduction 26

2.2 Early indigenous groups and European missionaries 27

2.3 Pioneer trekking and Boesmanland water sources 29

2.4 Pioneers and land distribution in Boesmanland 34

2.5 The quest for permanent water sources on Boesmanland farms 39

2.6 Pioneer water prospecting and land fencing in Boesmanland.....43

2.7 Water sources and wool farming in Boesmanland.....48

2.8 The adaptability of Boesmanland farmers in a parched environment.....50

2.9 Conclusion.....51

CHAPTER THREE.....53

GROUNDWATER IN BOESMANLAND.....53

3.1 Introduction.....53

3.2 John Brown and artesian water resources.....53

3.3 An Australian hydro-geographical comparison with subterranean Boesmanland water sources.....58

3.4 Methods of water extraction.....62

3.4.1 Wells.....62

3.4.2 Wind pumps.....65

3.4.3 Boreholes.....68

3.5 The drill operator and Windpomp Dokter.....71

3.6 Conclusion.....84

CHAPTER FOUR.....86

WATER PROVISION TO TOWNS OF BOESMANLAND…….....86

4.1 Introduction.....86

4.2 Water provision and the towns of Boesmanland.....87

4.2.1 Carnarvon.....89

4.2.2 Springbok.....103

4.2.3 Loxton.....116

4.3 Conclusion.....125

CONCLUSION.....127

BIBLIOGRAPHY.....131

CHAPTER ONE

CONTEXTUALIZING THE HISTORICAL EXPANSION AND SETTLEMENT OF HUMANS IN THE BOESMANLAND THROUGH WATER EXPLOITATION

1.1 Introduction

Water is an essential element for life and development of societies and cultures in general. As a predominantly dry country, the history of the settlement and expansion patterns of humans in South Africa was greatly influenced by the availability of water. From irrigated towns, to drought-ridden rural areas, the historiography of South Africa shows a constant battle for sufficient water for humans and their livestock to survive. It only takes one glimpse at a map of the north-western region of South Africa to realise that water is important there. Even with the naming of farms and places there is a fascination for, or rather obsession with, water in Boesmanland. Through the names of farms and places in the district, it is clear that water played an integral role in the environmental consciousness of the people. Examples of water-themed names are *Fontein* (spring) – Soebatsfontein, Soutfontein, Bitterfontein, Leliefontein, Arbeidersfontein, Ongeluksfontein, Loeriesfontein; *Rivier* (river) – Groenrivier, Drierivier, Haasrivier, Willemsrivier; *Vlei* (marsh) – Gemsbokvlei, Consentvlei, Brandvlei, Soutvlei, Elandsvlei; *Puts* (well) – Rasseputs, Broekzijnputs, Galputs, Bitterputs, Vaalputs, Roodezijnputs; *Drif* (brook) – Kaapsedrif, Vioolsdrif, Grootdrif; *Water* – Jakkalswater, Witwater, Bokwater; *Dam* – Vaaldam, Brakdam; *Pan* – Brospan, Verneukpan; *Poort* (gorge) – Rietpoort; *Kuil* (creek) – Klipkuil; *Kolk* (abyss) – Grootkolk, Leeukolk, Boesmanskolk, and Kootjieskolk, to name but a few.[1]

The average annual rainfall for South Africa is about 497 mm, which falls predominantly in the eastern parts of the country and very little in the interior. South Africa is thus classified as a water-stressed country. The history of water in South Africa should also be understood within the context of conquest and colonisation.[2]

[1]O.J. Ferreira & G. Van der Waal-Braaksma, *Die Noordweste: Die stoflike kultuuruitinge van die streek se bewoners*, Perskor, Johannesburg, 1986, p. 57.
[2] T. Tvedt & E. Jakobsson, (Eds.), *A History of Water: A World of Water*, I.B. Tauris & Co. Ltd., London, 2006, p. 157.

In *A Study of History,* Arnold Toynbee influentially posited that the "history of civilisations was primarily driven by a dynamic process of responses to environmental challenges".[3] Challenges "provoked exceptional civilising responses in ascendant societies, while inadequate responses contributed to stagnancy, subordination and collapse in declining ones".[4] Prominent among the environmental challenges was water.

It is a common trend that wherever water resources have been increased and made most manageable, navigable and potable, societies have been most robust and long enduring.[5] Those that succeeded in significantly increasing their demand and supply regularly were among the few that broke out of history's changelessness and bare subsistence to enjoy spurts of prosperity, political vigour, and even momentary pre-eminence. Often major water innovations leveraged the economic, population, and territorial expansions of world history. "Those unable to overcome the challenges of being farthest removed from access to the best water resources, by contrast, were invariably among history's poor."[6]

It was also a common pattern of history that expansions driven by intensified use of water and other vital resources were followed by population increases that in turn so increased consumption that they ultimately depleted the further intensification capacity of the society's existing resource base and technologies.[7] Such resource depletions thus presented each society with a moving target of new challenges requiring perpetually new innovative responses to sustained growth. This population-resource equation – the ever-shifting balance between each society's population size and the resources and know-how within its means to produce enough goods to sustain it – and its activating cycle of intensification and resource depletion, was one of the central dynamics of human and water history. History is littered with societies that declined simply because they could not overcome the deleterious local-resource depletions and population expansions accompanying their own initial success.[8] Whenever a major historical breakthrough occurred in the supply of water such as the introduction of the wind pump to South African boreholes, it often had transformational impact upon history by converting what had been a water impediment into a dynamic force for expansion. According to French

[3] A.J. Toynbee, *A Study of History: Abridgment of Volumes I – V*", Abridgment by D.C. Somervell, Oxford University Press, London, 1974, pp. 1-19.
[4] S. Solomon, *Water: The epic struggle for wealth, power and civilization*, Harper Perennial, New York, 2010. p. 15.
[5] *Ibid.*
[6] *Ibid.*
[7] *Ibid.*
[8] *Ibid.*

historian Fernand Braudel from the Annales School (1902-85), water history must also deal with what he called *'a la longue durée'* (historical waves of great length) – perhaps the most fascinating of the three temporalities for the water historian.[9] "This type of temporality can be regarded as a kind of 'geographical time', focusing on relationships between humans and the environment that change almost imperceptibly; being a history of repetition and recurring cycles based on seasons or longer natural cycles affecting the cycle of the seasons themselves: such as climate changes, rivers finding new courses, etc." It entails a focus on those aspects of everyday life that might remain relatively unchanged for centuries.[10]

Historically, the terms used to refer to the various groups of people discussed in this study are fraught with prejudice, stereotyping and subjectivity. There are not many sources that introduce the discussion on the complex historiography of the names or terminology attributed to people in the northwest of South Africa as well as Shula Marks. She writes:

> "It is clear from anthropological evidence that 'Hottentot' and 'Bushman' are not discrete racial categories. Although it is commonly believed that the San were smaller in stature than the Khoi, here again the evidence is inconclusive. Dutch sources in the seventeenth century noted that the Nama were considerably taller than the Cape Khoi, while Desmond Clark has drawn attention to a similar difference between the northern and southern Bushmen. The Dutch did not distinguish between the Khoi and San on physical grounds in the seventeenth and eighteenth centuries, though the words 'Hottentot' and Bosjesmans' did describe a way of life: a Hottentot or Khoi was a herder; a Bushman or San someone who quite literally lived in or by the 'bush'. Yet there is little to distinguish a landless and cattleless Khoi from a Bushman, or a Bushman who has acquired cattle from a Khoi. Thus, despite the reservation of the linguists, who point out that the Khoi and San language groups are quite unrelated, the term Khoisan appears best suited to refer to the Late Stone Age peoples of the Cape whom the Dutch encountered in the seventeenth and eighteenth centuries, unless their precise tribal groupings are made clear from the documents."[11]

Many of the sources utilised for this study include terminology attributed to people. Terms such as 'Basters', 'Coloured', 'Bushmen' and 'Hottentot', which all form part of the pre-colonial, colonial and post-colonial vernacular of the geographical area, were being explored in this study. The very name used to refer to this area is Boesmanland (or Bushmanland if directly translated into English). Throughout this study the author endeavoured to deal with

[9] J. Le Goff, *History and Memory,* Translated by S. Rendell & E. Claman, Columbia University Press, New York, 1992, pp. xxi-iii.
[10] Tvedt & Jakobsson, *A History of Water*, p. x.
[11] S. Marks, 'Khoisan Resistance to the Dutch in the seventeenth and eighteenth Centuries', *Journal of African History,* 13, 1972, pp. 55–80.

the nomenclature of the various groups of people and areas with as much sensitivity and awareness as possible of the historical prejudice attached to each term. As mentioned by Marks, differentiation between various groups is not always easy. Another challenge was the contextual timeframe utilised in this study. Due to the extent of the period covered for the purpose of research, the terminology attributed to people, places and things changes considerably, which can lead to further confusion. Therefore, in pursuit of historical accuracy, the indigenous people of the area discussed in this study will be referred to as Khoisan. The region, which will be demarcated in full detail later on, will be referred to as Boesmanland. This is to honour the modern description of the region by current inhabitants.

The study of human settlement in this region thus takes into account the movement of Khoisan, various Bantu-speaking groups, white settlers and so-called 'Basters'. The latter term refers to a group of mixed ethnic decent (European and Khoisan) who made up a substantial part of the population of Boesmanland. The term is still in use today by people residing north of the Orange River, and, correspondingly, the relevant literature overwhelmingly employs the same reference with no alternative term. Nevertheless, this author recognises that it could be seen and experienced as derogatory by others. Therefore, to distinct this group historically from other ethnic groups in the region the term 'Baster' will be used in this study but will be treated with sensitivity and respect. Inverted commas will be used to indicate that the term is contested.

As a mixed ethnic group, the 'Basters' provide a constant reminder of the degrees of assimilation that took place between white settler, Bantu-speaker and Khoisan groups. The nature of this 'assimilation' has been questioned and arguably disproved by writers such as M. Adhikari and J.M. De Prada-Samper. Adhikari argues that the San, or Bushmen, were systematically exterminated and that "missionary records show that all missions to the San, whether north or south of the Orange River, ended in failure and that the stations established in their territory either closed down or their proselytising efforts very soon focused on another group."[12] De Prada-Samper argues that the above- mentioned "assimilation" and incorporation of San people into the farm-economy that is frequently being referred to in the literature of Dutch expansion in South Africa was often a brutal and sometimes murderous process.[13] The interaction, conflict and cooperation between these groups are briefly being discussed in this

[12] M. Adhikari, *The Anatomy of a South African Genocide: The Extermination of the Cape San Peoples,* University of Cape Town Press, Cape Town, 2010, p. 85.
[13] J.M. De Prada-Samper, "The forgotten killing fields: "San" genocide and Louis Anthing's mission to Bushmanland, 1862-1863", *Historia*, 2012, 57 (1), pp.172-187.

study, and special attention will be given to the impact of water on the development and settlement of the various groups in this region of southern Africa.

The supply or availability of water in the South African context is more or less fixed as it depends on domestic factors which have not changed for at least 10 000 years.[14] The aim of this study is to research human settlement patterns and expansion, be it by Khoisan, white trekboers or 'Basters', from the eighteenth to twentieth centuries in correlation with the ability to exploit the region's water resources through pre-modern and modern water extraction technologies. This study explores the historical expansion and settlement of humans in Boesmanland through the exploitation of available water sources. The living conditions in the dry Northwest, specifically Boesmanland, will be contextualised in this study by exploring the political and environmental factors that shaped it.

1.2 Water Historiography

Little has been written about the water history of Boesmanland. Only a few sources specifically relate to groundwater and the exploitation thereof for the purpose of expansion and settlement in Boesmanland. If read in parallel with one another, these sources provide a good description of the area. The lack of water in the scarcely populated area is briefly mentioned in almost any account of Boesmanland.

Other authors provide a useful contextual background for a study on water history. Fritz Potgieter briefly wrote about the conditions and geographical challenges in the Northwest of South Africa in *Water,* compiled by F.A. Venter for the former Department of Water Affairs.[15] Venter also refers to hydra-technology in the same compilation. He describes the basic machines, such as the crude wooden wind pump and snare to draw water from wells.[16] Venter briefly discusses the history and culture of drill machine operators, which had a remarkable influence on the water history of Boesmanland.[17] Lance van Sittert published an article regarding drill machine culture and water "prophets" as part of South African cultural history.[18] Van Sittert concluded that the contrast in the environmental conditions of Europe and South

[14] R. Parsons, "Geological Survey of South African Groundwater Sources", *Water Research Commission*, 1989, pp. 251-258.
[15] F.A. Venter, "*Water*", Department of Water Affairs, Pretoria, 1970, pp. 267-268.
[16] F.A. Venter, "*Water*", pp. 267-268.
[17] See R.O. Herbst, "Die Rynse Sendinggenootskap en die Kareebergbasters, met spesiale verwysing na die Amandelboomsendeling, 1845-1860", Unpublished MA thesis, Stellenbosch University, 2004.
[18] See L. van Sittert, "The Supernatural State: Water Divining and the Cape Underground Water Rush, 1891-1910", *Journal of Social History*, 37(4), 2004, pp. 915-937.

Africa meant that the foreign scientific methods of engineers and geologists often failed when practiced in the dry interior of South Africa. This in turn led to a growing distrust by farmers in the "scientific" ways. The farmers instead relied in what seemed like quasi-scientific methods, like water divination prophets and *mikstokke*[19], but in reality were based on common sense and practical experience. P.J. van der Merwe touches on the subject of water in his trekboer studies by referring to the lived experience of surviving in a drought-prone area.[20] R.O. Herbst refers to the quarrels between white farmers, 'Basters' and Khoisan over water and grazing land next to the Sak River in his doctoral dissertation. In this dissertation, Herbst shows how the white farmers ultimately succeeded in taking control of the water sources, forcing the Khoisan further inland.[21]

In his book, *The Rise of Conservation in South Africa: Settlers, Livestock, and the Environment 1770 – 1950,* William Beinart looks at the expansion of European economic and political power through the lens of environmental history.[22] He separates the development of the global European empire into two phases: The eighteenth century, dominated by "sugar, African slaves, and shipping in the Atlantic world", and the nineteenth century, which saw "antipodean settlement and trade, especially that resulting from expanding settler pastoral frontiers" dominate global development of the European empire.[23] In Chapter 5, *Water, Irrigation and the State, 1880 – 1930*, Beinart discusses the first colonial attempts at water legislation in an effort to regulate the conservation and use of natural water sources.[24]

Muchaparara Musemwa writes about the importance of an interdisciplinary approach to water history. He argues that as flows of water does not respect boundaries, so too should historians be unhindered by disciplinary confines in the pursuit of a transdisciplinary understanding of this complex resource. He urges historians to reach out to other disciplines such as anthropology, sociology, archaeology and the natural sciences, amongst others, in their study

[19] A *mikstok* is a forked branch or Y-shaped frame bent from steel wire. This implement is sometimes used to indicate the presence of groundwater in a specific location. The bearer holds the *mikstok* by the two extensions, pointing the single base away from the body, parallel to the ground. The bearer then walks around the designated area, if the base of the *mikstok* drops closer to the ground, it is believed that there is groundwater present at that specific location.

[20] See P.J. van der Merwe, *Pioniers van die Dorsland*, Nasionale Pers, Kaapstad, 1941, pp. 18-20.

[21] See R.O. Herbst, "Die Rynse Sendinggenootskap en die Kareebergbasters, met spesiale verwysing na die Amandelboomsendeling, 1845-1860", Unpublished MA thesis, Stellenboasch University, 2004.

[22] W. Beinat, *The rise of conservation in South Africa: Settlers, Livestock, and the Environment 1770 – 1950*, Oxford University Press, Oxford, 2003, p. 1.

[23] *Ibid.*

[24] *Ibid.,* pp. 158-194.

of water history.[25] Johann Tempelhoff echoes this sentiment in his discussion of 'panarchy'. He argues that a cross-disciplinary collaborative approach to the history of water will lead to a better understanding of the topic. He suggests that historians as social scientists should be able to use the methods and tools of the natural sciences. He argues that "[t]he more comprehensive the integration of knowledge to understand the history of water, the better will be our understanding of the dynamics of water in social-ecological systems in southern Africa".[26] Furthermore, Tempelhoff points to the cultural dynamic of water history in southern Africa. He identifies a dynamic relationship between human skills and natural resources in an effort to secure a sustainable living. He posits that "[t]his forms part of the intellectual power of humans in securing for themselves survival under adverse conditions on a landscape that has a certain aesthetic and potential cultural attraction. This is a culture that has, for thousands of years, been present in many parts of Africa. In southern Africa we are privileged to have remnants of this remarkable heritage of humankind."[27]

W.P. Visser writes about the role of water as an agent for social change in his two case studies of irrigation schemes. Though the areas in question are not exactly the same, Visser's study examines the process of irrigating rural areas in the interior of South Africa, which is applicable to this study. He refers to the report of the Carnegie Commission of 1934, which found that many aspirant farmers lacked the necessary irrigation experience to succeed in their agricultural ventures. The report also recommended that "only candidates who showed the necessary perseverance to overcome the trying conditions on pioneering projects, be selected as settlers".[28] The interaction between aspiring water prospectors and government officials will be examined in this study.

Sean Archer masterfully discusses the impact of wind pumps and wire fencing in the Karoo, of which Boesmanland is a sub-region. He depicts the change in farming practices in correlation with changing technology, which in return changed the ecology of the area.[29]

---

[25] M. Musemwa, "Flows of Water/ Flows of Power/ Flows of History: Current trends and Transdisciplinary Insights and Future Directions", *South African Historical Journal*, 71(2), September 2019, p. 11.
[26] J.N. Tempelhoff, "Exploring panarchy and social-ecological resilience: Towards understanding water history in precolonial southern Africa", *Historia*, 61 (1), 2016, p. 112.
[27] J.N. Tempelhoff, "Historical Perspectives on Pre-Colonial Irrigation in Southern Africa", *African Historical Review,* 40 (1), 2008, pp. 121-160.
[28] W.P. Visser, "Water as agent for social change, 1900-1939: Two case studies of developmental state approaches in establishing irrigation schemes", *Historia,* 63 (2), 2018.
[29] S. Archer, "Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice", *Journal of Southern African Studies*, 26 (4), 2000, pp. 675-696.

International water historian of note, Donald Worster, examines the development of the American West, identifying the élite of technology and wealth who have controlled its most essential resource, water, in his book *Rivers of Empire.*[30]

By the time German missionaries arrived in the region in 1845, the treaty between 'Baster' communities and white farmers had already gone sour some years before. This treaty was established in the 1820s in reaction to the alienation of water resources by incoming whites. The 'Basters' were placed as a barrier community between white farmers and Khoisan. Through enforced treaties with neighbouring white farmers, the Khoisan of the Kareeberg in Boesmanland, once a significant "threat" to the white stock farming sector, were assimilated into the farm economy as labourers by 1845, or as discussed above, violently exterminated by white settlers. The drastic decrease in Khoisan resistance from the Kareeberg slowly diminished the value of the Kareeberg 'Basters' as buffer community to the nearby white farmers after 1830. Consequently, their status as allies to the colonial community decreased accordingly. White farmers of the overpopulated neighbouring districts increasingly set their eyes on the whole Kareeberg district, which the 'Basters' felt they earned for themselves through years of commando service. Soon the future of the 'Basters', although a community beyond the official boundaries of the colony, was under threat. To the 'Baster' community, and the missionaries in their midst, a period of tension with their white neighbours and increasing uncertainty regarding the Amandelboom, now Williston, mission station next to the Sak River unfolded.[31]

The first signs of the complicated land issue the Amandelboom missionaries would have to deal with for the full extent of their stay in the Kareeberg, became apparent within days of their arrival. Notwithstanding the continual drought conditions which placed the viability of Amandelboom as a permanent mission station in question, it was clear that the 'Baster' community were under significant pressure from their white neighbours. The fountain at Amandelboom was not only frequented by the surrounding farmers, but the only piece of cropland in the vicinity of the spring was cultivated to the disadvantage of the 'Basters' by a white Roggeveld farmer. The fact that these "invaders" utilised the only source of survival bothered the missionaries from the outset. One of these missionaries, L.D. Reinecke, remarked in his diary that these visits by farmers could lead to trouble for the mission in the long run. He

[30] D. Worster, *Rivers of Empire: Water, Aridity and the Growth of the American West*, Oxford University Press, Oxford, 1992.
[31] R.O. Herbst, "Die Rynse Sendinggenootskap en die Kareebergbasters", pp. 17-22.

warned the German missionary administration that, should they remain at Amandelboom permanently, the British government would have to do something substantial to keep their white subjects out of the area.[32] The cropland, just like the spring itself, would be needed to support the mission station. He remarked, not without prejudice, that the unconsidered invasion of the farmers with their enormous herds was the true reason why everything surrounding the fountain was so trampled. Most likely, Reinecke depicted the feelings of the 'Basters' when he described the white farmers in the surrounding areas "as migrant antelope who visit the area annually in their thousands".[33] When it rained, he wrote, "hundreds of stock farmers, just like the antelope, descended on the area. As soon as the grazing was depleted, the farmers and the antelope departed again almost instantaneously".[34] He added to the comparison of the farmers and their antelope counterparts when he writes, "A sure indication that the area is in a sorry state is the fact that there are currently neither farmer nor migrant antelope to be seen in the area".[35]

The tension between the 'Basters' of the Kareeberg and the white farmers illustrates the paramount importance of access to water sources at the time.[36] It is interesting to note that there are two types of water sources mentioned. First there is the spring, which is a source of surface water used by the 'Basters' and white farmers. The 'Basters', and the sympathetic German missionaries who wanted to settle at the fountain themselves, were definitely not happy about sharing this source. Clearly there was not enough water for the 'Basters', missionaries and white stock farmers to settle there permanently in 1845. The second source, rainwater, was even more volatile. The area did receive rain, but it was not enough to sustain all the people and their livestock throughout the year. Both farmers and game still had to rely on a seasonal migration system in order to survive.[37]

However, none of these sources focus explicitly on how farmers managed to utilise water sources in a sustainable manner. This study makes a contribution in filling the lacuna on the water historiography of the area by tracing the expansion and settlement of people in Boesmanland from 1760, when the first crown land was allocated to colonists, until c.1960,

[32] R.O. Herbst, "Die Rynse Sendinggenootskap en die Kareebergbasters", p.23.
[33] *Ibid.*
[34] *Ibid.,* p. 23.
[35] *Ibid.,* p. 23.
[36] M. Adhikari, *The Anatomy of a South African Genocide: The Extermination of the Cape San Peoples,* University of Cape Town Press, Cape Town, 2010, p. 85.
[37] M. Musemwa, "Flows of Water/ Flows of Power/ Flows of History: Current trends and Transdisciplinary Insights and Future Directions", *South African Historical Journal*, 71(2), September 2019, p. 11.

when wind pumps were introduced in the region, through the appropriation and exploitation of available water sources.

1.3 Methodology, research strategy and challenges

The following issues will be investigated: When did people start inhabiting this area, and which factors made it possible? How did people survive in this arid landscape? How did the availability or non-availability of water affect their mobility and patterns of settlement?

Different sources of water were made accessible at different stages between 1760 and 1960 according to rainfall patterns and technological development. The first tier was temporary surface water, which was usually available for six months to a year at most after a normal rainy season. Then there were smaller sources, like streams and ponds, which dwindled after a few weeks of the rainfall. Shallow wells that were dug by hand were the first attempt to reach deeper into the ground for water. There are no subterranean geographical formations in this area to carry underground water to the ocean. This is because of the solid rock formations embedded in the area. Digging wells in the region is a mammoth task and doing it by hand was thus nearly impossible. Boreholes, reaching deep into the earth's crust, became possible as technology advanced and wind pumps brought a steady stream of drinking water where previously there were none. The period between the eighteenth and twentieth century has been chosen as a time frame for this study because permanent settlement in Boesmanland began in the eighteenth century by trekboers searching grazing land and water sources for their growing flocks. By the late nineteenth century groundwater became readily available to farmers through the installation of wind pumps at boreholes made with drills. The 1960s were the golden era for borehole drilling and fencing of boundaries on farms.

The first farms for white settlers were allocated near the Kammies mountains in Namaqualand in 1760, marking the beginning of organised expansion and permanent settlement in the area. It is important to note that this date is by no means an indication of the first presence of human inhabitants in the area. Apart from the 'Baster' community living at Amandelboom, which was briefly discussed in section 1.2, people have lived in this region for possible millennia before the eighteenth century. The history of the Bantu-speaking people on the fringes of Boesmanland was thoroughly investigated by Aubrey Herbst in his doctoral study and will not be discussed in detail in this study, although other indigenous transhumant groups who lived in the area will be discussed on pages 20 to 25. By 1960 technology to drill boreholes was

available to farmers of the area, making permanent settling in fixed geographic areas the norm. Therefore 1960 also more or less serves as a demarcated end to the period of investigation for this study. Boesmanland by no means froze in time since 1960, the expansion and settlement of humans in the area reached a fixed pattern which remained relatively stable since, although by c.1990 it became clear that the wind pump was slowly being replaced by solar panels for the extraction of water. As mentioned, the time span for the study covers about two hundred years, from 1760 to c.1960, i.e., since the time the Dutch East India Company (DEIC) granted farms in the area, until boreholes made permanent settlement in the area possible. The long timespan allows one to explore the relative slow rate of development of commercial, agricultural and permanent human occupation in an arid and remote area of South Africa. The focus of the study is not to provide a detailed narrative of the period, but rather to highlight aspects of water extraction, and its central role in the development of permanent settlements in Boesmanland.

The study illuminates the link between permanent human settlements and permanent water sources, as well as temporary human settlements and temporary water sources. By drawing on the correlation between the availability of water and human settlement patterns, the study will hopefully cast light on the extraordinary efforts made by humans to overcome the extreme challenges of water shortages in Boesmanland.

The first tier of research for this study was a literary study based on secondary sources regarding the topic. As said, few secondary sources elaborate on the challenges to create water access points. Was it simply a case of a harsh environment, or did economic and political factors play a role as well? Such questions could only be answered by a scrutiny of relevant archival sources such as municipal minutes and geographical reports.

The Cape Archive Depot was invaluable for this study. The correspondence between various town magistrates and the colonial administration in Cape Town shed light on the challenges of running small towns on the distant colonial frontier. The reports of district surgeons illuminated the actual health implications for people living in drought-ridden areas and the role that infrastructure played in delivering, or sometimes failure to deliver, clean drinking water to humans and animals. Closely linked to the infrastructure issue were the reports of the district engineers and chief inspectors. These reports illuminated the shortcomings of the developing towns and institutions of Boesmanland in terms of water. Projects such as new water tanks for schools and entire new water grids for a growing town were some of a range of developmental

issues. The collection of correspondence between divisional councils and the Department of Lands highlights the process of demarcation, valuation and the selling of crown land to farmers. The collection of letters sent and received by the civil commissioner and Boesmanland mayors revealed a myriad of complaints, misfortunes and incompetence by both the colonial officials and their subjects at times.

The annual reports of the Department of Agriculture as well as the geological reports by the Geological Institute proved very helpful in understanding the ecology and geography of the area. Other geological surveys were also consulted.

The archival material of the National Archive of South Africa (NASA) in Pretoria was not very conducive for research on the occurrence of water sources and water exploitation in Boesmanland. Despite friendly assistance by the staff, some of the collections were missing and others inaccessible due to a broken microfilm machine. Unfortunately, the archives of the Department of Water and Sanitation in Pretoria is in transit to NASA and currently (2019) not accessible to researchers.

1.4 Demarcating the region of Boesmanland

Figure 1: Approximate boundaries of Boesmanland for the purpose of this study. Source: Eybers, "*Op die voetspore van die ou reisigers*", p. 143.

P.J. van der Merwe, who studied the region intensively before 1940, said most *Boesmanlanders* regard the whole region west of the Sak River, which later becomes the Hartebees River and flows into the Gariep at Kakamas, to be Boesmanland.[38] There are, however, older generations who also consider the area east of the above-mentioned part of Boesmanland, which is both historically correct and supported by climate and vegetation.[39] Barry Eksteen based his demarcation of Boesmanland on early mission stations, 'Baster' groups and relevant places in the vicinity. He nevertheless recognises Kakamas and Kenhardt as the eastern border.[40] This corresponds with Husselman, who believes Boesmanland is situated from the Hartebees River

[38] P.J. van der Merwe, *Pioniers van die Dorsland*, Naspers, Cape Town, 1941, p. 25.
[39] H. De Beer, *'n Storie oor Boesmanland,* SUN Media, Stellenbosch, 2012, p. 7.
[40] B. Eksteen, *BB's van die Boesmanland*, R. Barry Eksteen, Bloemfontein, 2005, p. 8.

westwards.[41] H.A. Rossouw describes *Voor-Boesmanland* as the "youngest part with permanent inhabitants", which stretches from the Kamiesberg eastwards up to the (seemingly western) borders of Kenhardt and Calvinia. His qualification of "*voor-"* implies that Boesmanland goes beyond this point.[42]

The borders of Boesmanland are thus contested. There is still another matter to consider when attempting to demarcate the boundaries of this region, apart from vegetation, seasonal weather patterns and topography. Hidden from plain sight, could the key to Boesmanland's location be tied to the Bushmen who gave it its name? According to Van der Merwe the area was "earlier inhabited more or less exclusively by Bushmen" (own translation).[43] Skotnes claims that a group named the /Xam once occupied the whole of central South Africa, with other Bushmen groups to the North and West of the region. Such description would thus have made the entire country 'Boesmanland'. Her map, however, places the /Xam in central "ou Kaapland" (Cape Colony), stretching from the Kamiesberg up to Burghersdorp, including the entire Great Karoo with other Khoisan groups on the northern side.[44] According to Raper a large part of the Northeast Cape Colony was called Boesmanland when the region was still unknown to whites because of the Bushmen inhabiting the area. If the latter-mentioned group was the /Xam, it would prove Skotnes's map to be correct.[45] Large-scale conflict between Khoisan and white migrants only began in 1770.[46] Boesmanland can be considered as part of the Karoo, or at least flanked by it from below. On the upper border of Boesmanland lies the Kalahari. It is impossible, in terms of modern demarcations, to confirm the boundaries of Boesmanland of that time, but contemporary witnesses (Lichtenstein, Collins and De Mist) agree that the Khoisan were free from foreign rule in the central highlands of the Cape Colony, North of the Sak River and Sneeu Mountains.[47]

The description above should suffice to illustrate the elusiveness of boundaries demarcated by roaming transhumant peoples. It speaks to the very nature of Boesmanland. Life was constant

[41] De Beer, *'n Storie oor Boesmanland*, p.8.
[42] H.A. Rossouw, *Namakwalandse Kroniek*, UUB, Stellenbosch, 1973, p. 8.
[43] P.J. van der Merwe, *Die Noordwaartse Beweging van die Boere voor die Groot Trek, (1770-1842)*, W.P. Van Stockum en Zoon, The Hague, 1937, pp. ix-x.
[44] P. Skotnes, *Claim to the Country: The archive of Wilhelm Bleek and Lucy Lloyd*, Jacana, Cape Town, 2007, pp. 62-63.
[45] P.E. Raper, *Streekname in Suid-Afrika en Suidwes: Naamkundereeks Nr.1*, Tafelberg, Cape Town, 1972, p. 71.
[46] Van der Merwe, *Die Noordwaartse Beweging van die Boere voor die Groot Trek, (1770-1842)*, p. 189.
[47] G.W. Eybers, *Op die voetspore van die ou reisigers*, Maskew Miller Ltd., Cape Town, 1926, pp. 143-178.

in its oscillation for people who endeavoured to make a living in Boesmanland according to the availability of water sources, until technology made a more permanent existence possible.

Thus, despite being a difficult region to demarcate, for the purpose of this study the perimeters for Boesmanland will be demarcated by the Kamiesberg in the west; the Hantam and Kareeberg in the south; the Doorn Mountains in the east; and the Orange River in the north. Apart from the aforementioned geographical attributes, the area appears remarkably empty of other natural and human elements. The Hartebees River, from which the Gemsbok and Sak Rivers also stem, flows in the eastern half of the area. The area is diagonally crossed by the Katkop Hills as well as Hartzog's Rand.

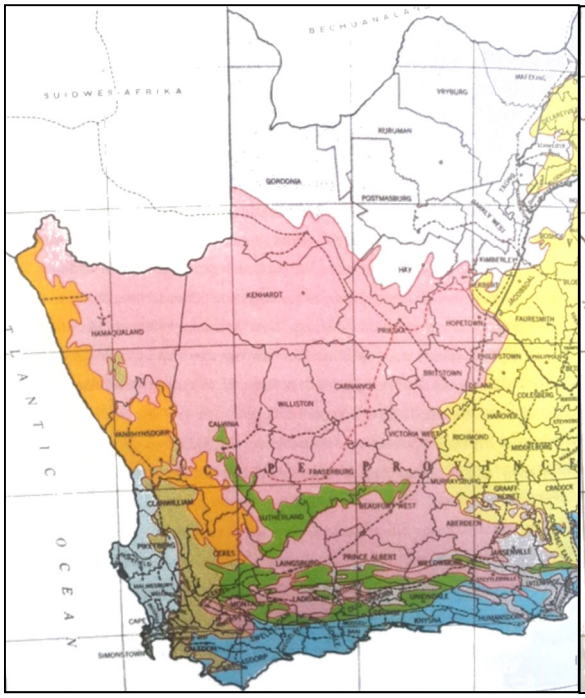

Figure 2: Acocks's estimation of the veld types of South Africa, c. 1400. Source: J. Acocks, "Veld Types of South Africa, Third Edition", *Research Institute for Botany,* 1988, p. 50.

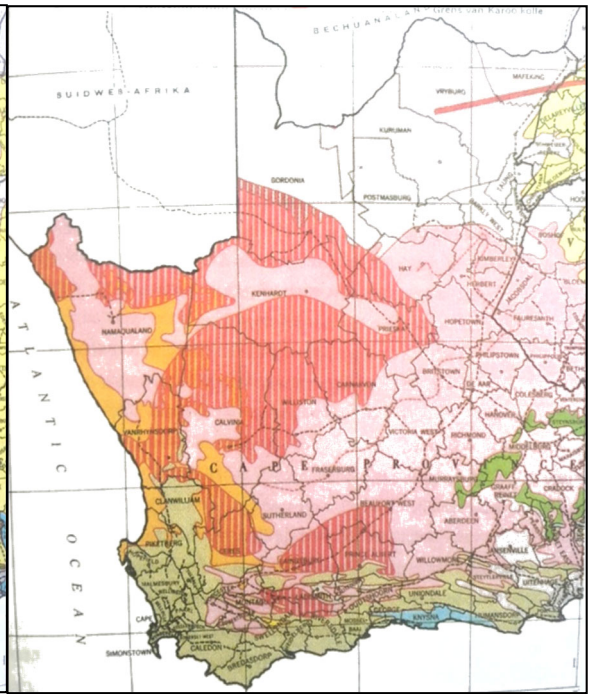

Figure 3: Acocks's map of the veld types of South Africa in 1950. Source: J. Acocks, "Veld Types of South Africa, Third Edition", *Research Institute for Botany,* 1988, p. 50.

This demarcation follows the same general outline as that of John Acocks's 1952 study of veld types in South Africa in 1950 and possibly by c.1400. On the maps shown in Figures 2 and 3, it is clear that Boesmanland has a specific veld type, which differs from neighbouring areas.[48] Vegetation types endemic to Boesmanland are the succulent shrubs *Ruschia pungens*, *Dinteranthus pole-evansii, Larryleachia denteri, L. marlothii, Ruschia kenhardtensis,* and herbs *Tridentea dwequensis, Lotononis oligochepalis, Nemesia maxi, Cromidon minitum,* as well as geophytic herbs *Ornithogalum bicornutum,* and *O. Ovatum* subsp. *oliverorum*. These

[48] J. Acocks, *Veld Types of South Africa*, Third Edition, Research Institute for Botany, Pretoria, 1988, p. 50.

species are solely found in Boesmanland, and thus will be used to differentiate Boesmanland from the surrounding areas.[49]

1.5 Climate and Geographical features of Boesmanland

Boesmanland forms part of a larger region known as the Karoo. The Karoo formed an almost impenetrable barrier to the interior from the Western Cape, and most early adventurers, explorers, hunters and travellers on the way to the Transvaal Highveld denounced it as a frightening place of great heat, great frosts, great floods and great droughts.[50] Today it is still a place of great heat and frosts, and an annual rainfall of between 50 – 250 mm, though on some of the mountains it can be 250 – 500 mm higher than on the plains.[51] However, groundwater is found throughout the Karoo, which can be extracted by boreholes, making permanent settlement and sheep farming possible.[52]

The xerophytic vegetation consists of aloes, mesembryanthemums, crassulas, euphorbias, stapelias, and desert ephemerals, spaced 50 cm or more apart,[53] and becoming very sparse towards the northern parts of Boesmanland, and from there into the Kalahari Desert. The driest region of the Karoo, however, is its southwestern corner, between the great escarpment and the Cederberg-Skurweberg mountain ranges, called the Tankwa Karoo, which receives only 75 mm of rain annually.[54] The eastern and northeastern Karoo is often covered by large patches of grassland. The typical Karoo vegetation used to support large game, sometimes in vast herds.[55] Today sheep thrive on the xerophytes, though each sheep requires about 4 hectares of grazing to sustain itself.[56] This is not the global norm, which relies on processed animal feed or higher rainfall natural vegetation such as ryegrass, tall fescue, and prairie grass.

The only sharp and definite boundary of the Great Karoo is formed by the most inland ranges of Cape fold mountains to the south and southwest. The extent of the Karoo to the north is vague, fading gradually and almost imperceptibly into the increasingly arid Boesmanland

[49] J. Acocks, *Veld Types of South Africa*, Third Edition, Research Institute for Botany, Pretoria, 1988, p. 52-55.
[50] E. Palmer, *The Plains of Camdeboo*, Fontana/ Collins, London, 1966, pp. 12-13, 120, 126, 140-146.
[51] D.J. Potgieter. & T.C. du Plessis, *Standard Encyclopaedia of Southern Africa*, Vol. 6, Nasou, Cape Town, 1972, pp. 306-307.
[52] D. Conolly, *Conolly's Guide to Southern Africa*, Fifth Edition, Conolly Publishers, Scottburgh, 1992, pp. 106-117.
[53] J. Acocks, *Veld Types of South Africa*, Third Edition, Research Institute for Botany, Pretoria, 1988, p. 50.
[54] *Ibid.*
[55] Palmer, *The Plains of Camdeboo*, pp. 12-13, 120, 126, 140-146.
[56] J. Acocks, *Veld Types of South Africa*, Third Edition, Research Institute for Botany, Pretoria, 1988, p. 50.

towards the northwest.[57] To the north and northeast it fades into the savannah and grasslands of Griqualand West and the Highveld.[58] The boundary to the east grades into the grasslands of the Eastern Midlands. The Great Karoo itself is divided by the great escarpment into the Upper Karoo (generally above 1200 – 1500 m) and the Lower Karoo on the plains below at 700 – 800 m. Many local names, each denoting different subregions of the Great Karoo, exist, some more widely, or more generally known than others. The Lower Karoo, going from west to east, is referred to as the *Tankwa Karoo*, the *Moordenaarskaroo*, the *Koup*, the *Vlakte* and the *Camdeboo Plains*. The *Hantam*, the *Kareeberge*, the *Roggeveld* and *Nuweveld* are the better-known subregions of the Upper Karoo though most of the region is simply known as the Upper Karoo, especially in the north.[59]

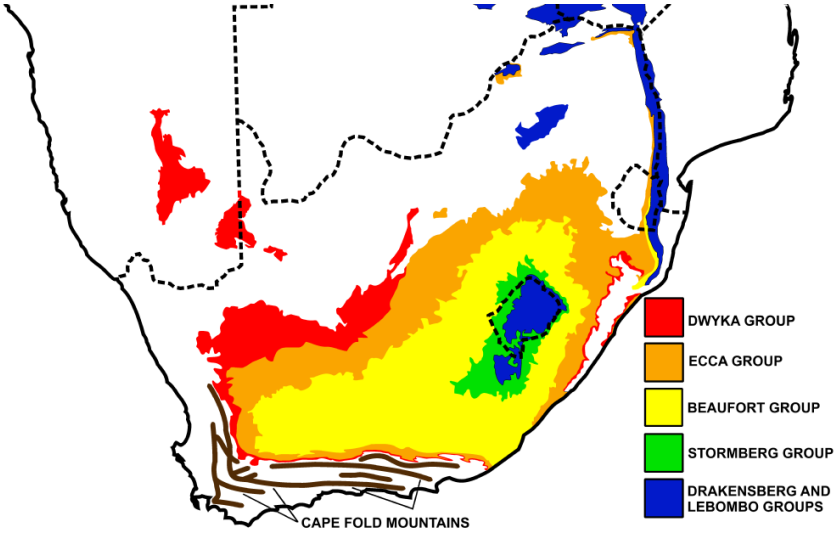

Figure 4: A schematic geological map of the outcrops (surface exposures) of the Karoo Supergroup rocks in Southern Africa. The location and approximate structure of the Cape Fold Mountains are also diagrammatically indicated for reference purposes. Source: [1]"*Atlas of Southern Africa*", p. 13, 98-106, 114-119, Reader's Digest Association, Cape Town, 1984.

The Great Karoo and Little Karoo lie almost entirely within two of South Africa's eight botanical biomes, namely the Succulent Karoo biome and the Nama Karoo biome, both of which, like the Karoo Geological System, are more extensive than the geographical or

[57] N. Norman & G. Whitfield, *Geological Journeys*, Struik Publishers, Cape Town, 2006, p. 206-223, 243-247, 252-273, 300-311.
[58] J. Acocks, *Veld Types of South Africa*, Third Edition, Research Institute for Botany, Pretoria, 1988, p. 50.
[59] Anon., *Atlas of Southern Africa*, pp. 13, 98-106, 114-119. Flat topped hills (called Karoo Koppies) are highly characteristic of the southern and southwestern Karoo landscape. These hills are capped by hard, erosion-resistant dolerite sills. This is solidified lava that was forced under high pressure between the horizontal strata of the sedimentary rocks that make up most of the Karoo's geology. This occurred about 180 million years ago, when huge volumes of lava were extruded over most of Southern Africa and adjoining regions of Gondwana, both on the surface and deep below the surface between the sedimentary strata. Since this massive extrusion of lava, Southern Africa has undergone a prolonged period of erosion exposing the older softer rocks, except where they were protected by a cap of dolerite.

historical Karoo described in South African atlases and guide books.[60] The Nama Karoo biome is located entirely on the central plateau mostly at altitudes between 1000 m and 1500 m.[61] It incorporates nearly the whole of the historical and geographical Great Karoo, but also includes a portion of southern Namibia's Namaqualand, and South Africa's Boesmanland (both local geographical names, not names of biomes). [62] It is the second largest biome in South Africa,[63] and forms the botanical transition between the Fynbos biome to the south and the Savannah biome to the north. It is defined primarily by the dominance of dwarf (less than 1 m high) shrubs with a co-dominance of grasses especially towards the northeast and east where it grades into the Grassland biome of the Highveld and the Eastern Midlands.[64] The shrubs and grasses are deciduous, mainly in response to the irregular rainfall.[65]

Figure 5: Flat topped hills (called Karoo Koppies). Source: *Atlas of Southern Africa*", p. 13, 98-106, 114-119, Reader's Digest Association, Cape Town, 1984.

Much of the Nama Karoo biome is used for sheep and goat farming, providing mutton, wool and pelts for local and international markets, especially since livestock can frequently be provided with a regular supply of water from boreholes. Overgrazing exacerbates the erosion caused by the violent thunderstorms that occur, infrequently, in the summer. "It also promotes the replacement of the grasses by shrubs, especially the less edible varieties such as the three-thorn (*Rhigozum trichotomum*), bitterbos (*Chrysocoma ciliate*) and sweet thorn (*Acacia karroo*)."[66] However, there are few rare or Red Data Book plant species in the Nama Karoo biome.[67]

[60] Anon., *Atlas of Southern Africa,* p. 119.
[61] Anon., *Geological Map of South Africa, Lesotho and Swaziland*, Council for Geoscience, Geological Survey of South Africa, Pretoria, 1970, p. 11.
[62] Norman & Whitfield, *Geological Journeys*, pp. 206-223, 243-247, 252-273, 300-311.
[63] Anon., *Geological Map of South Africa, Lesotho and Swaziland*, p. 11.
[64] Anon., *Geological Map of South Africa, Lesotho and Swaziland*, p.11.
[65] *Ibid.,* p. 12.
[66] *Ibid.,* p. 13.
[67] *Ibid.*, p. 13.

Figure 6: Sunset in the Great Karoo, near Sutherland, showing a multi-bladed wind pump, which has made permanent settlement and farming possible in this thirsty land. These wind pumps are as iconic of the Great Karoo as are the flat-topped Karoo Koppies. Source: Author's own.

The introduction of the wind pump to tap the Great Karoo's underground water resources in the late 1800s made permanent human habitation and sheep farming possible over large parts of the Great Karoo for the first time.[68] As a result, the teeming number of large antelope in the Karoo has dwindled into insignificance and, with them, the large carnivores have all but disappeared. Today the caracal (7 – 19 kg),[69] black-backed jackal (6 – 10 kg),[70] Verreaux eagle (3.0 – 5.8 kg) and the martial eagle (3.0 – 6.2 kg)[71] are arguably the largest predators likely to be seen in the Great Karoo. Leopards (20 – 90 kg) do occur, especially in the mountains, but are very secretive and, therefore, rarely seen.[72] Many of the animals that formerly inhabited the Karoo in large numbers, including lions, have been re-introduced to the area in nature reserves and game farms. [73]

[68] S. Archer, "Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice", *Journal of Southern African Studies*, 26 (4), 2000, pp. 675-696.
[69] C. Stuart & T. Stuart, *Field Guide to Mammals of Southern Africa*, Struik, Cape Town, 2007, pp. 136, 170, 176.
[70] *Ibid*, p. 170.
[71] P.A.R. Hockey, W.R.J. Dean & P.G. Ryan, *Roberts Birds of Southern Africa*, Seventh Edition, Trustees of the John Voelcker Bird Book Fund, Cape Town, 2005, pp. 531, 497.
[72] Stuart & Stuart, *Field Guide to Mammals of Southern Africa,* pp. 136, 170, 176.
[73] U. Oberprieler & B. Cillié, "*Raptor Identification Guide for Southern Africa*", Rollerbird Press, Pinegowrie, 2002, pp. 62, 82.

Figure 7: Map showing the location of Boesmanland within South Africa, as well as all the towns in Boesmanland. Source: Created by author using Google Maps (https://www.google.co.za/maps/@-30.423852,21.7700357,6.91z?hl=en).

1.6 A brief description of early human settlement in a parched interior

Although this study concentrates on the modern period of human settlement in Boesmanland, c.1860, it is important to emphasise that the region was by no means an "empty land" prior to this date. Throughout its history, Southern Africa has been the home of various peoples. It is widely accepted that the first people at the Cape were hunters and herders or Khoisan peoples. When the Portuguese first rounded the Cape in 1487, and on succeeding voyages, they found herders at Saldanha Bay, Table Bay and Mossel Bay who spoke languages characterised by clicks. It was believed that they called themselves 'Khoikhoin' – 'men of men'.[74] This is where the term 'Khoikhoi' originated. The Khoikhoi, moved through Boesmanland in small groups for thousands of years, but could not permanently settle in fixed locations for long periods of time due to a need to find water and food sources elsewhere. Artwork made by these groups dates back 10 000 years and the use of ochre 8000 years. The Khoikhoi highly valued the fountains on their hunting grounds in Boesmanland, where they obtained drinking water and stalked game.[75]

It was these Khoikhoi herdsmen who interacted closely with the Dutch from the first settlement at the Cape, and who were of great importance to them as suppliers of meat.[76] The Dutch and Portuguese found them spread parallel to the coast, sometimes a bit more inland in the absence of vegetation, from the Swakop river in Namibia on the Atlantic shore to the Buffalo river on the shore of the Indian Ocean shore.[77] This report therefore also placed the Khoikhoi within the boundaries of Boesmanland. They were transhumant pastoralists, moving in search of grazing for stock, and utilised the lush pasture of the Western Cape in spring, when the country further north and east which has summer rains, was dry. There is no evidence of their occupying the interior table land north of the Orange River, although Vedder wrote about the ancient occupation of land by Khoikhoi as far as Lake Ngami in modern day Botswana, and the

[74] M. Wilson & L. Thomlinson (Eds.), *The Oxford History of South Africa*, Clarendon Press, Oxford, 1969, pp. 40-41.
[75] R.O. Herbst, "Die Rynse Sendinggenootskap en die Kareebergbasters", p.18. Highlight hierdie bron ook maar ter wille van die eksaminatore.
[76] M. Wilson & L. Thomlinson (Eds.), *The Oxford History of South Africa*, Clarendon Press, Oxford, 1969, pp. 40-41.
[77] *Ibid.*

Khoisan languages which are still spoken by hunters living in the dry inland parts of the Kalahari.[78]

One oral tradition collected from Khoikhoi herders referred to their ancestors travelling with their faces towards the setting sun until they reached the 'great water', and then travelling southwards down the Atlantic coast[79]. Another tradition referred to an eastward movement to the Zuurveld in the Eastern Cape after the arrival of the Dutch.[80]

The Dutch founders of the refreshment station at the Cape in 1652 occupied land on the basis of grazing licenses, which were registered for varying periods and on vague locations by the DEIC. After the ban on livestock trading between European settlers and Khoikhoi was lifted by the DEIC, herds quickly increased. Kolbe reported in 1777 that each farmer had "600 schapen en 100 stuks grof vee bezat".[81] As a result water and grazing became scarce. This encouraged farmers to live further apart from one another and an increase in seasonal trekking in search of these resources. Governor Willem Adriaan van der Stel supported farmers moving further afield for their pastures and stated that the trekking will see to it that "de schaapen en beesten zeer in menigvuldigheid, vette en welgesteldheid zijn toegenomen."[82]

Numerous fiction and non-fiction authors have written about the life and misery of the dry South African interior, including the whole region of the Karoo and Boesmanland. Sir John Barrow went on various expeditions into the interior of South Africa, and in 1799 he accompanied troops to Graaff-Reinet to suppress an uprising caused by skirmishes between white farmers and Khoisan.[83] According to Lewis-Williams and Dawson, the seventeenth century use of "Boschjesmans" was also meant as a collective name for groups who each had their own name. The term "San", which is often used by anthropologists, is actually a condescending term that originated from Nama. It refers to economically disadvantaged group that does not own livestock.[84]

---

[78] H. Vedder, *The Native Tribes of South West Africa*, Cape Times Ltd., Cape Town, 1928, pp. 114-115.
[79]Eybers, *Op die voetspore van die ou reisigers*, pp. 112-113.
[80] D. Moodie, *The Record, or a Series of Official Papers Relative to the Conditions and Treatment of the Native Tribes of South Africa 1838-42*, A. A. Balkema, Cape Town, 1960, p. 293.
[81] P. Kolbe, *Nieuwe algemene beschryving van de Kaap de Goede Hoop*, Petrus Conradi, Amsterdam & Volkert van der Plaats, Harlingen, 1777, p. 23.
[82] De Beer, *'n Storie oor Boesmanland*, p. 81.
[83] W.J. Barrows, *An Account of Travels into the Interior of Southern Africa in the years 1797 and 1798*, G.F. Hopkins, London, 1802, pp. 17-19.
[84] De Beer, *'n Storie oor Boesmanland*, p. 83. See pp. 3-5 for an explanation of the ethnic nomenclature.

Barrow's company was forced to stay over in Graaff-Reinet for a considerable time due to the persistent drought that plagued the area. The journey back to Cape Town was seen as impossible due to a lack of water and adequate pasture. Barrow's party knew that the rivers that ran through the area, as well as other water sources, would be dried up. Barrow encountered the wonder of ample rain after the drought and reported a thunderstorm every afternoon for the first week. For the duration of the second week a continuous, gentle rain fell, followed by clear skies in the third week. Barrow sketches an idyllic scene of "...Karee shrubs with their short, thick leaves pushed out their fat bellies and nearly burst from the extravagance which the damp earth bestowed upon them recently".[85]

On the fourth week they departed, just barely making it over the rushing Sondags River. Soon after their departure from Graaff-Reinet, however, Barrow warned, "The traveller who has reason to admire the fairness of the Karoo, as we have done, is admonished to never forget that it also has lurking danger in some places".[86] When his party left Graaff-Reinet on 19 December 1799, they did so under the impression that the rain they had experienced was extensive. They soon found that the rain in the region can end as soon as it began, which left them and their animals without any water for four days. The idyllic picture he painted earlier quickly turned to a quest for survival. He also remarked that no wells had been made in the area he travelled (from Graaff-Reinet westward) to create water sources, nor were springs opened to let out more water. There were no large dams constructed to preserve rainwater, but some smaller dams were created around fountains.[87]

While travelling through the Roggeveld in 1802, Dr Heinrich Lichtenstein met a certain Mr Nel who, with his sons, owned six charter farms. Only four of these had water throughout the year and they were planning on selling the two farms without perennial water sources. Lichtenstein's description of the Roggeveld is similar to Barrow's with flat stretched-out plains of barren land.[88] On 31 May 1813 John Cambell, en route to Klaarwater (Griqua City), wrote in his diary: "After the morning prayers next to the wagon, in the open field under the wide blue sky, we departed before sunrise in hope that we will reach water before the heat of the day".[89]

---

[85] Barrows, *An Account of Travels into the Interior of Southern Africa in the years 1797 and 1798*, pp. 44-47.
[86] *Ibid.,* p. 49.
[87] Eybers, *Op die voetspore van die ou reisigers*, pp. 78-117.
[88] *Ibid.*, pp. 119-141.
[89] *Ibid.,* pp. 143-178.

These travellers were all painfully aware of the critical role water played in the daily life of inhabitants of areas in the interior of South Africa such as Boesmanland. The narrative thus slowly changes from an abundance of water in the close vicinity of the DEIC refreshment station at the Cape of Good Hope, to lesser and later a severe lack of water in the interior. For example, from 1899 to 1902 Cape Town received a respective 29.95, 20.79, 27.41, and 33.15 inches of rain annually. Carnarvon in the Boesmanland received 9.70, 11.48, 11.67 and 6.57 inches for the same years. Port Nolloth in Namaqualand, on the Cape West Coast on the same latitude as Boesmanland, received only 5.27, 5.35, 2.34 and 1.45 inches.[90]

During the 1850s, John Blades Currey travelled through the interior of South Africa, recording invaluable first-hand encounters in his diary of the regions of the country. He travelled from Namaqualand through Boesmanland and the Kalahari to reach the Orange River. His account illustrates vividly the climate, people and economy of the areas at the time. He contrasts Namaqualand and Boesmanland based on the terrain. According to Currey, Namaqualand was hilly and covered with bushes; Boesmanland was dead level and covered with a peculiar grass, so the contrast between the two was remarkable, "for within a few miles of Concordia one passed between stony hills thickly clad with euphorbia and aloe into what seemed a vast silver sea."[91] He remarked that there had been drought for years in Namaqualand. The economically marginalised, in particular the Khoisan, were suffering deeply as a result from this prolonged drought. The water they found was so brackish as to be almost putrid; the stunted bushes were burnt black. Food supplies were also scant.

Travelling on a road that passed right through Boesmanland and, as there had been much needed thundershowers, he found the beautiful Bushman grass was in prime condition. He described the grass as standing about as high as wheat in England, and each golden-yellow stern bearing above the seed a long delicate white filament like a little ostrich feather which seemed to be always in motion.[92] "The effect in sunshine or by moonlight of this silvery shimmer on a plain of apparently boundless extent, as level as a billiard table, once seen is never to be forgotten, and I saw it often. When one is about halfway across this plain, purple

[90] F.A. Venter, *Water*, Afrikaanse Pers-Boekhandel, Pretoria, 1970, pp. 267-268.
[91] P.B. Simons (Ed.), *John Blades Currey 1850-1900*, Brenthurst Press, Houghton, 1986, p. 17.
[92] *Ibid.,* p. 18.

shades which soon develop into conical mountains begin to loom, showing the line of the great Orange River which is approached through these solemn portals", he wrote.[93]

The western part of Boesmanland, which borders on Namaqualand, was almost entirely without accessible water sources for agricultural or prolonged domestic use at the end of the nineteenth century.[94] A century later, however, there were numerous shallow water sources in close proximity to the settlements in Boesmanland. The local inhabitants call these shallow water sources "putse" or wells. The southern part of Boesmanland has more water, due to water seeping temporarily through the soil, or 'fonteine', slightly higher rainfall, as well as more permanent 'fonteine'.[95] Further to the north, there are no such springs due to the lack of mountains and low rainfall, but the underground water level is shallow and can be reached at three to five metres.[96] The northern border of Boesmanland used to have a number of permanent springs, and after the rainy season, there were a few small seeping holes in the Plateau of Noup. In central Boesmanland rain is scarce and most of the small marshes only have water for a few weeks during the rainy season, or at most, a few months per year. The larger marshes can store water for up to six months after a substantial rainfall. It is also not uncommon, however, for the marshes to be completely dry for a number of years, when there is no rainfall. If it does rain during the summer, the water does not flow to the ocean, because of poor drainage. Rainwater thus collects in natural crevices. If the water remains fresh, it is referred to as a *vlei,* or a *pan* if the water becomes salty.[97]

The Khoikhoi also made use of large basins (*komme*) in which water collected naturally during rainy periods, and other basins filled with sand from which water could be obtained after digging down through about two metres of sand (*graafwater*). They also dug *gorras* (holes in the sand of dry riverbeds) which retained water.[98] In this extremely level area, there were no fountains, and the groundwater level was so deep that no pioneer settler or indigenous inhabitant originally attempted to dig a well. Before the trekboers began to dig wells and drill boreholes from the nineteenth century onwards they were mainly dependent on natural water sources – something Boesmanland does not have much of.

---

[93] *Ibid.*, p. 19.
[94] Van der Waal-Braaksma & Ferreira, *Die Noordweste*, p. 59.
[95] Solomon, *Water: The epic struggle for wealth, power and civilization*, p. 202.
[96] Solomon, *Water: The epic struggle for wealth, power and civilization*, p. 202.
[97] Van der Waal-Braaksma & Ferreira, *Die Noordweste*, p. 57.
[98] J. Walton, *Wind pumps in South Africa*, Human & Rousseau, Cape Town, 1998, p. 2.

The extensive nature of livestock farming made it unavoidable for white farmers to expand inland since 1730, before there were no unoccupied fountains or ponds within a 48 to 64 km radius of the Cape.[99] Expansion to the north was limited to mountainous areas where most of the perennial water was to be found. Further north, beyond the mountainous areas, conditions were too variable for the livestock farmers. However, a few die-hards took on the region beyond the reach of the perennial Buffalo River running on the west side of the Kamiesberg towards the Atlantic Ocean, and in 1760 farms were allocated at the Kamiesberg in Namaqualand. On the eastern side of the Kamiesberg permanent water sources dwindled quickly. F.A. Venter writes in his Department of Water Affairs study, *Water*, that farms were allocated in 1760 adjacent to the Kamiesberg in Namaqualand and the northern expansion started from the Roggeveld. Between 1800 and 1825 trekboers occupied the most valuable area of Boesmanland, an area of approximately 647 475km^2 south of the Orange River. This district was inhabited by Khoisan, who highly valued the springs on their hunting grounds. There they obtained drinking water and stalked game. When the trekboers and 'Basters' tried to occupy this water, the Khoisan retaliated.[100]

[99] F.A. Venter, *Water*, Afrikaanse Pers-Boekhandel, Pretoria, 1970, pp. 267-268.
[100] *Ibid*.

CHAPTER TWO

HUMAN EXPANSION AND SETTLEMENT IN BOESMANLAND, c. 1875 - 1960

2.1 Introduction

The geography of South Africa is an ensemble of contrasting landscapes. This chapter will focus primarily on the modern people who have called these landscapes home, particularly in Boesmanland. However, it will become apparent from the very beginning, that the land itself is not a minor character in this narrative but takes centre stage throughout all the acts and changing actors. Though this chapter will focus on the first inhabitants, pioneers and later farmers of Boesmanland, the environment will be a constant focus - one simply cannot write about Boesmanland without writing about the environment.

John C. Brown, government botanist at the Cape of Good Hope and Professor of Botany at the South African College, construed how the geographical conditions of South Africa came to be in his 1875 book, *Hydrology of South Africa*, as follows:

> "After having been long a portion of the basin of the sea, and after, it may be, repeated upheavals and submersions of the land, in whole or in part, it has been upheaved from the depth of the sea, drained, dried by evaporation, and covered with vegetation, much of which has been destroyed by man, and the removal of this has permitted a freer evaporation, the effect of which has been a drying up of lakes, and a diminished flow of streamlets and streams within the memory of the present inhabitants, with the somewhat frequent occurrence of destructive torrents carrying off to the sea water hurriedly precipitated from the atmosphere in thunder showers, leaving an arid atmosphere and a desiccated land. The aridity which has been thus produced is unfavourable to the culture of cereal and other plants, which those who now inhabit the land desire to raise, and it is sought by artificial means to secure the moisture desired."[101]

[101] J.C. Brown, *Hydrology of South Africa*, John Crawford Publishing, Kirkcaldy, 1875.p. 4.

2.2 Early indigenous groups and European missionaries

Before drill machine technology unlocked underground water sources, it was commonplace for groups of people to migrate, along with large herds of livestock, in pursuit of water and grazing in the Northwest of South Africa. One such group was the Oorlams, a subtribe of the Nama, who are originally descendants of the Koina, Europeans, and slaves from Madagascar, India, and Indonesia. They resided on the banks of the Gariep River. They apparently had a strong desire for Christian education. This desire was met by a European Christian mission organisation known as the Rhenish Missionary Society.

The Rhenish Missionary Society (Rhenish – of the river Rhine) was one of the largest missionary societies in Germany. Formed from smaller missions founded as far back as 1799, the Society was amalgamated on 23 September 1828, and its first missionaries were ordained and sent off to South Africa by the end of the year. The London Missionary Society was already active in South Africa, and a closer working relationship was formed with them. The society established its first mission station in the Cederberg in 1829, named Wupperthal. Very soon, the missionaries started migrating north through the arid and sparsely populated south-western region of South Africa. Here they encountered various local groups such as the Herero, Nama and Damara, amongst whom they often fulfilled a mediatory role. The missionaries endeavoured to broker peace treaties between these groups, and for this reason were later seen as political assets by the local groups.[102]

The Oorlams residing on the banks of the Gariep (Orange) River with Rhenish missionaries in their company, were forced back to the Sak River in March 1802, where they had previously settled before their migration to the Gariep River. This move back to the Sak River was due to veld degradation caused by their herds. At first they attempted to escape the dwindling pastures through local relocations, but at last had no option but to return to their former location.[103] It is highly unlikely that the Khoisan who settled at the site since the Oorlams' departure welcomed their return to the Sak River. They gave Kicherer and Scoltz, Rhenish missionaries invited by the Oorlams to travel with them and minister to their people, false information regarding rain which they claimed had fallen, which caused the group to wander around for days without

[102] E. Strassberger, *The Rhenish Mission Society in South Africa, 1830 – 1950*, Cape Town, Struik, 1969, pp. 7-13.
[103] N. Penn, *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005, pp. 255-287.

water. The first fountain they reached was also poisoned and eighty oxen were stolen. When the group returned to the Sak River, they found that without the gifts of tobacco and meat the Khoisan had returned to their former ways, which involved a break-in at the school building and a neighbouring farm.[104] These Khoisan were by no means peaceful anymore, and a commando to the Gariep area was necessary in 1800 after the theft of cattle from an European, Gerrit Floris Visser. Apparently, he was a deeply religious man and tried to keep up his peace initiative and supplied livestock and game meat to the Khoisan until 1804. He had an unparalleled influence over the Khoisan who called him "father". The relationship between the various groups settled near the Sak River was becoming increasingly hostile. The missionaries therefore left the Sak River area for a time to work amongst the more approachable Koina and 'Basters'.[105] However, the Rhenish Missionary Society did establish a permanent mission station in Schietfontein in 1847, from which the town of Carnarvon would be founded (see chapter four for more details).

The competition between various groups, each with their own motivations, habits and culture, all vying for the same natural resources, often lead to conflict. These pastoral economies had a number of restrictions imposed upon them by the close man – animal relationships that existed. These restrictions can be broken down into two separate but interacting types: (1) social constraints, in which the individual pastoral society conforms to particular social beliefs revolving around their animals, such as only eating them at special occasions or when they die, and relying on them for milk products, and (2) environmental constraints, where the need for pasture and water for the animals requires mobility, selectivity and opportunistic awareness on the part of the herdsman.[106]

[104] Penn, *The Forgotten Frontier*, pp. 255-287.
[105] A. B. Smith, "Environmental Limitations on Prehistoric Pastoralism in Africa", *The African Archaeological Review*, 2, 1984, pp. 99-111.
[106] *Ibid.*

2.3 Pioneer trekking and Boesmanland water sources

In his travel journal, *Pioniers van die Dorsland* published in 1941, Professor P.J. van der Merwe wrote about the life and hardships of Boesmanland and provided valuable information about the geographical location of early water sources in the territory.[107] To date, Van der Merwe can be regarded as the most authoritative historian who did actual pioneering field research in Boesmanland in the 1830s and 1940s. Therefore, the first section of this chapter is based on his research findings. His descriptions of the parched land travellers had to navigate is a very realistic depiction of the harsh geographical and climatological environment in which pioneer Boesmanland farmers would try to make a living. He claims that Boesmanland "of the olden days", i.e. before widespread introduction of boreholes, such as the southern Kalahari, was a desert.[108]

Boesmanland was virtually uninhabitable on a permanent base, not because of a lack of vegetation, but due to a lack of water. The part of Boesmanland which borders on Namaqualand was entirely without water until modern water exploitation techniques were introduced. The last available water sources were on the edge of the winter rainfall region: Eenriet, Kweekfontein, Ratelkraal, Dabeep, Goeinoep and Alwynsfontein. Approximately one hundred kilometres west of Gamoep a number of shallow waters were concentrated close to one another: Bosluis, Bassonputs, the Bitterputse, Kleinputs and Galputs. All of these shallow wells were on the perimeter of large salt pans between trampled sand dunes. As many of the names suggest these shallow waters were, however, brinish.[109] During the same period there were a number of strong, permanent waters on the northern border of Boesmanland. These were located in the mountainous area next to the Orange River or on the left of the road leading from Springbok to Pofadder. Most were no more than fifty kilometres from Pella, a missionary station on the banks of the Orange River. There were also good springs at Agab, Caboop, Dabinoris, Namies, Pella and Pofadder and shallow but permanent wells at Aggenys, Gaams, Naroep, Hoogoor, Groot- en Kleinrosynbos, Wortel and a few others. Furthermore, there were temporary water sources in the mountains after it had rained.[110]

---

[107] Van der Merwe, *Pioniers van die Dorsland*, pp. 28-29.
[108] Although this section is largely derived from Van der Merwe's work, no other study could be traced that provides the same detailed information on the cultural and agricultural history of Boesmanland during the same period.
[109] N. Penn, *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005, pp. 255-287.
[110] Van der Merwe, *Pioniers van die Dorsland*, p. 27. See also Figure 8, p.30.

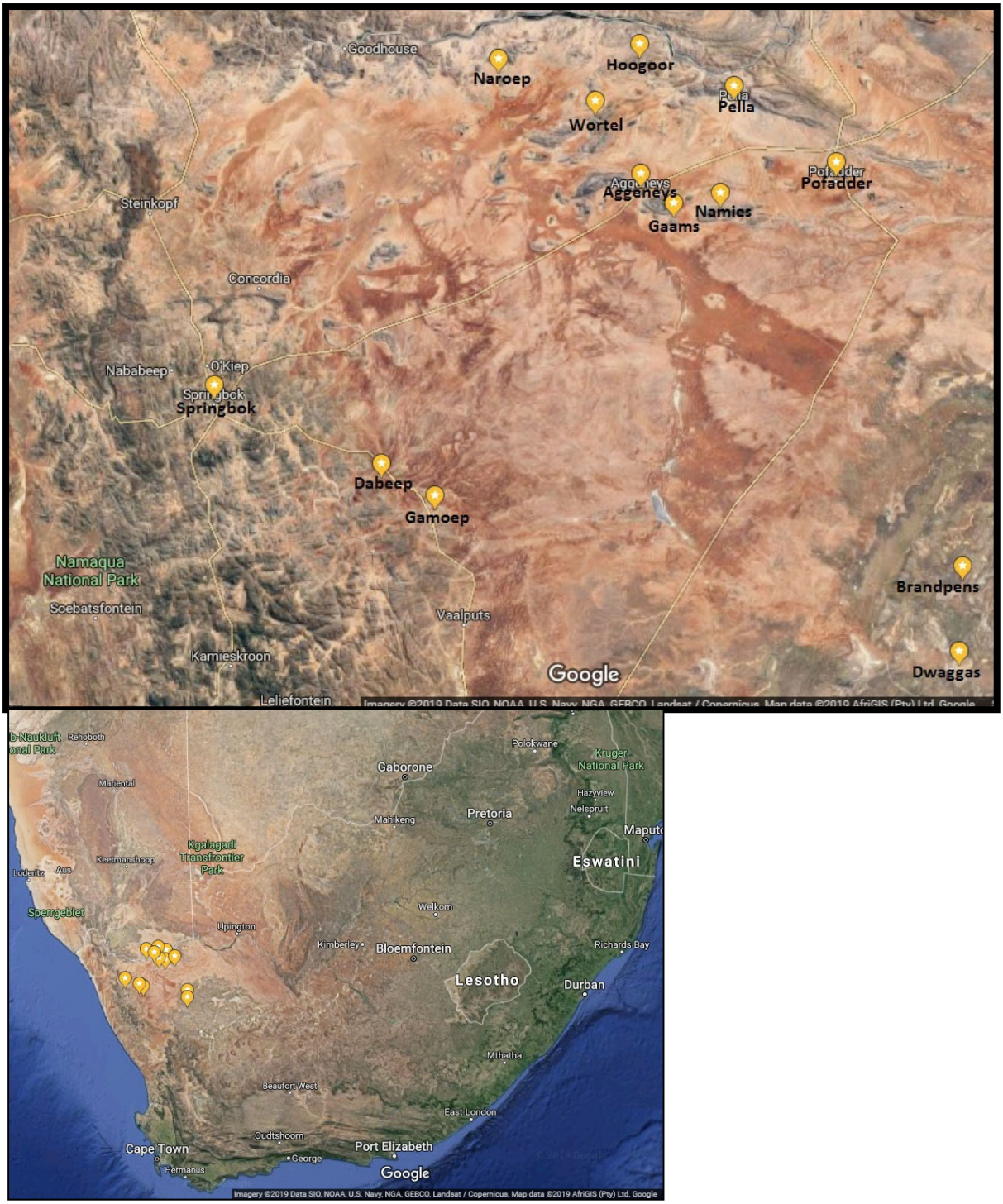

Figure 8: Surface water sources as mentioned by Van der Merwe. Source: Created by author using Google Maps (https://www.google.com/maps/@-28.9577127,25.9479123,1329325m/data=!3m1!1e3).

There is also a relatively water-rich belt on the southern border of Boesmanland. Next to the Krom River, which forms the southern border of Boesmanland, there are springs that bubble out into the dry riverbed and sometimes flow for a few kilometres. Except for Lopersplaas, there are no more springs to be found north of the Krom River. However, underground water is available near the surface. As far as Sewefontein, located on the 30° southern latitude line,

Van der Merwe stated that nineteenth century farmers dug shallow wells between 1 – 4.5m deep. Of these water sources Brandpens, Boegoefontein, Dikpens, Dwaggas, Kamaas, Sewefontein and Swabies were the most renowned. The proper *Dorsland* (Thirstland, referring to the harsh, dry conditions of the area) begins after this, as the land elevates and no more springs are found. In the *Dorsland* ground water is hidden deep inside the dry earth's crust. The drainage of the plateau is fortunately very poor due to its extreme levelness. There are no riverbeds to channel rainwater to the Orange River, therefore, all rainwater gathers in natural depressions. In Boesmanland these marshes are called *vleie* when water remains fresh, and *panne* if the water becomes saline. Fortunately, there are more *vleie* than *panne*. These freshwater *vleie* can hold water from a week up to more than a year if they were filled with rainwater. A *vlei* can also be topped up with more water before it becomes completely empty, thereby extending its tenure as a life source for some time. The rainfall in Boesmanland is very low, however, with an average of 50 to 250 mm per year (see chapter one pp. 11 – 12 for more details). Consequently, most *vleie* are only filled for a few weeks or a few months per year at most. Some *vleie* are left completely dry for years.[111]

In the period before the advent of boreholes, it was incredibly risky travelling through Boesmanland, especially with livestock. From Namaqualand (e.g. Springbok) to Namies, the first oases in the desert, there were a number of roads, but all of them lead through uninhabited land. No matter which route travellers chose to take, there was always a twelve-hour trek ahead without any water in sight. Usually travellers could obtain water at Gamoep, Goeinoep, Kweekfontein or Ratelkraal, after which a 115km trek lay ahead before the next water source.[112] The *bitterputse* (bitter wells) are closer to the border of Namaqualand, but the Namaqualand trekboers never passed through that area because it was too far away from their migration route and the available water was of a poor quality, i.e. too brackish to be consumed by humans or livestock.[113]

In some places, scattered far and wide, travellers could find *graafwater* (spade water, referring to shallow groundwater obtained by digging in sand beds). These were large stone basins, that were covered with sand conveyed by wind. The basins were shaped like uneven saucers of 19 to 22 metres in diameter. Some were smaller. When it rained the earth did not absorb the water

[111] Van der Merwe, *Pioniers van die Dorsland*, pp. 29-30.
[112] *Ibid.,* pp. 30-31.
[113] N. Penn, *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005, pp. 255-287.

and the sand prevented it from evaporating. According to Van der Merwe, travellers only had to dig one-and-a-half to three metres in the sand before water began to seep through. The water was gathered at the bottom of the hole, before it was scooped out into buckets or natural, empty stone basins. To gather enough drinking water for a human in this way did not take long, but to draw enough water for a team of horses took a few hours. People also had to remain vigilant as they had to prevent animals from jumping into the hole to quench their burning thirst, and thus crushing the digger inside the shallow well. Brabies was one such place on the road between Namaqualand and Namies where travellers could get *graafwater*.[114] However, it was never a given that these shallow groundwater basin sources would deliver water. The amount of water trapped by such an underground basin was finite. Usually travellers would not know whether a specific basin had received water recently or whether other travellers utilised the source ahead of them. It often happened that a hunter or trekker rushed to such specific basin with the expectation that water would be found there, only to be disappointed. He would then have no choice but to trek on with tired animals in the hope that he would reach the next water source and be able to quench their searing thirst there.[115]

Van der Merwe referred to many Boesmanland veterans who could still remember a time when they had to trek by ox wagon without water for twelve hours. At the last available water source trekkers rested their livestock well. At three o'clock in the afternoon they watered the oxen thoroughly and then harnessed them. That night the trek would take place continually without sleep. At midnight they might have unharnessed the livestock for an hour or so to rest. They would then trek on until the sun became too hot the next day. The animals would be unyoked in order to graze. By three o'clock in the afternoon trekking would be recommenced like the previous day, and if everything went according to plan, they would reach the next water hole by ten o'clock on the morning of the third day.

However, everything did not always go according to plan. The load might have been too heavy, the oxen too weak, or they could run into some other problem. The oxen in such a scenario would be sent ahead to the next watering hole at ten o'clock on the third morning without their load and the trekkers would try to ride through the night. It was not an easy journey. At night travellers had to trek on without rest. In summer, the unbearable heat set in early in the morning, which also made sleep impossible. The suffering of the trek-animals was terrible to observe.

[114] Van der Merwe, *Pioniers van die Dorsland*, p. 32.
[115] N. Penn, *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005, pp. 255-287.

They became emaciated, with red eyes and cracking tongues, black with thirst. Occasionally some animals perished along the way, making the load even heavier for the remaining ones, and in its way made the travellers' chances of reaching the next water hole even slimmer. If something went wrong a trekker could expect a cruel death in the forlorn wilderness.[116] Therefore, trekking with small, skinny livestock was a serious problem. They had to be pushed forward day and night. When the advanced section of the stock reached a water source, the wagon had to turn around immediately with water in order to save as much possible livestock that lagged behind.[117]

It is rather unsurprising to note then that, should one wish to complete such a journey, everything had to go according to plan. No trekker could afford to get lost. Unfortunately, this happened all too often. Wagon tracks were plentiful, but no roads mapped the monotonous landscape. Owing to the extreme levelness of the ground every traveller simply followed his own route. Therefore, it often happened that the wrong track was followed by an unfortunate traveller. The safest option for the traveller was to follow one's own route and rely on one's own sense of direction. But this personal sense of direction would have had to be excellent, since there were no mountains or other landmarks that could serve as guide. Besides, most travelling was done during the night, making tracks and landmarks difficult to recognise.[118]

It is still easy to get lost in Boesmanland, even with tarmac roads and road signs. The roads and landscape are just so unvaried in areas due to a lack of landmarks, that even a local can be led astray. By the 1940s there were still no major roads running through the heart of Boesmanland, as Van der Merwe found on his travels through the region. Should a traveller wish to travel from Springbok to Brandvlei or Pofadder to Loeriesfontein, he or she could find that there was nothing but small farm roads to lead the way. These small, winding paths were all the same size. It was often unclear which was the "main road" and which a "side road".[119] Van der Merwe learnt of many experiences where travellers were convinced they had been going in a different direction, only to arrive in the same spot a few hundred kilometres later.[120]

---

[116]Van der Merwe, *Pioniers van die Dorsland*, pp. 32-33.
[117] *Ibid.*
[118] N. Penn, *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005, pp. 255-287.
[119] Van der Merwe, *Pioniers van die Dorsland.,* p. 34.
[120] *Ibid*., p. 36.

2.4 Pioneers and land distribution in Boesmanland

As late as the first decade of the twentieth century, a large part of Boesmanland still consisted of undistributed crown territory. Despite its precious Bushman grass (*Hyparrhenia hirta)* and wild cabbage *(Salsola tuberculate),* Vrybult, the name by which the central highland of Boeshmanland was known at the time, was an uninhabitable desert where two unavoidable forces, thirst and loneliness, were prevalent for centuries.[121] But for a relatively short period after thunderstorms, which brought rainwater to the *vleie*, Vrybult held no water for man or beast. Only the oryx, springbuck and ostriches could survive there as a last resort. The last farms appeared between Namaqualand, Gamoep, Ratelkraal and Rietfontein. From the Hantam and the northern Bokkeveld onwards no humans were settled north of Swabies and Sewefontein.[122] The land between the last-mentioned settlements and the waters of Pella on the Orange River were fertile ground, but could not be inhabited or cultivated as there were no water sources. To dig a hundred feet well on crown land was hardly considered, as it could happen that by the next granting of farms one could easily be displaced from this government land and would have to forfeit the well which was usually incredibly expensive to dig. The thirst land could thus not be conquered until the government granted land for permanent settlement.

A surveyor was appointed by the divisional councils of the region and revised by the Surveyor-General, to valuate crown land before it was distributed. Once a farm had been allotted to someone, the owner received a licence in accordance with Act 40 of 1895 which formalised these regulations.[123] The licence deed contained the owner's details, the farm's name, as well as a lot number. A duplicate of the original deed was filed at the Civil Commissioner's Office as record and to present in court in case of legal proceedings. A triplicate deed was given to the licensee. According to Act 42 of 1908 a Land Board was appointed by the government, but they did not have the authority to appoint a surveyor. This was done in order to have a fair assessment of the land, through a surveyor familiar with the area.[124]

The process for land distribution was complex. Farms were declared open for selection in terms of Act 42 of 1908 by Government Notice No.1321 of 30 October 1908. A surveyor appointed

[121] Van der Merwe, *Pioniers van die Dorsland,* p. 36.
[122] *Ibid.*
[123]Western Cape Archives Record Service (hereafter WCARS), Land Division Region (hereafter LDR), "Allotment of Farms", 110 5624/ D1885.
[124] WCARS, LDR, "Prospecting of Farms", 110 5624/ G2435.

by a divisional council valuated the land after which individuals could apply to buy the land from the Crown. An applicant was considered by the Land Board, which in turn made its recommendation to the Secretary of Agriculture. Once the Secretary of Agriculture accepted the application, the purchase could go through and the owner received a title deed for the lot.[125]

The allotment of farms was not only approved in terms of financial suitability, but also in terms of a clean criminal record and unblemished morals. The Civil Commissioner of Namaqualand, for example, recommended that the Secretary of Agriculture withhold approval for the allotment of the farm *Grace Puts*, until a decision could be made in connection with a murder charge against the applicant, Mr P.J. Cornelissen, who was out on bail awaiting trial at the time of his application for land.[126]

In 1908 two surveyors, B.F. Kraphl and L.W. Leipoldt, began mapping Namaqualand and Boesmanland. The project took about three years to complete. At the start of the project they suffered a great deal as Boesmanland was in the grips of a drought. The landscape looked like a swept yard and emaciated game could not survive in the veld. The surveyors lived on bread, tea and extremely lean game meat. Drinking water had to be obtained 80km away. Their horses had to be fed to stay alive, as the veld was too barren. They paid £4 for rye and 10 shillings for chaff per bag. They thus worked at an abnormal cost and stood the chance to lose on the transaction.[127] Fortunately, it rained early in 1909. Within weeks there was a momentous change of the veld. The desert suddenly turned into a paradise. *Maansepan*, a large natural pan, looked like a sea. The grass turned green, and soon game fattened. The *vleie* had hardly filled up when thousands of birds arrived, wild geese, wild ducks, water cockerels, flamingos, pelicans and more. Leipoldt once shot into such a flock and reportedly took down twenty-two wild geese. According to Van der Merwe, it was not long before the trekboers arrived with their livestock as well. Livestock grazed as far as the eye could see. Impromptu tented cities sprang up on the edge of *vleie*.[128]

A few years later, between 1910 and 1913, J.G. Muller and A.S. Watermeyer mapped out Calvinia's region of Vrybult. As the work progressed the government allocated the land demarcated as farms. Between 1907 and 1920 most of the farms in Boesmanland were sold.

[125] WCARS, LDR, "Prospecting of Farms", 110 5624/ D1336.
[126] WCARS, LDR, "Prospecting of Farms", 110 5624/ D1283.
[127] Van der Merwe, *Pioniers van die Dorsland*, p. 37.
[128] *Ibid.,* p. 38.

However, there was plenty of unallocated crown land left still to be divided into individual farms.[129] Some of the above-mentioned crown land that was not divided into farms yet was registered as game reserves. These game reserves were a way for some farmers to obtain crown land in an indirect manner. [130] Earlier in 1893, when a few farms were also allotted in the Springbok district, approximately 170 000 hectares were set aside as a game reserve.[131] The game reserve was established through the efforts of W.C. Scully, who later became the magistrate of Springbok.[132] The government endeavoured to protect the game in the area and appointed Andries Esterhuise of Zilverfontein as game keeper. Later the police took the game under its protection on behalf of the government. This came at a great cost but was to no avail. The game population was wiped out, specifically during the *Huil-oorlog* (Cry War) as the 1914 Rebellion in Boesmanland was known in that region. The rebellion was a reaction to the newly established Union of South Africa's participation in the First World War as an ally of Britain against Germany. It was an armed insurgence led by Boers who supported the reestablishment of the South African Republic in the Transvaal.

Figure 9: Map showing the area of unallocated crown land. Source: Created by author using Google Maps (https://www.google.com/maps/@-30.3343898,18.9119483,339626m/data=!3m1!1e3).

[129] WCARS, LDR, "Prospecting of Farms", 110 5624/ G363/ 9. Also see Figure 9 p. 36.
[130] O.M. Blakeway, "Namaqualand Letter Book", in G.M. Theal, *The History of South Africa from 1873 to 1884: Twelve eventful years*, George Allen & Unwin Ltd., London, 1919, pp. 117-121.
[131] WCARS, LDR, "Allotment of Farms", 110 5624/ G363/ 9. According to land survey documents, this portion of land was regarded as part of the Division of Boesmanland.
[132] Van der Merwe, *Pioniers van die Dorsland*, p. 38.

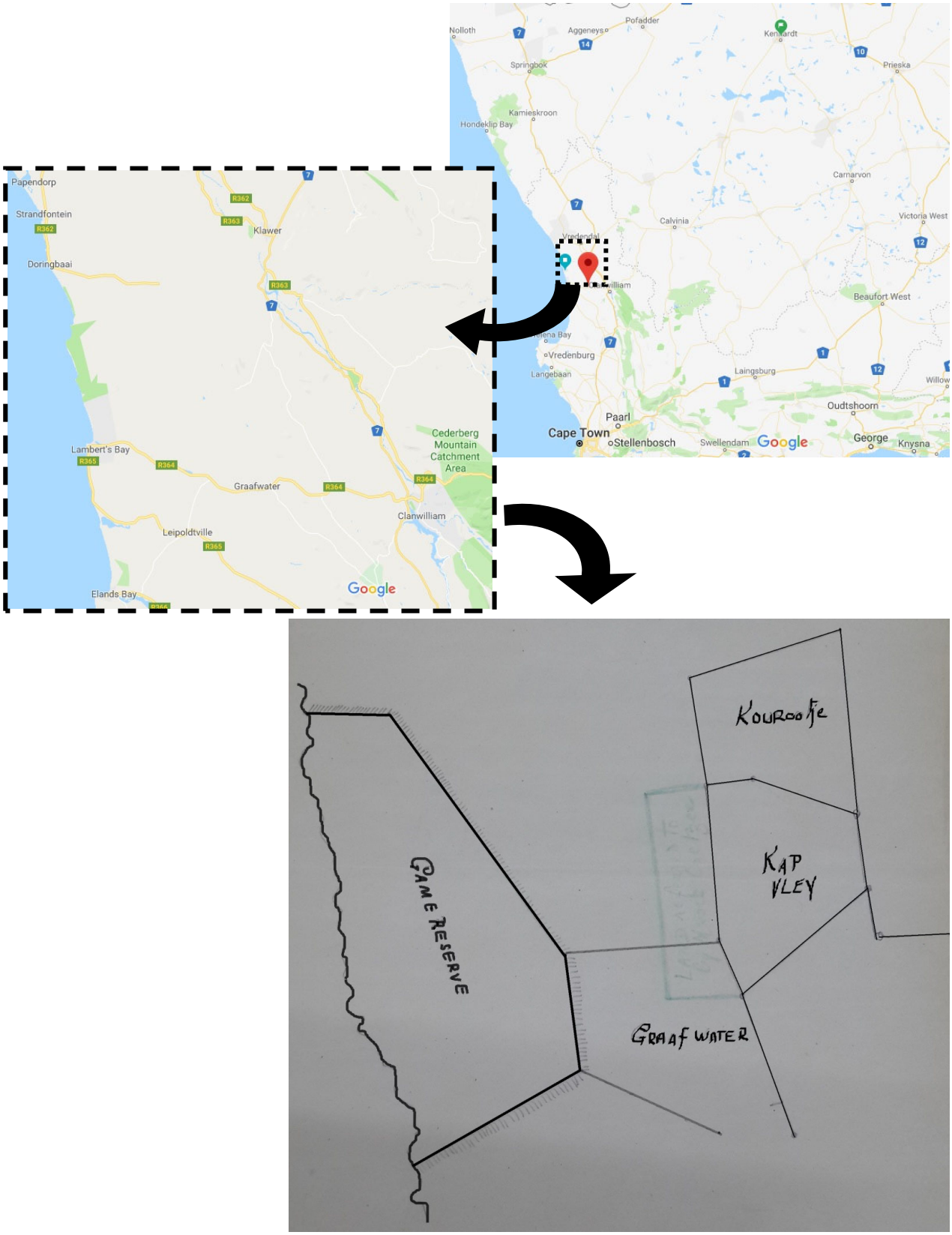

Figure 10: Map of farms in the Division of Boesmanland, 1975. WCARS, Department of Agriculture Credit and Land Tenure (Hereafter ACLT) 616/ 5389/ 8.

During the Rebellion, lawlessness was rife in the Northwest, and game was shot by the thousands. Before motor vehicles were introduced, the game could protect themselves by fleeing hunters. To chase and catch an oryx on horseback on a hot day was neither easy nor enjoyable, but with the aid of a vehicle, the fate of the game was sealed. After the First World War there were hardly any game left, and it was debated whether it was worth leaving such a valuable piece of land uncultivated for the sake of a few oryx.[133]

Under these circumstances the provincial administration distanced itself from the rights to the game reserve in 1919 and handed it over to the Department of Lands of the Union Government. The reserve could then be distributed among farmers as state owned land, but for some reason the department dragged its feet with the process. The area was only surveyed in 1929, and land distributed a few years later. An area of sixty thousand hectares of unallocated land between the districts of Springbok, Calvinia and Kenhardt still remained unoccupied (see Figure 9). By the end of the 1920s the area was divided into seven farms: Consentvlei, Koffiemeul, Knyperbult, Loerduin, Paul se Vlei, Smousvlei, and Tweeling. These farms, the last free land in Boesmanland, were only distributed on applications as late as 1938. With the distribution of these farms the occupation process of the dry Vrybult region, located west of Kenhardt, east of Namaqualand and north of Calvinia (roughly corresponding to the area shown in Figure 9), which began thirty years prior to 1938, was complete.[134] However, before the land was allotted it did not lie completely fallow either. Persons unwilling or unable to buy crown land could still apply to lease the land from the government before it was sold off.[135] Trekboers could also apply for a grazing licence which gave them sole grazing rights on a specific piece of crown land.[136] Figure 9 shows the farms adjacent to the game reserve created by Scully in 1893. [137]

[133] Van der Merwe, *Pioniers van die Dorsland,* p.39.
[134] *Ibid.,* p. 40.
[135] WCARS, LDR, "Prospecting of Farms", 110 5624/ G1213.
[136] WCARS, LDR, "Prospecting of Farms", 110 5624/ F6084.
[137] WCARS, LDR, "Prospecting of Farms", 110 5624/ G363/ 9. See also Figure 9, p. 36.

2.5 The quest for permanent water sources on Boesmanland farms

"The utilization of Boesmanland is the history of a bitter struggle for water" wrote rev. A.D. Lückhoff in 1925.[138] This is a true state of affairs for Boesmanland, since one of the first requirements for permanent settlement in the region was water. As soon as the government allotted and sold the land the pioneers began to develop it. This settlement attempt was relatively successful, with the immense challenges taken into account. It was in part due to the suitability of the vegetation in the region for sheep production, and the pioneer trekkers and farmer's ability to appropriate ground water sources for themselves and their animals. The dryness of the land and the unreliability of surface water sources were still serious challenges in this process, but they were ultimately overcome by the determination of the people involved and the development of technology to bridge the final hurdle to obtain a permanent or sustainable water source. What used to be a desolate desert in the first decade of the twentieth century rapidly became one of the most self-sufficient and burgeoning small-livestock districts south of the Orange River by the 1940s.[139] It took incredibly hard work, determination and sturdy fortitude to cultivate this parched land. What these pioneers managed was certainly a mammoth task, and as P.J. Van der Merwe wrote in 1941, should not go untold in the history of pioneers in South Africa.[140] The water of Vrybult was hidden under hundreds of feet of solid rock layers. To hew a well into this bed of rock was not easy at all. The work was further mired by the fact that there was no surface water. Therefore drinking water for workers had to be brought in from neighbouring farms, sometimes over long distances.[141] A farmer, Albert Nel, told Van der Merwe that when he was able to dig a well on Koeries in 1884, he had to ride five hours on horse to fetch water.[142]

Figure 11 is a table and corresponding surveyor's map of part of Boesmanland. The table indicates, amongst other information, the cost of the original survey of the farms, which was payable by the first buyer of a farm. Indicated along with the cost of survey and title deed, are the original purchase prices of the farms. The average purchase price, including the cost of survey and title deed per farm of the sample shown below, was £550. That was equal to £63

[138] WCARS, LDR, "Prospecting of Farms", 110 5624/ G363/ 9.
[139] P.J. van der Merwe, "*Pioniers van die Dorsland*", p. 40.
[140] *Ibid.*
[141] *Ibid.,* p. 41.
[142] *Ibid.,* p. 41.

036 or R2 026 694.10 in 2017 Rand value, according to the historic composite price index published by the United Kingdom Office for National Statistics.[143]

When considering that there was no infrastructure such as boreholes, fences, houses or roads at that time, the comparative purchase prices generally corresponds to prices of farms in the region today (2018). With an average farm size in the region being between approximately 5000 and 6000 hectares, and the average price per hectare being between R800 and R1000, the average farm purchase price is approximately R4 000 000 for a developed farm (2018 marked-based prices). This seems to explain the difference in price for an undeveloped piece of land in the region in historical times versus a developed farm today. The map in Figure 12, p. 42, depicts the same area, but several years later. Some of the original farms remained the same, but most of the boundaries have changed since the original survey. This shows the dynamics of the farmland through buying, selling and redefining of the boundaries of farms over time.

[143] "£1 in 1900 → 2017 | UK Inflation Calculator." U.S. Official Inflation Data, *Alioth Finance*, Online, https://www.officialdata.org/1900-GBP-in-2017?amount=1 [Accessed 17 May 2018]. It is very difficult to accurately calculate the values of these purchase prices in Rand correctly due to factors such as hyperinflation and slumps in the market values of land in correspondence to the national inflation rate, the conversion from the British pound to the Rand (according to 1961 values, see Figure 11, p. 41) and other factors. Despite the obvious shortcomings of such calculations, it provides a rather accurate estimation.

Statement showing the amount payable as Cost of Survey and Title Deed which have been included in the Purchase Amount of each Lot. Division: Namaqualand.[144]

Lot No.	Licence No.	Name of Licensee.	Name of Farm.	Purchase amount including cost of Survey and Title Deed.			Purchase amount excluding cost of Survey and Title Deed.			Cost of Survey included in Purchase Amount.			Cost of Title Deed included in Purchase	
				£.	s	d	£.	s.	d.	£.	s.	d.	s.	d.
373	14	B.F. Liebenber	Hartebeest Rivier	822	-	-	760	10	10	60	16	11	12	3
380	15	J. Hayes	Dabenoris	751	-	-	700	11	11	49	15	10	12	3
381	16	J.A. van den	Gans	728	-	-	680	11	3	46	16	6	12	3
382	17	J.A. van den	Karas	770	-	-	720	7	2	49	0	7	12	3
383	18	J.N.A. Visser	Koup Leegte	462	-	-	410	1	1	51	6	8	12	3
384	19	J.H.J. Kennedy	S Hectares Schaduwe	605	-	-	560	8	-	43	19	9	12	3
385	20	G.J. Visser	Vogelstruis Hoek	479	-	-	425	15	4	52	12	5	12	3
386	21	E.Herridge	Klein Pella	652	-	-	606	18	1	44	9	8	12	3
387	22	F.J. Brand	Swart Lintjes Rivier	393	-	-	335	18	10	56	8	11	12	3
388	23	R.A.S.J. Coetzee	Kap Vley	437	-	-	400	7	9	36	-	-	12	3
390	24	C.P. Cornelisse	Witberge Kloof	559	-	-	500	12	6	57	15	3	12	3
391	25	J.J. Dixon	Witwater	386	-	-	350	16	9	34	11	-	12	3
393	26	J.A. van den	Plaatjesfontein	449	-	-	400	5	11	46	1	10	12	3
394	27	H.J.J. Mostert	Schaap Rivier	220	-	-	250	2	6	36	19	3	12	3

Figure 11: Purchase prices of farms. Source: WCARS, LDR, "Prospecting of Farms", 110 5624/ D1886.

[144] WCARS, LDR, "Prospecting of Farms", 110 5624/ D1886.

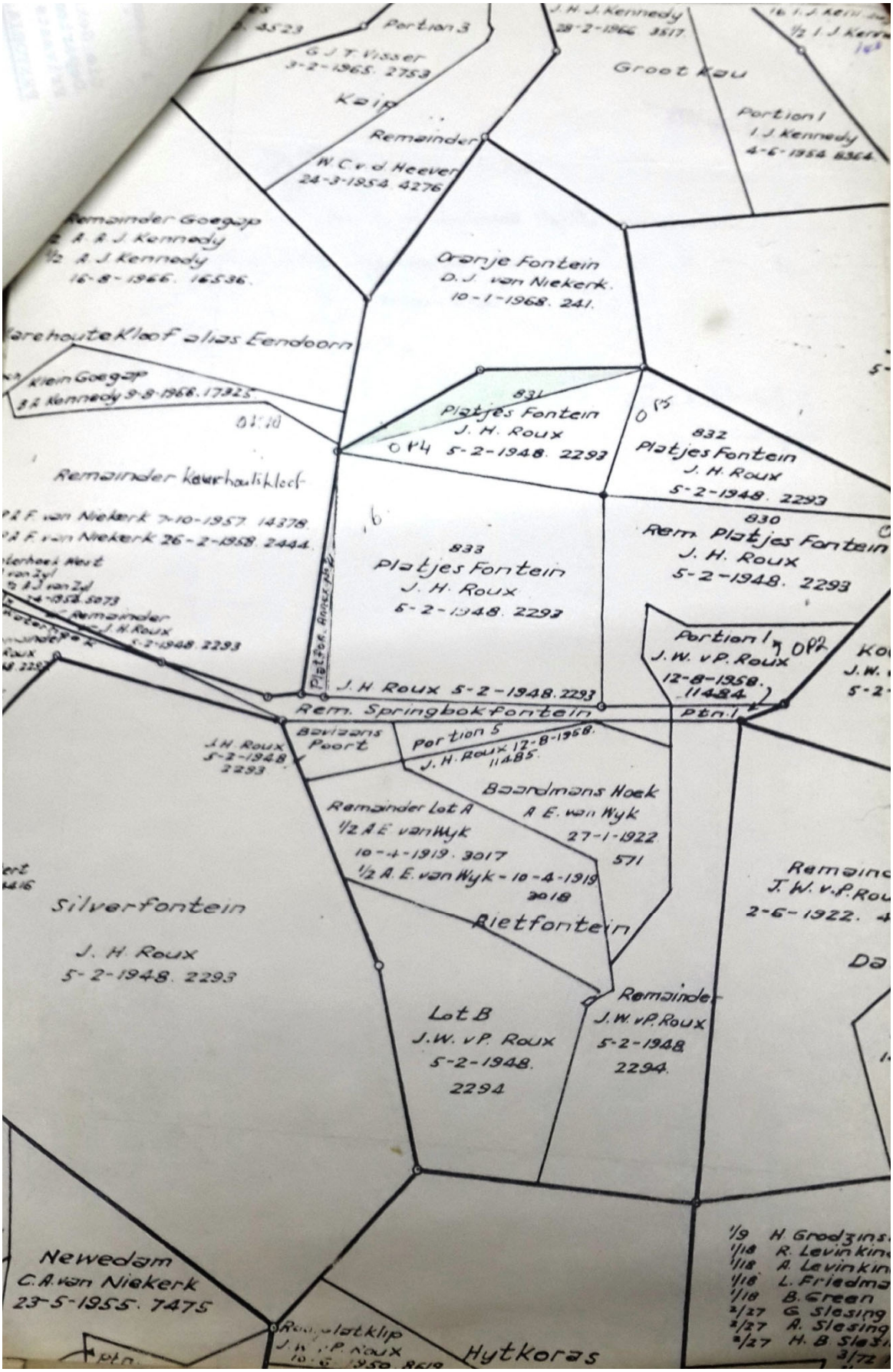

Figure 12: Map of Boesmanland farms in the Springbok district, 1975: WCARS, ACLT, 616/ 5389/ 8. Note the ubiquitous term "fontein" being used as farm names which illustrates the central significance of water in Boesmanland.

2.6 Pioneer water prospecting and land fencing in Boesmanland

The Government did not always pave the way for a pioneer farmer to a well-watered farm either. Before a farmer could prospect for water on crown land, a licence had to be secured from the Secretary of Lands. In 1908 the Surveyor-General made it clear that the government had no intention to carry out any well-sinking or drilling with jackhammers (see chapter three) on crown land, nor set out any tenders for independent contractors to do so on its behalf, even at a lower than normal rate as P.G. Low of Haartbies Rivier, Van Rynsdorp, offered. This reluctance by the state was a massive problem for the development of the Northwest, as Garwood Alston, a water prospector, informed the Surveyor-General in 1909. However, A.H. Cornish-Bowden, the Surveyor-General at the time, responded very positively to Alston's remark. Alston informed Cornish-Bowden that his attempts at water prospecting in Boesmanland had proven fruitful. He claimed that a large part of Boesmanland lay fallow due to a lack of water sources, and that restriction on water prospecting implied that the region could not fully develop. As Cornish-Bowden pointed out, the key element to finding water sources seemed to simply be a matter of hard work. It took time and energy, but with enough input, a prospector would eventually succeed.

After that, the Surveyor General opened undeveloped land to water prospectors in the hope that their efforts would yield better results. He remarked that under Act 40 of 1895 successful licensees often did not make real attempts to find water and merely occupied farms for the few months in a year whilst the pans were full and the springs flowing.[145] The urgency of the matter was repeated in another letter sent in October 1909 by the Acting Civil Commissioner of Namaqualand to the Surveyor-General.[146] The Commissioner enquired whether a stretch of vacant crown land could be made available for water prospecting. Such land was situated in the east of Boesmanland adjoining the Kenhardt border in the Namaqualand Division. Including a rough sketch of the area in his response, the Surveyor-General recommended water prospecting as it would make the land, which was laying waste at the time, usable.[147]

[145] WCARS, LDR, "Prospecting of Farms", 110 5624/G1260.
[146] For administrative purposes the Surveyor General of Boesmanland fell under Namaqualand.
[147] WCARS, LDR, "Prospecting of Farms", 110 5624/ G416/ 09.

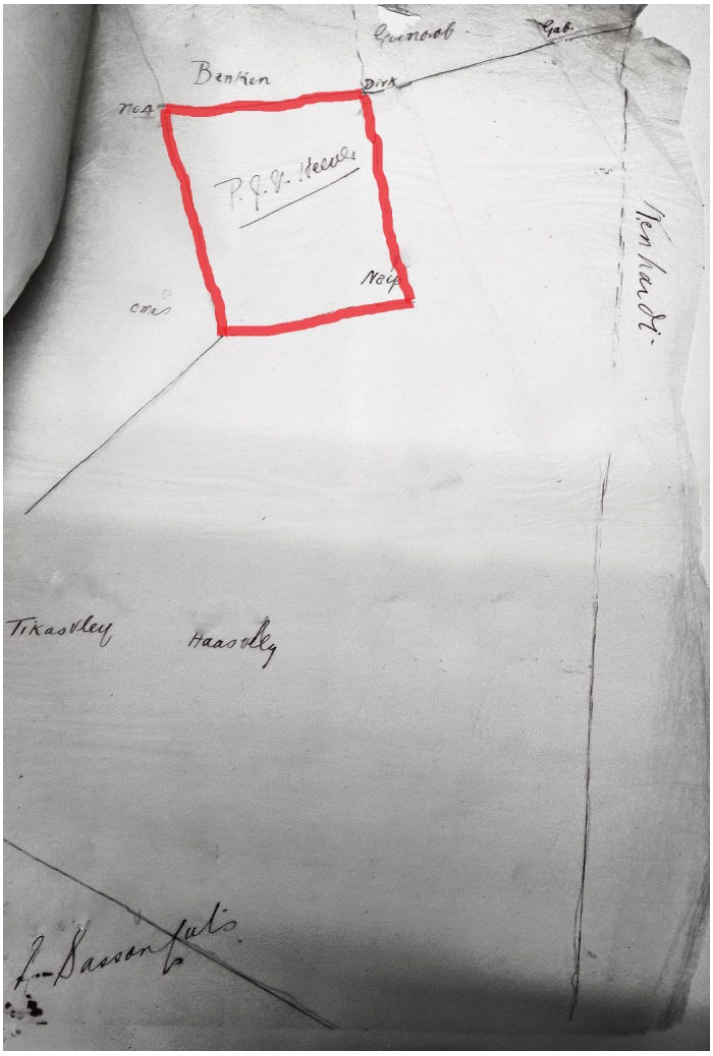

Figure 13: A rough sketch of previously unused crown land suggested for water prospecting in Boesmanland, 1909. Source: WCARS, ACLT, 616/ 5389/ 8.

One Mr P.J. van den Heever had already requested to lease the land by the time the Acting Civil Commissioner's letter to the Surveyor General was sent.[148] The letter reiterates the desire that water prospecting should be encouraged rather than hindered.

Unfortunately, it seems as if Cornish-Bowden's letter was the final attention given to the matter. In 1913 J.P. de Vries applied for a licence to prospect for water on the farm Hanthamberg Zuid in Boesmanland but was informed that no more licences for water prospecting were being issued.[149]

[148] WCARS, LDR, "Prospecting of Farms", 110 5624/ G416/ 09.
[149] WCARS, LDR, "Prospecting of Farms", 110 5624/ F5816.

A clearer picture of the quest for water to develop Boesmanland emerges when some of the individuals who took part in this operation are being investigated. One such man was G. J. Visser of Kykgat, a son of one of the first pioneers of Boesmanland. Visser was born in 1876. Until 1907 he trekked with his father's livestock, after which he got married and set out on his own. Initially he moved hither and thither on rental farms until he bought the farm Volstruishoek in 1910. The farm had no surface water, but Visser immediately began to dig wells. On the fourth well he struck water at 38 meters. By 1912 he put up a wind pump on the well which was the first wind pump in Vrybult area.

However, the farm was not to Visser's liking. He sold it in 1917 and bought the farm Kykgat. This was also a dry farm, but the veld was of much better quality than that of Volstruishoek and apparently Visser was not discouraged to dig wells. Eighteen months after the farm was purchased water was found in a well 36 meters deep and 19 meters wide. Unfortunately, the well only provided enough water for household purposes and not enough for livestock as well, therefore the search for water sources continued. Twenty-one years (1917 – 1938) went by before Visser found a good water source. During this period, he had seven wells dug and three boreholes drilled, almost all of them over thirty meters deep. The well that gave water in 1938 was 44 meters deep and 14 meters wide, and cost more than £300 to dig. Visser spent an astounding £1850 in the pursuit of water throughout his life, which illustrates the perseverance of these early Boesmanland farmers in their quest to find sustainable water sources.[150]

Visser had two earthen dams built which held water for a few months after it had rained. When the dams dried up, he had to lease water from two neighbouring farms at 5 shillings per hundred small livestock per month and 1 shilling per head per month for large livestock. This arrangement required a lot of labour and was expensive to sustain. "The struggle wore me down and I simply worked for other people's rental money", Visser complained about the dry decades, "but now that I have the water everything is worth it. I shall easily regain my expenses (own translation)."[151] He was 62 years of age when he finally found sustainable water sources, and still his farm was not completely cultivated.

While digging wells and drilling boreholes, Visser also fenced the perimeters of the farmland and subdivided the land into two smaller camps. By 1939 he was still living in a small zinc

[150] WCARS, LDR, "Prospecting of Farms", 110 5624/ F5816.
[151] Van der Merwe, *Pioniers van die Dorsland*, p. 45.

house of 3.7 by 4.5 meters with brick-lined walls. Adjacent to the house was a kitchen of 3.7 by 3.7 meters and a reed canopy for a vehicle. He could never build a more permanent house structure since he did not know where he would find water. "Now I first want to build a house for my wife, and then I want to make more inner camps [sic.]," he said after he found a significant water source on his farm. "I also want to make more water [sources], because the farm stretches too [far] and I cannot cultivate it properly. My water is situated in a corner of the farm. From there to the furthest signpost is ten miles (21 km). Then there is a stretch of sand dunes in between, which is difficult for the livestock to cross. The consequence is that the [furthest point] of the farm, easily three thousand hectares, is nearly inaccessible to me [sic.]" Visser explained.[152]

Visser paid £1280 for 12000 hectares. Although it was substantially more than what the first owner paid in 1910, it was still a cheap price for the land. The wells, dams, wind pumps and camps cost £2680, which, in reality meant that the farm cost £3960 in total. By the time he had cultivated Kykgat to its full potential, the improvements would have cost him three to four times the original price of the land. All would depend on how quickly he could find more water sources.[153]

Between 1910 and 1940, an incredible amount of infrastructure development took place in Boesmanland. Where once only ostriches and oryx roamed, houses, paddocks, wind pumps, lime-lined earthen dams and wire fences were being erected.[154] But a lot of work still had to be done as the quest for water was not complete. By the 1940s, Boesmanland as a whole had far too few water sources in relation to the available grazing land. The veld was thus not used in the most economical way and there were still farms of 20 000 and 30 000 hectares which had no water sources. Farmers who had more than one drinking hole for livestock on every 10 000 hectares would be regarded as exceptionally fortunate. There were many farmers who had only one water source for every 20 000 to 30 000 hectares. Van der Merwe refers to one farmer who had 70 000 hectares of land with only two water sources on it.[155] As in the case of Visser, many farmers had the added hindrance that the water source they did have, was sometimes located in a corner of their farms, placing the furthest limit of the farm 24 to 34

[152] Van der Merwe, *Pioniers van die Dorsland*, p. 45.
[153] *Ibid.*, p. 46.
[154] S. Archer, "Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice", *Journal of Southern African Studies*, 26 (4), 2000, pp. 675-696.
[155]Van der Merwe, *Pioniers van die Dorsland*, p. 44.

kilometres from the water. There were farmers in Boesmanland who could therefore only use one half of or two-thirds of their land properly. The remainder of the farms could only be used after a rainy season had formed open water sources on the surface, or when there was plenty of vegetation for livestock to graze on. When this happened, the farmers immediately sent their livestock to these outer pastures, to save the pastures around their homesteads. But still the outer pastures were not utilised to its full capacity.[156] Due to the lack of waterholes, livestock was forced to trek for too long distances. This situation not only caused overgrazing of the veld, but also exhausted the animals. During droughts, many animals died from lack of water even though there was still grazing left. The animals simply perished en route to the water sources.[157]

During the first half of the twentieth century, there was a great demand for government to deploy drilling machines in the Northwest. Some farmers applied for a drilling machines but had to wait for five years. Others never received the government's response concerning drilling machines at all. Sheep subsidised by the Land Bank could die due to drought or become emaciated, yet a wind pump erected in the wilderness could withstand the elements with reasonable maintenance and would increase the carrying capacity of a farming property significantly. The government's reluctance to subsidise the drilling of boreholes in the Northwest was thus a hindrance to the development of the area.[158]

Between 1929 and 1930, whole districts of the Northwest were still unfenced. Since the late 1930s farmers began fencing their properties. By 1945, Boesmanland was being fenced intermittently, and some farmers made inner camps on their farms. However, more camps were still needed. It was not a question whether the value of the land justified the cost of making the camps, but most farmers in the Northwest commonly agreed that the fencing of their properties was worth the expense. Camps not only decreased the running cost of a farm, but also protected it from overgrazing and thus enabled the farmer to save parts of his veld. A prominent Boesmanland farmer told P.J. van der Merwe in 1945: "I had inner and outer camps made for £1250. Today, I will not have it removed for under £2500. A farmer is not the boss on his farm until he has fenced it" (own translation).[159]

---

[156] S. Archer, "Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice", *Journal of Southern African Studies*, 26 (4), 2000, pp. 675-696.
[157] Van der Merwe, *Pioniers van die Dorsland*, p. 45.
[158] *Ibid.*
[159] *Ibid.,* p. 48.

2.7 Water sources and wool farming in Boesmanland

P.J. van der Merwe optimistically predicted that once Boesmanland could be entirely cultivated, and all farms fenced, enough inner camps made, and water sources for all the outer camps supplied, the former Boesmanland wilderness would be permanently habitable. He also claimed that farmers would become wealthy and have no difficulty dealing with droughts. Despite the sparse rainfall the region receives, Van der Merwe assumed the veld was sustainable enough for farmers to save for a *non*-rainy day. He believed that with human endurance and capital this wilderness could be tamed.[160] He would be proven correct, if only partially. By the 1960s this dry semi-desert region would become one of the biggest wool producers in the world, and, with the help of government subsidies, Boesmanland farmers did become wealthy.

As shown in the graph on p. 46 below, the production of wool in Southern Africa increased steadily between 1910 and the 1960s, with a spike in the mid-1930s. However, the price of wool is not constant. For instance, the lowest production season in the data set was 1916/17. The price of that particular consignment amounted to R281.50 per ton. The biggest production year in the data set was 1932/33, yet the price was much lower than in 1916/1917 at R91.76 per ton. The next peak in production was in 1959/60. This production peak was met by an equally high price of R734.14 per ton. Wool farming was thus highly profitable. In 1961, South Africa was the sixth largest wool producer in the world.[161] When compared to the average precipitation for South Africa of the same year, no correlation exists between rainfall and wool production levels. For instance, the maximum precipitation for the period took place in 1917, yet the 1916/17 season saw the lowest wool production for the entire period under consideration. In 1932/33, when South Africa had its highest wool production year in this period, the precipitation was not remarkable either. The average precipitation for the whole period was 38.961251mm and the average wool yield was 101 929 730 kg. In 1959/60, when the next peak in wool production appeared, the precipitation was 38.20422583mm, which is almost exactly the average.[162]

It is important to point out that the data sets are the average for the entire South Africa. It has a very variable rainfall regime across the country. Some areas are clearly seasonal (both

[160] Van der Merwe, *Pioniers van die Dorsland*, p. 45.
[161] N. Vink, "The Global Sheep Industry", *Merino Focus*, 2009, p. 30.
[162] "Wool Production Since 1910", *Cape Wools SA* Online, http://www.capewools.co.za/documentlibrary/wool-production-history [Accessed 14 November 2016].

summer and winter rainfall), some are a-seasonal (can expect rain at any time of the year) and in the far northwest of the country there are very arid areas that receive only a small amount of rain each year. Not only is there a huge range in rainfall patterns across the country, but in some regions where thunderstorms can produce the majority of the precipitation, the rain events can be very isolated. The data set is useful for its scale in terms of geography, but also period. In 2012 the South African Environmental Observation Network launched a program to gather rainfall data from farmers.[163]

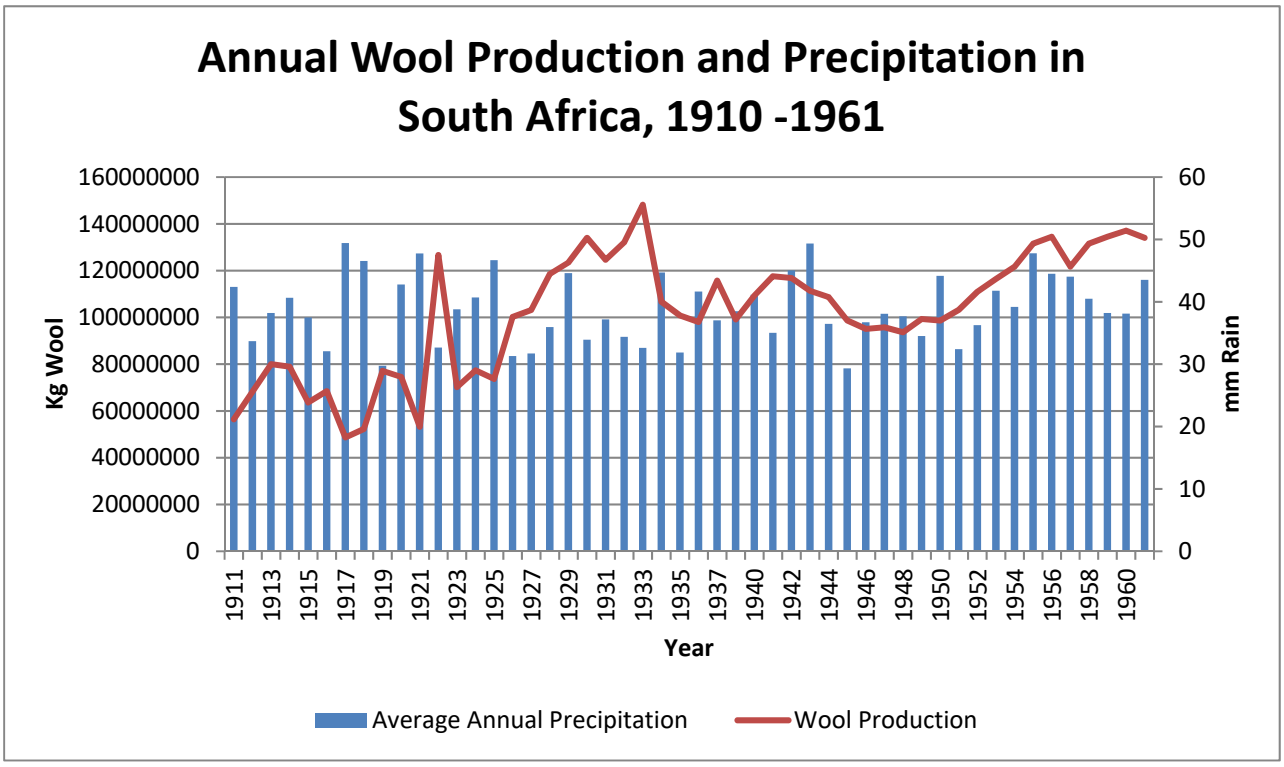

Figure 14: Author's own graph. Data from *Cape Wools SA*.

What the data therefore suggests, is that wool farming, particularly in Boesmanland, was not completely reliant on rain for its success. The introduction of boreholes would enable farmers to keep up with production, regardless of the season's rainfall. The veld vegetation, as primary source of food for sheep, was still dependent on rain. But this problem could be circumvented by providing additional feed to the animals. It would entail a higher production cost, but as the data illustrate, it did not hinder production itself.

[163] V. Goodall, "Farmer's Rainfall Data: A Valuable Resource for Studying Changing Trends in Climate", *SAEON*, Online, http://www.saeon.ac.za/enewsletter/archives/2012/december2012/doc08 [Accessed 29 August 2017].

2.8 The adaptability of Boesmanland farmers in a parched environment

It was not inevitable that farming in Boesmanland would become profitable. It has already been mentioned that apart from factors such as fencing and boreholes in the development of farms, there is something to be said about the people involved in the cultivation of farmland too. Boesmanland was far from regions where a comfortable or convenient lifestyle could be pursued. Those who did settle there had to possess at least some kind of unique or intrepid characteristic to be able to survive. Boesmanland, as far as Van der Merwe was concerned, required more labour, ambition, perseverance, and a deliberate pioneer spirit than most other frontiers. The people who applied for land in Boesmanland knew the natural conditions upfront. Many of them had trekked their livestock on tenured land for years. The people who settled in Boesmanland became well-adapted in their new wilderness home. Another factor that moulded the pioneers was their constant battle with the implacable and volatile environment. If there was no water for the livestock, the farmer had to make some sort of plan. When there was drought, the farmer had to keep his spirits up. Should his business go bankrupt, he would simply have to start all over. Nature toughened the Boesmanland pioneers to prepare for disaster.[164]

The environment also taught the farmers how to trek with their livestock. Thunder showers in Boesmanland fell in thin strips. Farmers naturally wanted green pastures for their livestock for as long as possible. Under these circumstances, many farmers trekked after the rains in the summer, despite still having grazing on their farms. No rainfall in Boesmanland during winter and it becomes very cold. Boesmanland borders on winter rainfall regions in the west and south. Therefore, many Boesmanlanders trekked annually after the green pastures and milder climate of Namaqualand, Northern Bokkeveld, and the Hantam during winter. Every few years a severe drought would force the Boesmanland farmers to distant districts in search of refuge for their animals. Many trekked their livestock as far as the former Eastern Province, Griqualand West, Botswana, and the Orange Free State.[165]

Another remarkable aspect of Boesmanland was that by the 1940s most farms were still owned by the original owners since the beginning of the twentieth century. Where many pioneers of the Orange River region fell by the wayside and others sold their land after a few years of hardship and bought cheaper land further on, it did not often happen in Boesmanland.

[164] Van der Merwe, *Pioniers van die Dorsland*, pp. 49-50.
[165] *Ibid*., pp. 49-50.

Notwithstanding the fact that only hardy pioneers went there in the first place, its inhabitants realised that they simply had to persist. There was no crown land or cheap farms elsewhere to go to.[166]

2.9 Conclusion

In Boesmanland, one could find a poor trekboer who had the trek road as his home, but the economic position of the settled farming community steadily became more prosperous. The economic status of Boesmanland inhabitants was diverse. Some Boesmanlanders thus became affluent. There were some with debt and mortgages, but they were at least self-sufficient. This must be credited to the fact that the first generations of Boesmanland farmers were reluctant to go into debt and did not overextend themselves in their farming enterprises. Most began farming on a small scale, lived a simple life and steadily expanded their farming operations. The settling on farms in Boesmanland usually took place as follows: a pioneer farmer trekked to a dry farm with a wagon and team of oxen and a few hundred animals between 1915 and 1920. His animals drank at the nearest water source or moved when the surface water sources dried up. The first dwellings would be a tent or a simple wattle and daub hut. In the meantime, a well would be dug. When dynamite stock ran out the farmer would wait until he had money again to buy more. As soon as he found water he would build a house. At first a crank would be used to draw water from the well, later replacing it with a wind pump when funds became available. A cement dam of approximately half a metre would be erected to store pumped water. Later the dam wall would be raised as soon as more cement could be afforded.[167] When more funds became available the farmer would build a fence around his farm and make inner camps. In this way the Boesmanland farmer gradually developed his farm. By the time when all the required infrastructure on the farm would also be in place, it would be all paid for and debt free. At times this *modus operandi* was regarded as a lack of foresight and entrepreneurship by more risk prone investors in urban areas, but it resulted in the survival of many farms in a particularly dry and hostile environment.[168]

---

[166] Van der Merwe, *Pioniers van die Dorsland*, p. 40.
[167] Water infrastructure such as wells, wind pumps, boreholes and dams will be discussed in more detail in chapter three.
[168] Van der Merwe, *Pioniers van die Dorsland*, pp. 52-53. For more information on extracting water from underground sources, see chapter three, pp. 58-65.

CHAPTER THREE

GROUNDWATER IN BOESMANLAND

3.1 Introduction

In the previous chapter it was shown that two factors were paramount in establishing Boesmanland as it were. For farmers to settle in Boesmanland permanently, they needed ways of reaching the subterranean water sources, and fences to surround and divide their farms. Without such infrastructure, Boesmanland could only be exploited by migrant farmers during the rainy season and in its aftermath. For the rest of the year, man and beast could not survive there permanently without leaving to obtain water elsewhere. This chapter will examine in more detail how people went about creating these artificial waterholes. Advances in technology, and what that meant for the people in Boesmanland, will be explored. First the various methods for digging wells will be explained. This will span technology first developed in the ancient world, to modern versions and additions to it. Next the twentieth century technology of the drill machine will be discussed. There were different types of machines available, and their strengths and weaknesses had a remarkable effect on the region's agricultural landscape. The people responsible for operating the machines, *boormanne* (bore men), will receive special attention. The creation and evolution of the wind pump will also be discussed. The iconic silhouette of the humble wind pump permeates the cultural imagination regarding rural South Africa, but this piece of technology also changed the nature of agriculture especially in the dry interior of the country.

3.2 John Brown and artesian water resources

In the autumn of 1844 John C. Brown was sent to the Cape of Good Hope, at the insistence of the directors of the London Missionary Society, to take charge of a congregation in Cape Town. Having accomplished this, Brown took occasion in 1847 to make a tour of the colony. While passing through the Karoo, he witnessed the privations to which the inhabitants were subjected through the aridity of the climate.

His recollections of the journey "call up vividly even now oft-recurring visions of bones of oxen at varying distances along the road, the bones of oxen which had succumbed by the way travelling in a land where no water is."[169]

As a contemporary eyewitness of the conditions in the arid interior, his account sketches an important backdrop for the technological advances that were to come. Another example of the conditions which Brown came across during his travels in the interior reads as follows:

> "At one place at which we arrived on a Saturday we learned that beyond that place there was no water to be obtained within a distance of 84 miles on the road to Beaufort, whither we were bound, and we found this to be the case. Resting the horses on the Sabbath, when we resumed our journey we started before daybreak, and managed by nightfall to reach the fountain, but water the horses touched not by the way. The day following we had at midday to send our horses six miles off the road to slake their thirst while we rested, letting them browse by the way in going and coming, the *achter reiters* (rear riders) driving them slowly, very slowly along, that they might not be unfitted for resuming the journey on their return."[170]

With this amount of effort needed to obtain water for people and horses, it is difficult to imagine what the people could produce for food in the region. Brown found this out soon enough:

> "At a farm house, at which towards evening we were, in accordance with colonial hospitality, welcomed and served with tea, I, inconsiderately perhaps, but stay-at-home travellers will say very naturally, said I would be obliged if they would give me also a little bread. 'Bread', said the farmer, 'we have not seen bread for nearly three years.' 'Why, how is that?' said I. 'Because of the drought,' was the reply, 'we cannot raise corn' (the name given in the Colony to wheat). 'Then what do you raise?' I asked, 'Nothing,' said the farmer, 'we have occasionally had showers, and after these we have sown beans and they grew; but scarcely were they above the ground when they died away.' 'Then what do you eat?' 'Mutton.' 'But what do you eat with the mutton.' 'Mutton.'

[169] J.C. Brown, *Hydrology of South Africa*, John Crawford, Kirkcaldy, 1875, pp. 35-85.
[170] *Ibid.*

> 'What do you mean?' 'I mean what I say, we eat the fat with the lean and the lean with the fat, and so do the best we can."[171]

In 1896 the Cape colonial Department of Agriculture released its first annual report by the Geological Commission. A part of the report was a report by a sub-committee on deep artesian well boring. The aim of the sub-committee was to find suitable locations for deep artesian boreholes to provide water in arid areas. The commission did not hold any definite hope of being able to indicate a spot where a deep borehole would have discovered a considerable quantity of underground water. As the report stated it was not merely a question of "boring deep enough," for the presence of water at great depths depends on certain geological and meteorological conditions. A large part of the dry region of the colony was cut up by numerous igneous dykes which, while damming up the water locally and offering water at comparatively slight depths, prevented any underground circulation on a large scale such as was necessary for a successful attempt at deep boring. The commission had no information as to the existence of large synclinal folds consisting partly of pervious and partly of impervious strata such as are found where deep boring has proved successful.[172]

The physical features, meteorology, and hydrography of a country also bear intimately on the question of finding water: the distance of the high lands from the waterless areas; the relation of rainfall to the quantity of water which flows off; and the conditions affecting percolation, ought all to be taken into consideration. The government has paid little or no attention to these issues according to the report.[173]

If, however, a deep borehole was to be put down, the commission was of the opinion that such an expenditure was premature, unless a series of purely experimental bores were intended. They suggested that the following course be pursued, viz., that certain areas, such as north of the railway between Matjiesfontein and Beaufort West and south of the Zwartbergen Range in the neighbourhood of the Cango Cave Limestone, which were scantily supplied with surface water, be surveyed topographically and geologically in such detail as was necessary to form a judgment as to the possibility of considerable quantities of water existing at great depths, and that all further operations await the result of such a survey. £5,000 was made available for the

[171] Brown, *Hydrology of South Africa*, pp. 35-85.
[172] T. Steward, G.S. Corstorphin & H. Saunders, *Report of Sub-Committee on Deep Artesian Well Boring*, *First Annual Report of the Geological Commission*, Department of Agriculture, Cape Town, 1896, p.30.
[173] *Ibid.*

project. This amount would, however, only have covered one borehole. One deep artesian well would not have settled the question conclusively, as some special circumstances may have affected the results.[174] Therefore, the deep artesian well project did not solve the drought challenges of the interior of South Africa.

Yet, dry and arid as the Karoo was, within a few days after a thundershower it was clothed with verdure on every spot on which the showers may have fallen; and if the rain were copious, within perhaps three weeks thereafter it would be studded with flowers, many of them of exquisite beauty, delicate in structure, and brilliant in hue. So copious at times were the showers which fell in connection with a thunderstorm, that they completely deluged the land. For instance, shortly before it happened, the inhabitants of a village were roused during the night by the noise of a rush of waters threatening to carry all before it, and one man, stepping to the door to see what it might be, found himself on crossing the threshold more than knee-deep in the stream, and scarcely able to maintain his footing against its flow.[175]

Brown looked at the above conditions and suggested that rainwater had to be stored in some way in order to cultivate the arid region. According to him "it was quite practicable greatly to modify the condition of the Colony and of its inhabitants, by a proper storage of the waters which fell from the heavens during the rainy seasons in districts in which these annually occur, and the water which fell in thunder showers, and tropical torrents of rain in districts in which annual rainy seasons were unknown."[176] He did foresee that it would be difficult, but still possible, as he wrote:

> "There might be difficulties to be overcome, but I knew of nothing great which has been accomplished by man without difficulty. It might be difficult to get labourers; it might be difficult to carry to them needed provisions for their support while engaged in the work; it might be difficult to find the money required; and it might be difficult to do a hundred other things. But the practical questions resolved themselves into two, 'Was it practicable?' and, 'Would it pay?' On the latter point I was not then, nor am I now, in possession of the data necessary for a solution of the question, and therefore I could not speak. But in answer to the first I could say I see no physical hindrance which may not with

[174] Steward, Corstorphin & Saunders, *Report of Sub-Committee on Deep Artesian Well Boring*, p.30.
[175] Brown, *Hydrology of South Africa*, pp. 35-85.
[176] *Ibid.*

> reasonable effort be overcome; and on my return to Cape Town I communicated to others the impressions I had received of the practicability of greatly modifying the effects there produced by the aridity of the climate."[177]

Brown was not far off with his prediction that the country would be better off with artificial water sources in the arid areas such as Boesmanland. The source of the water was not directly from rain though, and had to be retrieved from underground sources, which was in return replenished by rainwater. Therefore, it was practicable, with some adaptations and improvements, and it would ultimately pay for the sources to be extracted.

The demand for deep boring at the end of the nineteenth century in South Africa came largely due to the success of the hydraulic engineers and geologists in Queensland, Australia and the United States. However, the difference in geological character between these countries and South Africa was significant.[178] The conditions of Queensland especially showed that the ideal basin-shaped section is not necessarily present where enormous supplies of artesian water are tapped, but in the existence of rocks of a soft, unstable nature, interbedded with hard compact beds. Queensland had the necessary conditions for artesian water not known to exist in South Africa except in the case of the Cape Flats sandstones. The Inspector of Water Drills in the Colony secured a fair supply of water by shallow holes. South African knowledge of the structure of the country and the rocks composing it was still very limited at the end of the nineteenth century. This made the drive for deep boring towards artesian water in the Boesmanland challenging at the time.[179]

[177] Brown, *Hydrology of South Africa*, pp. 35-85.
[178] Steward, Corstorphin & Saunders, *Geologist Report*, pp. 11-12.
[179] *Ibid.*

3.3 An Australian hydro-geographical comparison with subterranean Boesmanland water sources

As the above report mentions, South Africa and Australia have similarities in terms of climate and weather conditions. Although they are not identical, a brief explanation of the Australian hydro-geography provides an insight into similar subterranean water sources in Boesmanland. In most parts of Australia, only a small proportion of rainfall finds its way into rivers, lakes, dams and aquifers. While surface water supplies in dams and reservoirs are usually the main focus when assessing water availability, Australia also has significant groundwater reserves. Groundwater is water contained underground in geological formations, made up of porous rocks or soils, known as aquifers. Surface water (in rivers) and groundwater can be interconnected as water seeps through riverbeds and percolates down to become groundwater. They can also be interconnected as groundwater surfaces in wetlands or streams due to the removal of deep-rooted (usually native) vegetation.

Some areas have a high dependence on groundwater, such as Western Australia and the Northern Territory, where well over half of the consumption is supplied from groundwater sources. Groundwater quality can vary considerably, particularly with regard to the amount of dissolved salt (salinity) that affects its suitability for human consumption and agricultural use. The Great Artesian Basin is Australia's biggest source of groundwater. It extends for 1.7 million km^2 under Australia, including parts of South Australia, New South Wales, Queensland and the Northern Territory. It contains 64,9 million GL of water and is the world's largest artesian groundwater basin.[180] The Great Artesian Basin (GAB) is one of the world's largest groundwater resources. It lies under 22% of Australia, stretching from the wet tropics to outback deserts and vast pastoral areas. A relatively unsung hero, the GAB has sustained Aboriginal people for thousands of years and now supports a wide range of communities, enterprises and industries. It is truly a resource of national importance.[181]

The existence of groundwater in Boesmanland had long been commemorated through place names as mentioned in chapter one. Apart from these cultural markers, groundwater can also be detected through close observation of birds, animals and flora. William Burchell advised

[180] Department of Agriculture, Fisheries and Forestry, *Australia – Our Natural Resources, At a Glance*, Canberra, 2004, p.18.
[181] *Ibid.*

watching for circling swallows, captive baboons were fed salt and set to the task and folk-botany recognised an *aarbosje* (vein shrub) for its water-finding capabilities. Folk-geology was similarly attuned to reading the landscape for water, prospecting dry river beds for *graafwater* (spade water) trapped by *seekoei gate* (hippopotamus holes) and dolerite dykes and everywhere else seeking out the dolerite *water klip* (water stone), *keerbanke* (weirs) indicating underground water.[182] Hydro-geography thus ordered human geography in Boesmanland, with the location of permanent water sources determining the locations of towns and the central points of farms.[183] State intention in Boesmanland turned to these "underground dams" in the 1870s as a cheap alternative to re-engineering the colony's rivers.[184]

Drilling tools and foremen were duly imported from Britain in 1878 to prospect for water on crown land in the far west as a means of encouraging its sale and settlement as well as finding water and perhaps coal along the expanding lines of railway.[185] The initial liability for all expenses confined private use to syndicates searching for mineral Eldorados, but even when parliament fixed a flat rate in 1890 the £25 per month charge elicited few takers.[186] Only after part of farmers' liability was converted into kind in 1893 did the demand for the government water drills take off, further encouragement by drought and the generous subsidy offered those wishing to purchase their own drills.[187] The struggle to find water at a reasonably quick rate thus disproved any myths and hopes of a massive underground lake in South Africa. Boesmanland therefore had comparatively small underground water sources to Australia, despite early South African beliefs that the Australian example could be replicated in Boesmanland. Even the Australian example soon proved to be less impressive as initially believed.

An aquifer is a wet underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) in which groundwater can flow. The oldest, lowest layers of the GAB actually sit in a few different basins separated by rock ridges, but the upper layers of the Basin are continuous. Fed by rainfall, much of the Basin's waters are of appropriate quality for

[182] W.J. Burchell, *Travels in the Interior of South Africa*, Volume 1, London, 1822, p. 184.
[183] L. Van Sittert, "The Supernatural State: Water Divining and the Cape Underground Water Rush, 1891-1910", *Journal of Social History*, 37(4), 2004, pp. 915-937.
[184] L. Guelke and R. Shell, "Landscape of conquest: frontier water alienation and Khoikhoi strategies for survival, 1652-1780", *Journal of Southern African Studies*, 18, 1992, pp. 803-824.
[185] WCARS, Cape Colonial Parliament (hereafter CCP), "Cape of Good Hope, *Report of the Hydraulic Engineer*, 1878-85", 2/1/68, G27.
[186] WCARS, CCP, "Cape of Good Hope, *Report of the Geological and Irrigation Surveyor,* 1878-85", G32-92, 11-12.
[187]WCARS, CCP, "Cape of Good Hope, *Report of the Inspector of Water Drills,* 1894", G14-95, 23.

most uses, including drinking, but minerals absorbed during the journey underground meant that water quality varies. High sodium levels in water from some aquifers make it unsuitable for irrigation, or too salty for human consumption. The water is often quite alkaline, and some contains high levels of fluoride. Water temperatures also vary, from 30° C in shallow aquifers to more than 100° C in deep aquifers. The water is warmed by heat produced in the earth's crust by uranium and thorium and by past volcanic activity.[188]

Despite the markedly smaller scale of the Boesmanland underground water supply, the basic structure is similar to that of the Australian counterpart. Most underground water stores are a combination of rock-lined "veins" of water, as is often described by Boesmanland inhabitants, and water-bearing materials as mentioned above.

Water naturally emerges from the GAB in various ways. Firstly, it emerges through discharge springs at the western and southern margins where aquifers come close to the surface, and elsewhere where aquifers meet vents or faults. Secondly, it emerges through recharge springs along the eastern margins where aquifers overflow with water that recently entered the system. It also emerges into waterways in some parts of the Basin.[189]

This is also the case in Boesmanland. As mentioned in chapter one, many farms and towns were founded around fountains in Boesmanland. Some of these fountains are perennial, some have a seasonal cycle, and others flow sporadically according to recent rainfall patterns. Boesmanland is similar to Australia in that some water sources are saline. Salt pans are used to gather salt as an additional source of income on certain farms. The groundwater is also alkaline, and in some cases too alkaline for drinking. Temperatures for groundwater also varies, but due to the relative shallow depth of boreholes in Boesmanland compared to Australia, most groundwater accessed through boreholes are not excessively hot.

Therefore, the comparison between Australian and Boesmanland groundwater sources revealed that the two examples have similarities, as early South African administrators observed, but the comparison is far from extensive. The surface aridity of Australia does compare with that of South Africa in certain places. However, South Africa does not have large underground basins filled with water like Australia. South Africa does have aquifers and smaller basins, but

[188] W. Booth & W. Tubman, "Water Down Under: Understanding And Managing Australia's Great Artesian Basin", [Online.], Available: http://www.environment.gov.au/water/publications/agriculture/great-artesian-basin-managing.html, [Accessed 27 May 2016].
[189] *Ibid*.

the two countries do not have similar underground water sources on the whole. South African underground water sources are much more sporadic and scattered, unlike the more concentrated sources of Australia. With this background on the geographical conditions in the interior of South Africa, this chapter will elaborate on the methods and techniques used to extract water through the years.

The map in Figure 15, p. 60, is a Karoo groundwater atlas showing the interpolated depth to groundwater levels of the region. As was seen with the Boesmanland-Australia groundwater comparison, it shows that for the most part, groundwater is relatively deep underground. Most of the water is found at 10 to 20 metres deep. When dug by hand, a well of this depth would take a serious amount of labour to dig.[190]

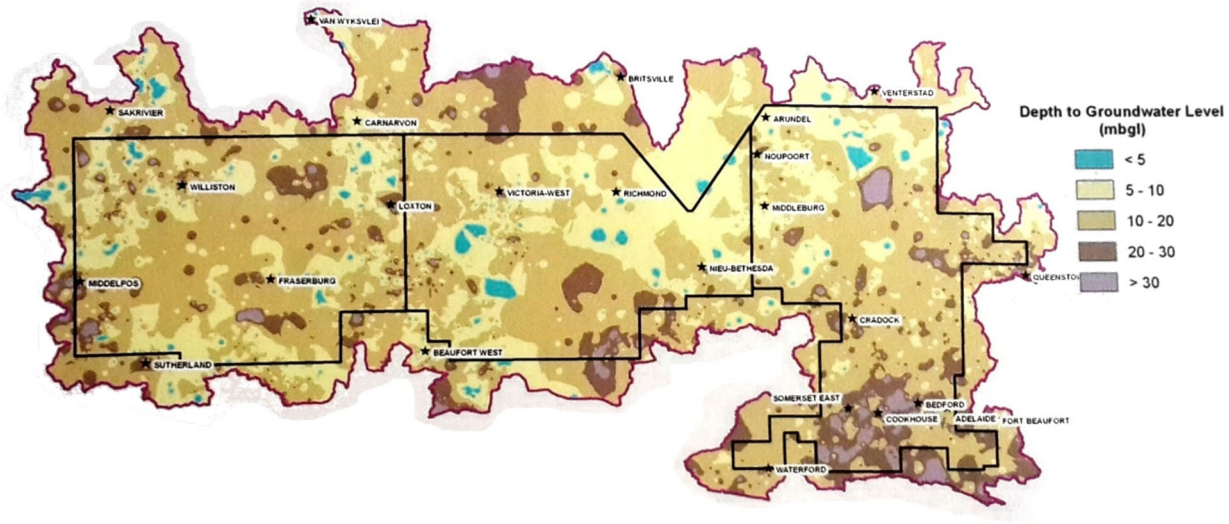

Figure 15: Karoo Groundwater Atlas: Interpolated depth to groundwater level (mbgl). Scale: 1:2500000. Source: G. Van Tonder, "Karoo Groundwater Atlas", *SRK Consulting*, 2012, p.7.

The following are the main aquifers present in the northwest of South Africa. First, there are the fractured veins in the Karoo sediments and their hardened contact zones in these sediments. These dolerite veins constitute an intrusion system in the Carboniferous and Triassic sediments: sub-horizontal sedimentary schists and sandstones of low permeability that are therefore unproductive. However, large yields are available from the dolerite veins of the contact-hardened sedimentary zones, which can be from a few centimetres to about 15 centimetres

[190] G. Van Tonder, "Karoo Groundwater Atlas", *SRK Consulting*, 2012, p.7.

thick. The dolerite veins can be detected by magnetometer. Down-the-hole hammers can penetrate these veins but the bits of percussion cable rigs cannot.[191]

Fairly thick zones of alteration and fracturing of the igneous rocks such as granites and diabase, which can be up to about 100 meters thick, do exist. This type of formation covers 20 % of the territory, and half of the country's boreholes are located here. The decision to install a borehole is taken on the basis of geophysical prospecting to measure resistivity.[192]

Finally, sands and alluviums appear on the beds of dry watercourses or floodplains. These plains are usually small in extent and traversed by dolerite veins forming natural dams behind which are deposited the sands and silts carried down by the floodwaters. In some places similar accumulations of sand have been produced by the construction of an overflow dam across the bed of the watercourse, which is gradually raised as the sand builds up. The sands constitute aquifers which are exploited for domestic use or for livestock.[193]

3.4 Methods of water extraction

3.4.1 Wells

The digging of wells in Boesmanland led to much disappointment. According to the historian P.J. van der Merwe, only one out of every four or five wells dug delivered water. He also met people who dug six or seven wells, all over thirty meters deep, before they found water for the first time. One such a farmer dug a combined 365 meters and drilled 304 meters for multiple sources before he found water.[194] Van der Merwe also found various pioneers in Boesmanland who searched for twenty years or more, and still found no water.[195]

[191] Parsons, "Geological Survey of South African Groundwater Sources", *Water Research Commission*, 1989, pp. 251-258.
[192] *Ibid.*
[193] *Ibid.*
[194] Van der Merwe, *Pioniers van die Dorsland*, p. 42.
[195] *Ibid.*

The digging of wells was an expensive pursuit. If a farmer could supply the equipment and dynamite, he only paid for the labour, which was approximately priced as follows.

	Per foot
For the first 25 ft.	**10c**
From 25 - 50 ft.	**15c**
From 50 - 100 ft.	**£1 - £1.05**
From 100 - 150 ft.	**£1.10**
Over 150 ft.	**£2 - £3** [196]

In Boesmanland many wells were over 60 meters deep. As a result, a deep well could easily cost a farmer between £200 and £300 according to the currency values of the 1940s. Consequently, a lot of pioneers spent more money on getting water to the surface than they spent on the purchase of their land in the first place. To buy cheap, uncultivated land actually could end up being an expensive purchase - especially in Boesmanland.[197] The pioneers of Boesmanland paid well-digging costs with difficulty. Most pioneer farmers who first moved into the area were not wealthy. Some had successful farms, but it was also their only property. People who already owned land could not receive extra farmland through land application. On the other hand, a farm could not be successfully cultivated without access to water. Without an underground water source, a farmer could only utilise his farm if there was surface water available. In the meantime, he had to live off his land as well possible while doing payments to pay off the loan and interest. If the farmer was certain that he would find water in the year of purchase, the year thereafter or even two years down the line, it would not have been a problem. However, no one could give a farmer such assurance. He could only work and hope for a miracle.[198]

Once the first shallow wells were dug, farmers were dependent on their own physical strength to lift the water from the wells. The simplest way was to lower a bucket at the end of a rope into the well and the farmer, standing on a wooden platform over the well, would then manually haul the full bucket to the surface and poured the contents into a nearby trough, from which

[196] Van der Merwe, *Pioniers van die Dorsland*, p. 42.
[197] *Ibid.,* p. 43.
[198] *Ibid.,* p. 44.

livestock could drink. Occasionally, the well was dug with steps leading down to the water level. A man standing on the lowest step filled the bucket with water and passed it to the person standing on the next higher step. He in turn passed it to the one on the step above, and so on, until it reached the top of the well, where the water was poured into a trough. To assist the farmer in lifting the water from the well one of two devices was eventually employed: one was the *rolput* and the other the *wipput*.[199]

The *rolput* consisted of a wooden roller supported on wooden or iron legs at each end which stood over the opening of the well. The free end of the rope, to which the bucket was secured, was attached to the roller around which it was wound by a cranked handle at one or both ends and was operated by one or two people.[200]

Figure 16: An illustration of a *rolput*, or hand crank well. Source: J. Olley, *Human- and Animal-Powered Water Lifters for Irrigation Practical Action*, The Schumacher Centre, Rugby, UK, 2008, p. 56.

[199] J. Walton, *Wind pumps in South Africa*, Human & Rousseau, Cape Town, 1998, p. 2.
[200] J. Olley, *Human- and Animal-Powered Water Lifters for Irrigation Practical Action*, The Schumacher Centre, Rugby, UK, 2008, p. 56.

The *wipput* (known in Middle Eastern countries as a *shaduf*) consisted of a long pole pivoted near the centre in the fork of an upright post. To one end of the pole a bucket was suspended on a rope over the well. The other end of the pole was weighted by a counterbalancing stone or other similar weight. When this end was lifted, the bucket at the other end of the pole was lowered into the well, where it filled with water. Assisted by the counterpoising weight, the operator pushed the weighted end down to raise the bucket of water, which was poured into a watering trough or furrow.[201] The use of the *wipput* was limited to shallow wells only as the depth was determined by the height of the supporting post and the length of the pole.[202]

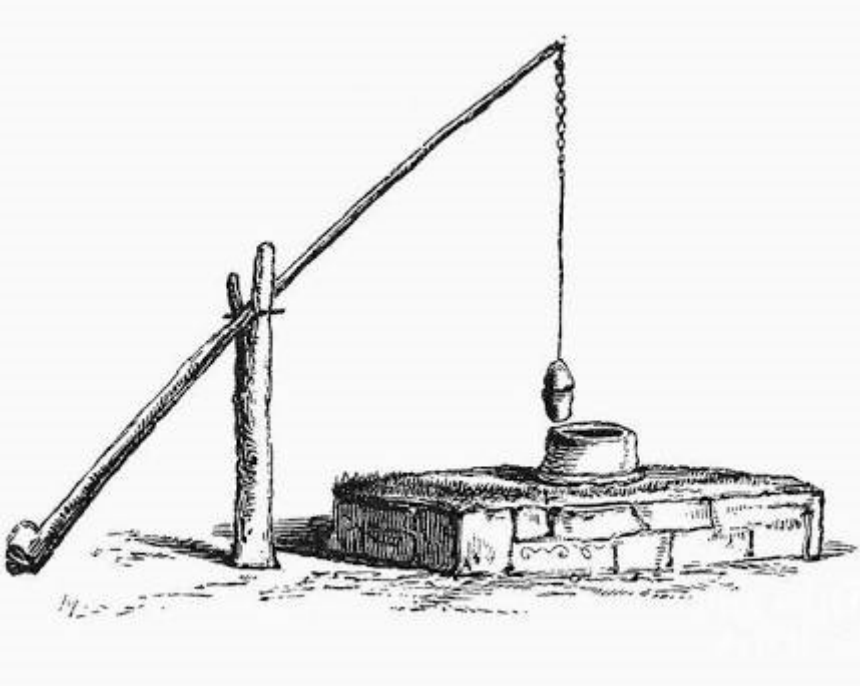

Figure 17: An Illustration of a *wipput*, or *shaduf.* Source: "Shaduf Irrigation", *Alamy*, [Online.], Available: https://www.alamy.com/stock-photo-shaduf-irrigation-na-well-using-shaduf-irrigation-at-the-ancient-city-95558869.html [Accessed 31 January 2019].

3.4.2 Wind pumps

The water-lifting machine which made permanent settlement of the large arid part of South Africa possible was undoubtedly the wind pump.

[201] "Shaduf Irrigation", *Alamy*, [Online.], Available: https://www.alamy.com/stock-photo-shaduf-irrigation-na-well-using-shaduf-irrigation-at-the-ancient-city-95558869.html [Accessed 31 January 2019].
[202] Walton, *Wind pumps in South Africa*, p. 2.

The earliest South African wind pump to be described or illustrated was one which appeared in the foreground of a watercolour by Johannes Cornelius Poortermans of Brink's farm, Saldanha Bay, in 1848. This was apparently a hollow-post windmill similar to those in use in Holland at the time. It consisted of a vertical hollow post which was supported by sloping ladders against two opposite sides and a sloping metal strut against each of the other sides. The head of the post carried four common sails which, by means of a cranked shaft, lifted and lowered a long steel rod passing down the hollow post to the pump or other lifting mechanism below. What may have been a similar wind pump was recorded in the 1845 *Census of Water-mills, Horse-mills and Windmills*, where it was reported that "a mill for raising water, worked by wind, has been erected lately at the Missionary Station Ebenezer (near the mouth of the Oliphants River), which it is expected will prove advantageous to the Institution, where hitherto no agricultural pursuits could be undertaken, for want of means to raise the water from the deep bedded Olifants River".[203] An unusual early wind pump was depicted by W.J. Anderson in his painting of 'Cape Town Observatory' in 1860. The wind pump was described as "a pump with shifting sails erected by Professor Piazzi Smyth during his residence at the Cape".[204]

On 29 June 1861, Robert Kearns of the 'Lead, Copper and Iron Works of 8 Church Square, Cape Town' advertised for sale in the *Graaff-Reinet Herald*:

> "...a self-regulating wind pumping engine for irrigation and supply of dwellings, on teak frame, stands 15 feet high. The principle features and advantages of this Engine are as follows: It requires very little attention, can be managed by a labourer, and stopped immediately. It cannot easily fall in disrepair, and a blacksmith or carpenter can do what is necessary. It will workday and night, turning itself to any change of wind. It is easily put up and will last for many years in constant work. The pumps can also be made to work by hand when there is no wind."[205]

In the 1869 *Census* of the Cape Colony a "windmill for irrigation at Adendorp" (near Graaff-Reinet) was recorded and the following year "two windmills for irrigation" were reported on the nearby farm of Buffelshoek. Whether these were the "wind pumping engines" of Robert

[203] J. Walton, *Watermills, Windmills and Horse-mills of South Africa*, Human & Rousseau, Cape Town, 1974, pp. 181-182.
[204] *Ibid.*, p. 8.
[205] *Ibid.*

Kearns is not known but it is evident that several wind pumps of different design were created during the second half of the nineteenth century. An interesting example was depicted on a photograph of "Schilderspan", a Mr Jackson's farm in the Karoo, near Britstown in 1896 which shows a wind engine with four cloth sails mounted on a wooden tower at the edge of a dam.[206] The earliest imported wind pump recorded in South Africa is a Halladay Standard wind pump, manufactured by the United States Wind Engine and Pump Company of Batavia, Illinois, and imported in 1874 by P.J. du Toit of Hopetown, who was known locally as "the father of the wind pump". In that year Du Toit met an itinerant engineer, named Robinson, to whom he suggested they build a wind pump. Robinson then informed Du Toit that a wind pump had already been manufactured in the United States. Du Toit asked Robinson to buy one of these wind pumps and import it to South Africa. Four months later a Halladay Standard wind pump arrived and was installed on Du Toit's farm.[207]

The Halladay Standard wind pump was a wooden windmill with a wheel composed of wooden blades and mounted on a wooden tower. It became popular later in the nineteenth century, particularly in the Graaff-Reinet district. Several other firms, such as the Williams Manufacturing Company of Kalamazoo, Michigan, exported wind pumps to South Africa. However, the real input of foreign wind pumps only began with the introduction of the all-steel wind pump with an annular wind rose, aptly described by John Reynolds as being "a circle of curved metal vanes arranged like the petals of a flower", which was patented in 1855. The first recorded use of it was usually attributed to a Mr Ruffle who had one fitted to his tower mill at Haverhill, Suffolk, England, c.1861.[208]

Robert Wallace, who travelled throughout the Cape in 1896, wrote:

> "To raise pure water for stock, for domestic use, and for irrigation purposes on a small scale, from the vast number of wells which now tap the subterranean water supply of Cape Colony, or will be bored in the immediate future, a cheap and simple power will be required, and this may be found in certain forms of wind motors. *Annular steel mills*, with the vanes rigidly fastened to an iron framework, are infinitely superior to those combinations of wood and iron, which collapse somewhat after the fashion of a large umbrella and were

[206] *Ibid.,* pp. 181-182.
[207] Walton, *Watermills, Windmills and Horse-mills of South Africa*, p. 9.
[208] J. Vince, *Power Before Steam*, John Murray Publishers Ltd., London, 1985, p. 129.

> frequently going out of order. They had the extent of the area exposed to the wind regulated by the movement of the individual vanes rather than by the entire wheel turning automatically at an angle according to the strength of the air current impinging upon it."[209]

3.4.3 Boreholes

The evolution of the wind pump in South Africa also found its way relatively early to Boesmanland. A variety of wind pump brands were installed in the region, but the preferred brand was *Climax*, for its durability and value for money. The drilling of boreholes made permanent settlement possible in Boesmanland, because reliance on the volatile surface water sources alone made human settlement impossible.[210] From 1848 onwards farmers started using wind pumps as a way to draw water, first from dams and rivers, but later also from wells and boreholes. The first wind pumps were made of wood, which did not have a very long lifespan. It was the all-steel wind pump, first patented in 1855 in England, that made a lasting impact on the appropriation of groundwater in Boesmanland. The design of the steel wind pump only had minor changes for over 135 years. The first solar power system was advertised in *Die Landbouweekblad* of 27 March 1992, indicating a slow transition from wind to solar power for the extraction of underground water in Boesmanland. This transition is still ongoing at present.[211]

On 15 December 1910, regulations for the hire of government drill machines were published in the *Government Gazette* for the first time. This notification gave an exact indication of the procedures regarding the drilling of boreholes with government machines.[212] Since December 1910, government drills could be hired to drill for water for agricultural and other purposes in certain areas of the Union of South Africa. The Minister of Lands published the terms of payment and the areas in which government drills could be hired in the *Gazette*. Payment for the lease of a drill had to be made either by cash payment in advance; or through a loan obtained either from the Land and Agricultural Bank (Transvaal) or from funds provided under an Irrigation Loan granted in terms of Part VII of Act No. 32 of 1906 of the Cape Colony. If an

[209] R. Wallace, *Farming Industries of Cape Colony*, 1896.
[210] J. Walton, *Wind pumps in South Africa*, pp. 8-9.
[211] *Die Landbouweekblad*, No. 729, 27 March 1992, p. 19.
[212] "Regulations for the Hire of Government Drills for Boring for Water", *Union Gazette*, 15 December 1910, No. 1099, pp. 900-904.

approved applicant wanted to pay for the hire of a drill in cash, he had to deposit £50 with the Civil Commissioner or Resident Magistrate of the district within which drilling was to happen and thereafter deposit, on demand, further sums as needed per the terms of agreement. If an applicant wished to pay via a loan, he needed approval from the Land and Agricultural Bank or the Irrigation Department, together with an application for a loan sufficient to defray the estimated amount payable for the loan of the drill.[213]

The acceptance of a loan agreement or application to a loan was subject to the discretion of the Minister, according to the following particulars: The geographical and geological practicability of the proposed drilling; the ability of the applicant to pay all charges; the necessity of water for domestic purposes, livestock or irrigation; and the proximity to other boreholes in existence or proposed.

The Irrigation Department provided two classes of drills, a steam percussion (or "jumper") drill, capable of boring a 15cm hole to a depth of 243m, and a steam rotary "shot" drill, also capable of boring a 15cm hole to a depth of 243m. The Department provided a foreman who had the direct charge of the drill and boring operations.[214] The choice of drill would depend on the geography of the drill site. The older jumper drills, which in effect combined the action of pounding a chisel with a hammer and steam power, was useful to break up surface rocks. This was limited to small areas or softer rock formations. This type of drill could not drill a borehole through dolerite for instance, which was common in Boesmanland. To drill through hard rock formations, the more powerful shot drills were needed. The rotary action of the drill also created a smoother and thus neater borehole.

The Department bore the cost of transport of the drill, appliances, drilling staff, and baggage to the railway station nearest the farm of the applicant who first leased the drill in a given district. The applicant who hired the drill first in a given district had to provide transport for the drill, its appliances, the drilling staff, and baggage from the railway station or centre to his farm. A succeeding applicant had to provide similar transport from the previous farm to his own farm, and the last applicant had to, if required, provide transport back to the nearest railway station or centre. The applicant had to provide transport between his farm and the railway station or such other centre as was selected for the conveyance of machinery and stores required

[213] "Regulations for the Hire of Government Drills for Boring for Water", *Union Gazette*, 15 December 1910, No. 1099, pp. 900-904.
[214] *Ibid.*

to conduct boring operations. The applicant had to provide the foreman with means of communication to and from the nearest post and telegraph office at least once a week. Working hours on ordinary weekdays were nine hours per day, except on Saturdays, when it was five working hours. No work was done on Sundays or public holidays.[215]

The Department provided the labour required for working the drill free of charge. The applicant had to supply other labour as was required for unloading, erecting, dismantling, and uploading of the plant, and the carriage of water at his own cost. The applicant had to supply and transport at his own cost sufficient fuel (wood or coal) of good quality, and water for the proper working of the drill and for the use of the drill staff. The applicant had to either supply food for the foreman by private arrangement and at reasonable prices or had to bring supplies for him from a store not less than once a month.[216]

Drilling was stopped at the applicant's request in writing to the Irrigation Department's Drilling Engineer, through the drill foreman: when a fair and reasonable supply of water was struck, or at the discretion of the Director of Irrigation when there was, or was likely to be, any damage to the drill, or when further boring was unlikely to yield satisfactory results. Responsibility for success was entirely at the applicant's risk, but any reasonable assistance towards a successful issue of the work was given. No more than three successful boreholes could be sunk on any property under one application, except with the sanction of the Director of Irrigation.[217]

[215] "Regulations for the Hire of Government Drills for Boring for Water", *Union Gazette*, 15 December 1910, No. 1099, pp. 900-904.
[216] *Ibid.*
[217] *Ibid.*

3.5 The drill operator and *Windpomp Dokter*

Figure 18: An entire wind pump head and frame loaded onto a vehicle in front of Leon Swanepoel Wind pump Repair Services. Source: Private archive of Leon Swanepoel.

Boesmanland is known for its vast landscapes and long distances between settlements. The geographical area is extensive, yet the human population remains scant. As a result, a multi-vocational culture developed. The population is not big enough to support various experts in niche fields. For this reason, the locating of potential groundwater sources, drilling of boreholes, cleaning of boreholes, as well as the endless maintenance needed to keep the wind pumps operational can all be performed by one individual, such as Leon Swanepoel of Carnarvon. A holistic perspective is needed when endeavouring to understand the use of groundwater in Boesmanland. The groundwater itself, the drilling machines and boreholes used to reach the water and then the pumps used to extract it, not to mention the drill machine operators, wind pump technicians and users of the water, cannot be separated from one another. In some cases, the various steps mentioned above are performed by different individuals, in others by a single individual. However, the steps remain intrinsically connected. In a personal interview with Mr. Leon Swanepoel, the operational aspects of prospecting for water and maintaining the infrastructure to obtain it came to light. Mr. Swanepoel owns a wind pump repair shop in Carnarvon, Northern Cape and formerly worked as a drill machine operator. According to him, the lack of rain in Boesmanland was the starting point of drill operations in

the region. Mr. Swanepoel's account lends credibility to the previous section regarding Brown's travels in the interior which sketched the dry conditions. He corroborated the earlier account of short-term surface water sources which appeared and disappeared after the rain, forcing farmers and migrant game of Boesmanland to move around in search of water. He concurred that the presence of game was a good indicator of surface water in an area. Therefore, the trekboers followed the game. As described in chapter two, communal land used by trekboers and game alike, could later be divided into farms and sold to private owners by the Crown. This, according to Swanepoel, raised many problems such as a lack of water sources on each of the individual farms.[218]

The first hand-dug fountains were shallow enough for water close to the surface to run out on its own. Wells were dug straight down, and water had to be lifted with buckets in various ways. Fountains were dependent on ground water levels staying high, and if rainwater did not replenish the level, the fountain dried up. Mr. Swanepoel spoke about the farm Bronkhorstspruit in the Carnarvon district owned by Mr. Basie Vermeulen. There is a fountain big enough to fill an irrigation dam used to irrigate pastures. He used a bulldozer to clean the fountain of mud, plants and rocks which the original diggers could not remove in a day and a half's time. Before the availability of bulldozers this project would have taken twelve men weeks to do. This fountain delivers 12 000 litres of water per hour. All farms did not have shallow water levels, however, and wells had to be dug. Where a fountain was approximately three to four metres deep, a well could be six or seven metres deep. Considering that the diameter of these wells was approximately six metres, the mammoth task to reach water in Boesmanland by hand becomes clear. There were no aluminium ladders to help the labourers get into this massive hole. Chains and ropes had to be used to haul people, equipment and all excavated soil and rocks out of the hole.[219]

[218] Personal interview, L. Swanepoel – H.F. Klopper, on the farm *Dankbaar*, district of Carnarvon, 15 December 2016.
[219] Ibid.

Figure 19: Windpump course for upcoming farmers on the Research Farm, Carnarvon. 2014. Source: From personal archive of L. Swanepoel.

Figure 20: Swanepoel removes tree roots from a borehole on the farm Eendefontein, Carnarvon. 2014. Source: From personal archive of L. Swanepoel.

Although the technology existed before this time, the jumper drill mentioned above, was commonly used in Boesmanland from the 1920s until it was mostly replaced by air pressure drills in the 1930s. Mr. Swanepoel used a jumper drill as a private drill machine operator. He often had to drill at least 20 metres before water was reached. The diameter of these boreholes was 20 cm. There were different kinds of drill machines available. Since the air pressure drills were being introduced holes were drilled with a diameter of 15 cm. This drilling method cut the time from six months of digging a well, if everything went well, to three or four days using the jumper drills, and down to even a few hours with an air pressure drill.[220]

[220] Personal interview, L. Swanepoel – H.F. Klopper, on the farm *Dankbaar*, district of Carnarvon, 15 December 2016.

Figure 21: A Jumper drill. The top beam is raiser vertically for the cable to droop over when the machine is in use. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

When the majority of these boreholes were being drilled between the 1930s and 1950s, a small town such as Carnarvon could have as many as seven contractors drilling for water. Jumper drills would still be used in case of clay soil, since the air pressure drills tend to compress clay soil, prohibiting water from seeping into the hole. Furthermore, it is used to clean existing boreholes from debris and to remove equipment from boreholes. Today there are very few of these drill machine operators left, for the simple reason that probably most possible boreholes into existing underground water sources in Boesmanland have been drilled. In the 21st century mainly maintenance is being done to existing boreholes, as well as additional boreholes in the case of the lowering water levels of existing boreholes or greater need for ground water arising. Still, the fact remains that boreholes and wind pumps paved the way for efficient exploitation of groundwater as a source of life for domestic and agricultural use in an otherwise hostile climatic environment.[221]

Mr. André Venter of Carnarvon, a farmer in the area, explained exactly how the two main drills used in Boesmanland, jumper drills and air-pressure drills, operate as well as the practical process of drilling boreholes in Boesmanland for a typical farmer. The jumper drill, which cannot drill through granite and iron ore, and is therefore only used to clean existing boreholes

[221] Personal interview, L. Swanepoel – H.F. Klopper, on the farm *Dankbaar*, district of Carnarvon, 15 December 2016.

today, has three main processes. The drill has two kinds of drill bits, a larger and a smaller bit. The larger bit is first used to drill through the softer, top formations. Once a harder formation is struck, the bit is removed and casings placed in the borehole to prevent the soft formation caving in. The smaller bit is then attached to drill through the harder formation. These boreholes commonly reached 30 to 40 meters deep. The drill bits mentioned above hangs from a steel cable one at a time, which is draped over a structure constructed over the borehole. The cable is suspended over the structure asymmetrically to compensate for the rebound of the drilling action.[222]

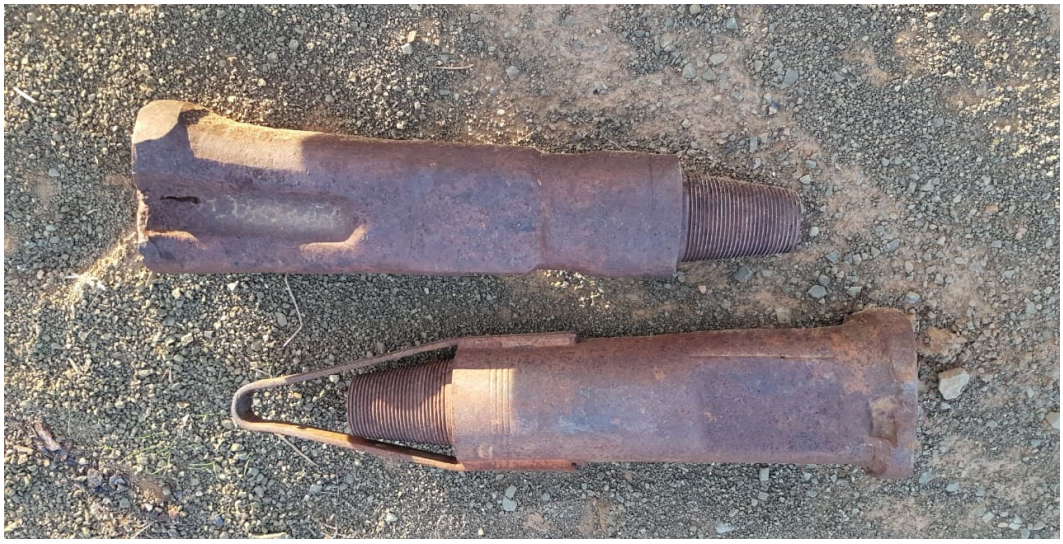

Figure 22: Two drill tips. The bottom tip has been modified to break rocks more effectively. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

As the bit strikes the earth and slowly sinks deeper into the formation, water is poured into the hole to form a soft mud from the earth that is drilled loose. This water must be brought to the drill site by the farmer via tanks or large drums. The drill bit is then removed and a bailer suspended from the steel cable. This is a pipe with a valve at the bottom. As the pipe is wiggled into the borehole, mud pushes into the pipe. Water is added to the hole until it runs clean. When the pipe is pulled out of the borehole, the valve at the bottom shuts, trapping the mud inside. The mud can then be removed from the borehole. The small drill bit is then reattached and the process continues until water is struck or the formation becomes impenetrable. This process took weeks to complete in the case of a new borehole.[223]

[222] Telephonic interview, A. Venter – H.F. Klopper, 7 February 2019.
[223] *Ibid.*

Figure 23: A dill tip (top) and bailer (bottom). Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 24: The bottom of a bailer. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 25: The top of a bailer. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure26: Attachable jumper drill bits used to lower the drill tip into the ground as it drills. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 27: Measuring instrument used to ensure the borehole remains the same diameter throughout. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 28: Drill tip catcher, used to attach the drill bit. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 29: A bellows used to heat the drill tip. The tip is heated and hammered to sharpen it and create the desired diameter. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Figure 30: Jacks used to ensure the jumper drill is level. Source: Private archive of Albertus Steenkamp of the farm Klipbank, Carnarvon.

Practically all modern boreholes are drilled using air-pressure drills. This drill also has two kinds of drill bits like the jumper drill. The larger bit is used first to drill through the softer top formation, after which it is removed and the smaller bit continues through the harder formations. Unlike the jumper drill air-pressure drills can drill through very hard rock types such as granite and iron ore. The air-pressure drill comprises of two machines. The first is the drilling machine and the other is an air compressor, which replaces the function of pouring water into the borehole as in the case of jumper drills. The compressor accumulates air-pressure, normally 25 bars, but can go up to 35 bars in larger machines, which is then used to blow rubble from the borehole as it is being drilled. This translates to roughly 40 to 50m^2/minute of air being forced into the borehole. This makes the process incredibly dusty. The drill tip is attached to hollow drill bits five metres long. These bits can be attached to one another and allow for air to move through the middle.[224]

Figure 31: An air-pressure drill. Source: Private archive of Dirk Steyn of the farm De Oude Muur, Montagu.

Figure 32: The tower of an air-pressure drill. Source: Private archive of Dirk Steyn of the farm De Oude Muur, Montagu.

[224] Telephonic interview, A. Venter – H.F. Klopper, 7 February 2019.

The drill machine has a tower structure which is placed over the borehole. At the top of the tower the compressor is rigged to the top bit in order to blast the compressed air through it. The topmost extension rotates and pounds simultaneously, while air is forced through it. This is how the air-pressure drill operates. As the drill tip moves deeper into the ground, more drill bits are added at the top of the tower. At the bottom of the borehole the drill tip pounds and rotates to break the rock apart while the compressor blasts the rubble from the hole. Typical boreholes are 50 metres deep but are increasingly up to 100 metres deep as groundwater levels decrease in Boesmanland. André Venter had a borehole of 150 metres drilled in 2018 in an attempt to provide water for his property in Carnarvon as the municipal water supply became insufficient for basic needs. At 150 metres the drill bits at the bottom got stuck in the hard formations. The drill machine operator attempted to remove the bits for weeks, but to no avail. The bits remain 150 metres underground as of February 2019 and the borehole inoperative.[225]The incident of the trapped drill bits illuminates the nature of drilling for groundwater in Boesmanland. The stakes are high and the process laborious. Drill machine operators are nomadic, as they move wherever they have a drilling contract. A farmer typically has to wait two months before a drill operator is available. The fee for the borehole can vary but is approximately R270.00 per metre (2018 values) and excludes the diesel needed to operate the machine. The amount of diesel needed for a specific borehole cannot be specified beforehand, because the final depth of the borehole and the density of the formations cannot be predetermined. More diesel is needed to drill through harder formations, as the machine drills slower through the dense rock. Typically, between 600 and 1600 litres of diesel is needed, the latter amount probably signifying a failed attempt.

Deciding where to drill a borehole varies between individuals. André Venter avoids the use of ‘water prophets’, but rather looks at the rocks and plants in the geographical landscape as well as aerial photographs to determine a site. He personally has had twenty boreholes drilled in his life, five of which were unsuccessful. Once the site for the borehole is chosen, the drill machine arrives with the operator, diesel is bought and a contract agreed upon, the process last less than a day. The farmer can only wait with baited breath to see whether the project will be a success.[226]

[225] Telephonic interview, A. Venter – H.F. Klopper, 7 February 2019.
[226] *Ibid*.

Below is a map showing the distribution of boreholes in South Africa in 2017 with Boesmanland in colour.[227] Only boreholes registered with the Department of Water and Sanitation are shown. There are many unregistered boreholes, which are not included in the map. The map shows that the areas with the most boreholes correlate with high rainfall areas. This substantiates the fact that groundwater levels are directly influenced by rainfall. In Boesoesland, an area with very low rainfall, there is a fair distribution of boreholes. When the carrying capacity of the vegetation in Boesmanland is considered, the lower density of boreholes also makes sense. Owing to the large area of land necessary to sustain livestock, farms in Boesmanland are comparatively larger than farms in the Cape Wine District for instance. The larger area correlates with a lower animal density, which in turn necessitates fewer boreholes per square kilometre of farmland. As long as animals have a water source reasonably close by at any given point, more boreholes are not necessary.

Drilling a borehole was, and is, a highly technical process. Far from being a simple hole in the ground, a borehole was constructed in such a way that water could seep in from the sides and allow for a pump of some kind to be placed in the borehole to extract the water. After a borehole has been drilled successfully, it had to be lined. The borehole lining is done by placing a pipe with a wide circumference into the newly drilled section of borehole. This was done to ensure that unstable geological formations above the drill bit did not crumble during drilling and fall onto the drill bit, trapping it in the borehole. Lining was also done in order to isolate the various types of underground formations and pressure zones from one another, and thus prohibiting water from other zones from flowing away. Borehole lining also protected the groundwater from contamination from outside elements. Lastly, the lining would be wide enough for the drilling equipment from moving inside the borehole freely during drilling.[228] The capacity of a borehole could also be tested by draining the borehole. The volume of water delivered at various flow tempos, as well as the time it took the borehole to return to its original water level, would be measured and used as an indication of the borehole's yield and capacity.[229]

[227] http://www.dwa.gov.za/Groundwater/hydromaps.aspx, "Hydrological Map Series: Distribution of Boreholes", *Department of Water and Sanitation*, Online, [Accessed 28 September 2017].
[228] Personal interview, L. Swanepoel – H.F. Klopper, on the farm *Dankbaar*, district of Carnarvon, 15 December 2016.
[229] *Ibid*.

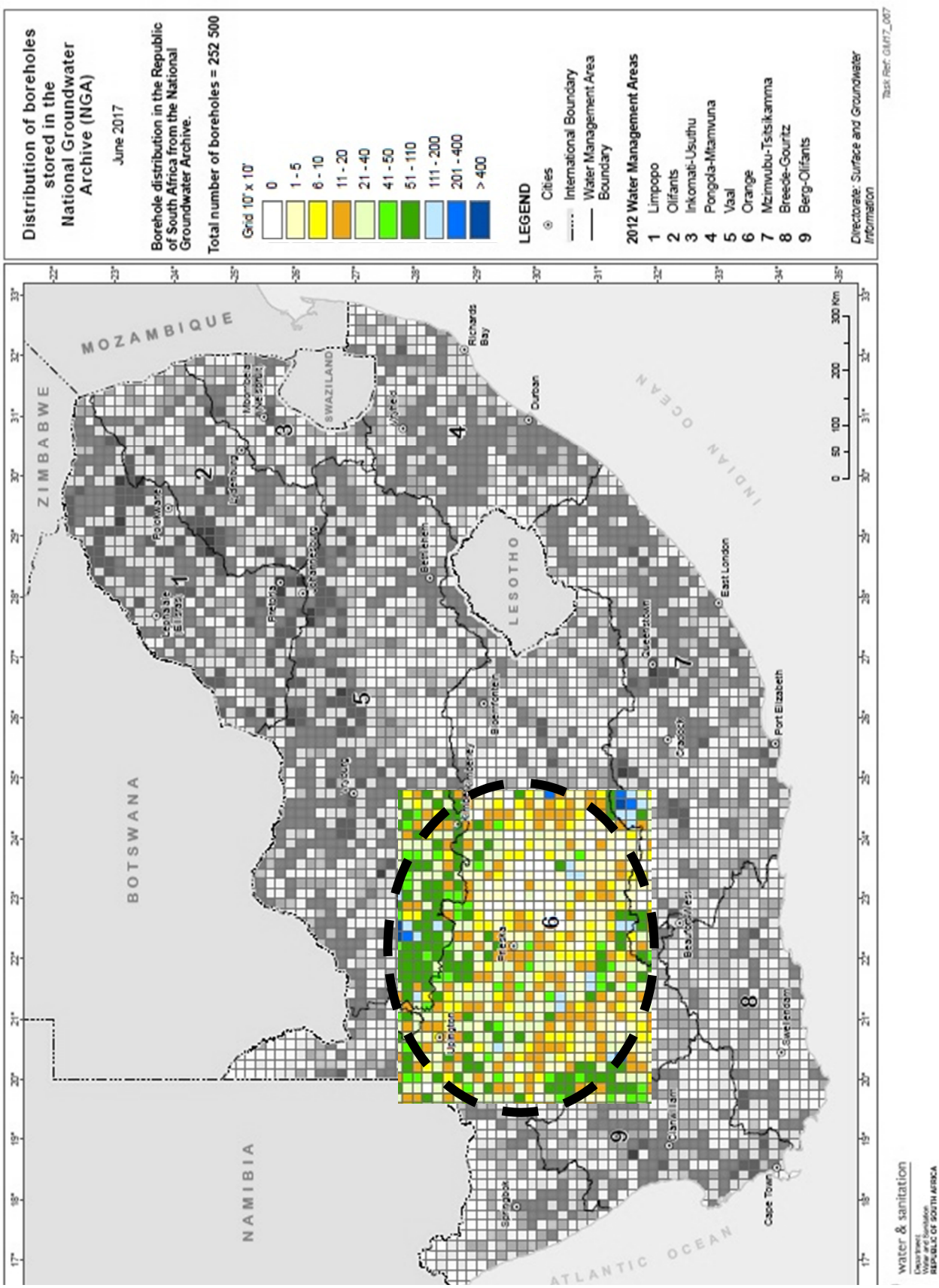

Figure 33: Distribution of registered boreholes. Boesmanland is indicated by the dashed line. The borehole distribution for Boesmanland is shown in colour. Note the relative scarceness of boreholes in the centre of Boesmanland in comparison to the area surrounding the Orange River at the top of the area in colour. Source: http://www.dwa.gov.za/Groundwater/hydromaps.aspx, "Hydrological Map Series: Distribution of Boreholes", *Department of Water and Sanitation*, Online, [Accessed 28 September 2017].

Part of the requirements for a successful borehole was to ensure that it was drilled vertically, and that the surrounding geological formations did not crumble and fall into the borehole. After a borehole has been drilled successfully, it had to be lined.

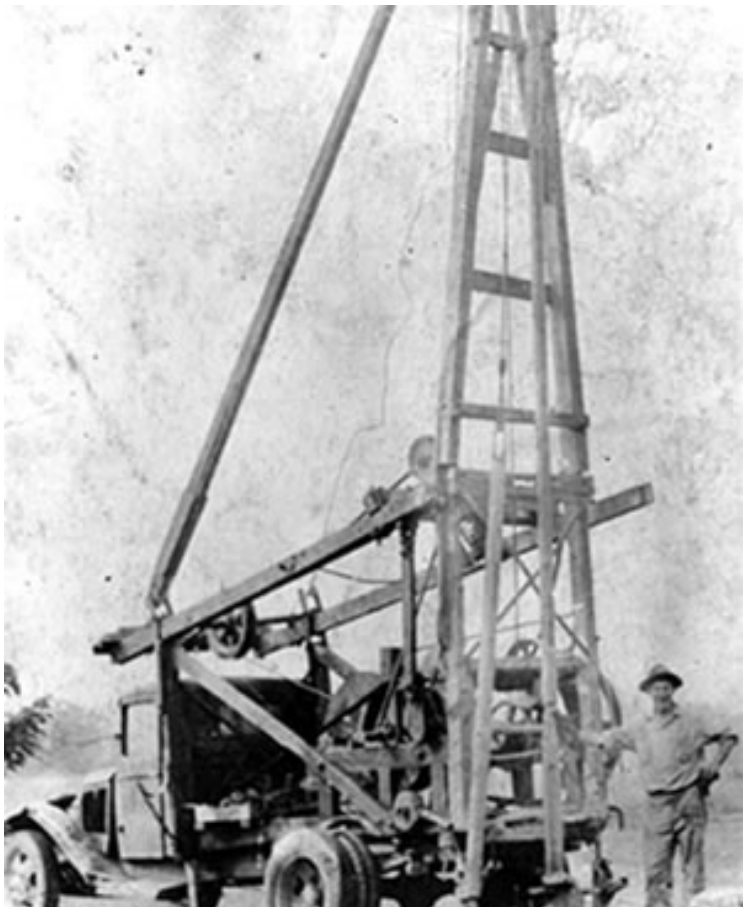

Figure 34: A *stamperboor* with a wooden frame from the early 1900s. Source: Private archive of Leon Swanepoel.

s

Figure 35: A Steyn's *stamperboor*. Source: Private archive of Leon Swanepoel.

Soil texture and salinity influence the amount of water and nutrients available to plants, in contrast with rain that seeps deep into the soil, runs of the surface, or evaporates. Rain that seeps into the soil and is absorbed by plants rather than evaporating or flowing away, is known as effective rain.[230] Rough sand absorbs water quickly, but do not retain it for long. Finer soil absorbs water at a slower rate, but can retain it for much longer because the moisture clings to the small soil particles. Clay and brackish soil retain water molecules so well that plants struggle to extract the water from it. The type of soil varies according to the underlying rock formations, the location of the soil in the landscape, and the annual rainfall.

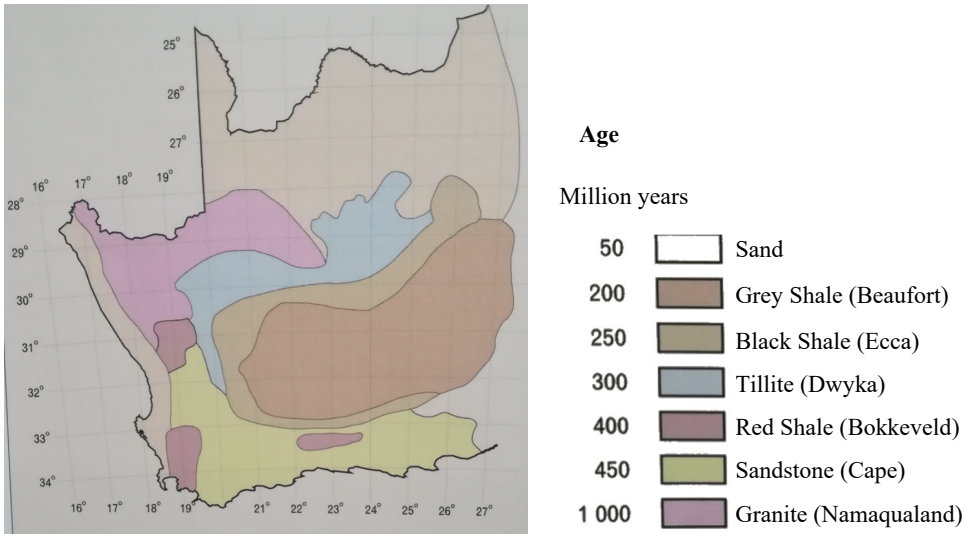

Figure 36: Geology of the Karoo. Source: K.J. Esler, *et al.*: *Karooveld*, 2006, p. 10.

The geography of the Karoo, of which Boesmanland forms part, is dominated by sedimentary rock, especially quarts in the south-western Karoo, and fine-grained mudrock and shale on the plains of the Central Karoo. Quarts erodes gradually to form white or grey acidic sand with low levels of phosphate, potassium and other minerals. Soil formed from Dwyka Tillite and shale is darker, finer and richer in organic material than soil formed by eroded quarts.[231] Dark grey Dwyka Tillite was deposited by glaciers which moved over the Karoo 300 million years ago, when Africa formed part of Gondwanaland. Soil formed from Tillite is often saline and tends to form a hard upper crust, which makes it unsuitable for agriculture and vulnerable to vegetation degradation through livestock farming. Shale and mudrock layers were deposited in deep inland lakes that covered the Karoo 200 million years ago. The black Ecca shales often break into thin plates. The grey Beaufort shales, which are rich in fossils, are layered on top of

[230] K.J. Esler, *et al.,* (reds.), *Karooveld: Ekologie en Bestuur*, Briza Publications, Pretoria, 2006, p.9.
[231] *Ibid.,* p.10.

these plates. These rock formations break into neat, square blocks. Magma pushed through cracks in the shale layers from deep under the Earth's crust and formed dolerite hills, or *koppies*.[232] These dolerite hills are a common site in Boesmanland. It was impossible for a *stamperboor* to drill through dolerite. This meant that many Boesmanland farmers knew that their farms had groundwater sources but had no way of reaching that water until the air pressure drill was introduced.

3.6 Conclusion

In a speech to the Borehole Water Association of Southern Africa on 25 May 2000, Ronnie Kasrils, Minister of Water Affairs and Forestry at the time, spoke about the aims of the government regarding water resources. He said that groundwater could play an extremely important role in providing 25 litres of water per person per day within 200 metres of a household, particularly in delivering water to dispersed rural communities. As a reliable and relatively accessible resource, it was particularly appropriate in arid areas that are prone to drought and where the surface waters dry up for months at a time. It is estimated that nearly half of the world's population depend on groundwater sources for drinking water supply.[233]

Political rhetoric aside, it was clear from Kasril's speech that the government acknowledged that South Africa, and in particular rural arid areas, urgently required groundwater via boreholes in order to supply water to a large portion of the population. This chapter explained the extraction of groundwater throughout the history of Boesmanland, from hand-dug wells and fountains, to evolving technology in drill machines for boreholes. As shown in this chapter, hydro-geography ordered human geography in Boesmanland, with the location of permanent water sources determining the locations of towns and the central points of farms. The key to unlocking Boesmanland for permanent human settlement was clearly in the shape of a borehole. The next chapter will take a closer look at some of the towns in the region.

[232] *Ibid.*, p.12.
[233] R. Kasrils, *Speech at Annual General Meeting of the Borehole Water Association of Southern Africa,* Borehole Water Association of Southern Africa, Johannesburg, 25 May 2000.

CHAPTER FOUR

WATER PROVISION TO TOWNS OF BUSHMANLAND

4.1 Introduction

> "The last Romance of Agriculture, the most daring of its many triumphs, is the Conquest of the Desert. Ever since the day when the immortal Pioneer stood on the Mount of Pisgah, looked backward over the bitter waters and forward to the utmost sea, the sons of men have pressed onward to the Promised Land. What is the loadstone that draws the peasant and the peer from shilling or stately home to die a lonely death on the frontiers of civilisation? It may be Commerce or Discovery, the Gospel or the Flag, or perchance a thoughtless woman's wile: these – all these – have brought men to the Never-Never Country, and so the trail is blazed for those who care to follow. For the nameless grave has often been the Valhalla of the brave."[234]

The above words are also relevant for town formation in Boesmanland, as many established farmers left their Boland farms in the close vicinity of Cape Town, with relatively abundant water sources, to trek into the dry interior of the country. Some left due to overbearing VOC or colonial administration; others simply sought the freedom of an existence in the rural parts of the country. Likewise, the British government and missionaries from Europe moved into the country to claim the last frontier for their respective realms. The towns of Boesmanland thus formed despite apparent lack of comforts or conveniences in this semi-desert region.

According to Haswell, many Boer-founded towns grew around places of worship established by the Dutch Reformed Church because parishioners, widely dispersed on farms, needed to converge every quarter to attend the communion service over several days.[235] The church building was often located on a hill and placed on a large square for farmers to encamp and trade during the communion weekend. In due course, those who could, acquired properties in close proximity to the church and built *tuishuise* (farmers' townhouses, cottages actually) for accommodation over the communion weekend. The embryonic church towns consisted of a

[234] W. Macdonald, *The Conquest of the Desert*, T. Werner Laurie Ltd., London, 1913, pp. 1-2.
[235] R. Haswell, "South African towns on European plans", *Geographical Magazine,* July 1979, pp.1-8.

single street, lined on both sides by cottages, built like their Dutch precedents on the street boundaries in a continuous wall of development, leaving maximum space for a back garden. When the grid extensions were added to the plan, church and square retained their focal positions within the street system while cemeteries were placed on the edges of towns with graves aligned east-west. Typically, Boer-founded towns were gridded and laid out on a spur site in such a way that the long streets could take best advantage of the slope for the irrigation of the rectangular *erven* (allotments), which usually stretched from street to street. Water was obtained from a river or spring and was led through the settlement by means of *leivore* (furrows or water leads) resulting in 'water' or 'wet' *erven*, as opposed to 'dry' *erven* unconnected to the system. Dry *erven* would be suitable for *tuishuise* or commercial use, but, points out Floyd, shops and businesses did not play an important part as the distant farmers were served by travelling pedlars; wet *erven* were specifically for the cultivation of vegetables and fruit.[236] Haswell concludes that it is the agricultural rather than urban nature, which distinguished the *dorp* from a village or town.[237]

Aside from the important religious motives mentioned above, Moll identified four other general reasons for town settlement: demographic, geographic, economic and social. Moll found that the presence of a large European population in the area, or a potential increase in the existing one, was a prominent reason for town formation in the interior of South Africa. So was the geographical location, where the availability of water and wood, and the distance from main roads, other towns and a border was paramount. Furthermore, the opportunity for trade and, less importantly, climatic and aesthetic considerations, were also reasons for town formation.[238]

4.2 Water provision and the towns of Boesmanland

According to Tvedt and Jakobsson, the struggle to control water is a struggle without end. Most people do not reflect on the historical significance of the subterranean labyrinth honeycombing the ground beneath the modern urban architecture; or how every time someone turns on a tap,

[236] T. Floyd, *Town Planning in South Africa*, Shuter & Shooter, Pietermaritzburg, 1960, p. 161.
[237] Haswell, "South African towns on European plans", pp.1-8. The Afrikaans word *dorp* here refers to a rural town situated in an agricultural landscape. These towns were originally founded for the purpose of providing goods and services to the surrounding farms, which remains its most important economic contributors.
[238] J.C. Moll, "Dorpstigting in die Oranje-Vrystaat: 1854 – 1864", *Contree,* No. 2, 1977, pp. 23-28.

there is a gurgle of water somewhere, deep below the houses and streets, made possible by the work of water planners and engineers over generations.[239]

The fact that cities and towns throughout the world recognise the provision of piped-in, potable water to dwelling places as an essential component in achieving an acceptable standard of living is indeed remarkable. It involves, in fact, two kinds of public decisions: first, a recognition of the need for a supply of water to be readily available to all settled areas, and second, a recognition of a need for the supply of water to be piped into each dwelling unit. Both the aforementioned features, namely household water supplies from public waterworks, are usually taken to exemplify the organisational genius of Imperial Rome and its later nineteenth century 'rediscovery' through the Sanitary Movement.[240] The Sanitary Movement was an approach to public health first developed in England in the 1830s and '40s. With increasing industrialisation and urbanisation, the removal of filth from towns and cities became a major focus in the struggle against infectious diseases. Clean drinking water, alongside waste removal, became of vital importance.[241]

The towns in the Northwestern Cape and Boesmanland in particular, are by no means cities, not even by ancient Roman terms. Still, the people who call these places home needed water like any other living creature, and the towns of Boesmanland still needed to plan their water distribution meticulously.

A scrutiny of water provision to towns in Boesmanland shed some light on how rural communities survived in the parched land. This section will discuss water provision to the towns of Carnarvon, Springbok and Loxton as three sample case studies of typical Boesmanland towns. Carnarvon will be used as case study for a typical Karoo town with a large agricultural community and transport routes running through it. In the case of Springbok the focus will be on the liaisons between local residents and the colonial authorities in order to establish essential infrastructure related to water provision for the town. The initial interest in the Springbok area was due to mining activities. Springbok also serves as an example to illustrate the challenging process of providing an adequate water supply to institutions such as

[239] T. Tvedt & E. Jakobsson, (eds.), "*A History of Water: Water Control and River Biographies*", I.B. Tauris & Co. Ltd., London, 2006, p. ix.
[240] K.F. Kiple & K.C. Ornelas, (eds.), "*The Cambridge World History of Food. Volume 1"*, Cambridge University Press, Cambridge, 2000, p. 726.
[241] M.E. Allen, "*Cleansing the City: Sanitary Geographies in Victorian London"*, Ohio University Press, Athens, 2008, p. 2.

schools and boarding houses in the distant corner of South Africa during the first few decades of the twentieth century. Loxton provides insight into the development of a small Boesmanland village, with its main purpose being to provide the surrounding farms with a church closer than the 80km distant Victoria West. Loxton's village dam, which collapsed in 1961, provided a rather unusual disaster for Boesmanland, where the small population of Loxton was suddenly faced with too much water.[242] Only overviews of the water provision histories of the three case studies will follow. Detailed histories of water provision to these towns would warrant a separate MA study on each.

4.2.1 Carnarvon

Before the history of water provision to Carnarvon can be discussed, the story of the town's various names, some connected to the word *fontein* or spring, needs to be discussed. Decades before a town was founded, a route for merchants and explorers on their way to Bechuanaland beyond the Orange River ran through the location of what would later become Carnarvon. The travellers would camp at Schietfontein. Schietfontein is located 166km southwest of Prieska, in the Karee Mountains, 181 km north of Beaufort West. Early explorers mention this refreshment station in their journals. P.B. Borcherds and his company arrived at the spot on 27 October 1801 and a few years later Henri Lichtenstein pitched his tent at Schietfontein after his company travelled along the banks of the Schietfontein River.[243] According to Lichtenstein, Schietfontein was located at the foot of one of the biggest and most prominent hills in a landscape almost entirely void of trees. His company hunted for ostriches and quaggas at the location.[244]

Despite the gradual entry into the interior of South Africa by *trekboers* by the end of the 17th century, the area around the Karee Mountains remained practically uninhabited until the 1830s, apart from the transhumant pastoralist San. The pastures north of the Roggeveld and the Nieuweveld Mountains was too arid and rainfall too uncertain during the pioneer's period to attract and maintain permanent inhabitants. The region between the Riet- and Sak River, as well as the area further north, could be used as *trekveld*, but no permanent settlements were

[242] See pp. 108 – 117 for details on the Loxton flood.
[243] P.B. Borcherds, "*An Auto-Biographical Memoir*", 1961, Struik, Cape Town, 1963, pp. 59-65.
[244] H. Lichtenstein, "*Travels in Southern Africa, 1803-1806*", Van Riebeeck Society, Cape Town, 1928, pp. 260-266.

possible.[245] Furthermore, the farmers of the Lower Bokkeveld, the Hantam and the Lower Roggeveld opposed the granting of private farms further north, as was the case for generations, in order to use the area as communal *trekveld.* In 1826 there were only four farms permanently inhabited between the Riet- and Sak River, an indication of the scarcity of permanent settlers in the area at the time. North of the Sak River Amandelboom, the location of present day Williston, was the only farm with permanent inhabitants. Prior to this there were eight dwellings located at fountains north of Amandelboom, but these were abandoned on instruction of the government, further illustrating the undesirable nature of the region as an area of permanent settlement at the time.[246]

Carnarvon's early beginnings can be traced back to the granting of grazing rights by the DEIC to Pieter Hugo in 1758, although it is a recorded fact that San people were present in the area long before this date. On 26 September 1758 Hugo was granted the rights "*om met sijn vee te moogen gaan leggen en wijden op de plaats gen. de Schietfontein geleegen aan't Groot Roggeveld*".[247] The rent for the farm was twenty rixdollar per annum. The farm Schietfontein was also leased to Gijsbert van Schalkwyk, Jacobus Cloete and Johannes Visser during the 1770s. One of the earliest settlers on the plains near Schietfontein was the Polish adventurer Jan Latsky. After fighting against Napoleon as part of a Cossack regiment, he arrived in the Cape in 1821. He travelled around the interior of South Africa as a merchant for six years, before he purchased the farm Celerijfontein, 18km from current day Carnarvon, at the age of sixty. In December 1867 he passed away at the age of 100 years and five months. By this time Europeans had a strong presence around the Karee Mountains.[248] Jan Latsky seems to have had a hostile relationship with the Khoisan in his area. His stone house had a small room attached to it filled with gun ports. Celerijfontein was not the only farm where skirmishes between European farmers and Khoisan took place. The whole of the Roggeveld and Hantam was prone to conflict at the time.[249]

Joachim van Plettenberg, Governor of the Cape from 11 August 1771 to 14 February 1785, adopted a policy of systematic genocide towards the Khoisan in 1778 after a period of extended

[245] *Trekveld* refers to uncultivated and undeveloped land with relatively open natural vegetation through which migrant farmers travelled to find grazing for their livestock.
[246] WCARS, LC 15/1, 25/1, "Loan Farms Register".
[247] WCARS, Registrar of Deeds, Cape Town Ltd. Co. (1861 – 1942) (hereafter LC), 15/1, 25/1, "Loan Farms Register".
[248] M.C. Kitshoff, "Kudde van Carnarvon: Nederduitse Gereformeerde Kerk, 1874 – 1974", Citadel Press, Cape Town, 1974, pp. 22-23.
[249] *Ibid.*

conflict. His successor, Lord Macartney, followed a more humane policy, and in 1798 proclaimed that a large enough area across the Sak River in the direction of the Karee Mountains must be transferred to the Khoisan. The field cornet Floris Visser attempted to win the favour of the Khoisan and negotiate a peaceful coexistence during the same time, but to no avail. During the first three decades of the nineteenth century the Karee Mountains increasingly became the hideout of Khoisan bandits who were in conflict with farmers from time to time. Should they be pursued due to some crime they had committed, the bandits simply escaped into the nearly impenetrable parts of the mountains, and so avoided arrest.

Other than the Khoisan and Europeans, a third group also appeared in the Karee Mountain region. At the conclusion of the fourth frontier war in 1812, Governor John Cradock signed a peace treaty with Chief Gaika, after the Xhosas were pushed back over the Fish River for the first time since 1789. The area seems to have become inadequate for the population, as a group led by Gaika's son, Jan Kaffer[sic], moved westward across the Fish River. The latter group was on friendly terms with the Cape government and were thus allowed to move into the colony. In 1816 a small group of them settled in the Karee Mountain region. When the Khoisan persisted in their looting expeditions, the Cape government, under leadership of Sir George Thomas Napier, saw a possible solution through this Xhosa group. A number of Xhosa families settled in the Karee Mountain area in terms of land granted to the community by Sir George in 1839.[250] The Cape governor granted land to the Xhosa, including the water sources known as Schietfontein, Harmsfontein and Rhenosterpoort, and before the end of 1839 110 Xhosa families had settled there. Napier made an agreement with Jan Kaffer [sic], in which the Xhosa group had to expel the Khoisan from the region, in return for which they received 98 000 hectares of land, which included the three aforementioned locations rich in groundwater and pasture. .[251] As a result of this agreement no farmer was allowed to settle in this reserve without permission. In addition to pushing the Khoisan from the area, the governor hoped that the Xhosa group would function as a buffer between the European farmers and the Khoisan. Over time the Khoisan were pushed out of the Karee Mountain region entirely, across the Orange River into the edge of the Kalahari.[252]

[250] E. Anderson, "A History of the Xhosa of the Northern Cape 1795-1879", *University of Cape Town Centre for African Studies Journal,* 12, 1987, pp. 112-113.
[251] *Ibid.*
[252] *Ibid*.

They owned plenty of livestock and were thus often forced to seek out water and grazing for their animals. As Europeans expanded into the area, the 'Basters' withdrew. Some of them settled in the Schietfontein area. The Xhosa chief was initially against them settling there and prohibited his people from interacting with them. Later he agreed to let them live in the vicinity of Schietfontein, for the sake of a mission station being opened there.[253]

Figure 37: Schietfontein, located 3km outside modern day Carnarvon. Source: Created by author using Google Maps (https://www.google.co.za/maps/@-30.9624474,22.125324,5180m/data=!3m1!1e3?hl=en).

According to an interview with a Schietfontein resident, Mrs. Louisa Hendriks, the origin of Schietfontein begins in the former Transkei. According to Louisa her great grandfather was part of the Gaika clan.[254] Louisa tells of her great grandfather, known as Jan Kaffer [sic], who arrived at Schietfontein with his cattle from Umtata in the Eastern Cape.[255] There is still a natural spring here, thus making it ideal for livestock. She does not know the name of his wife, or whether he was ever officially married to anyone[256]. When the Xhosa's arrived in the area

[253] Kitshoff, *Kudde van Carnarvon: Nederduitse Gereformeerde Kerk*, 1874 – 1974, p. 24.
[254] Personal interview, L. Hendriks – H.F. Klopper, Schietfontein, 9 July 2018.
[255] *Ibid.*
[256] *Ibid.*

there were Khoisan, but no Europeans. At a later stage some 'Basters' from Williston (then Amandelboom) arrived, and intermarriages took place.[257]

Property rights at Schietfontein had been a contentious issue from the outset. When the British government allocated the area of Schietfontein, it was subdivided into small plots. Some 112 plots were allocated to black (mostly Xhosa) inhabitants.[258] They could build a house on their plot. With the property rights to the plot also came grazing rights to the communal ground surrounding the area. The limit for livestock on the commune was overstretched, however, depleting the soil and grazing. It soon became unproductive to keep livestock, and the commune lay unused. However, in no time opportunists ceased this fallow land. The opportunists, who were from various ethnic groups, approached the property owners, and asked whether they could use their share of the commune. In order for this to be possible they had to technically buy one twentieth of the original owner's plot, so that they could obtain the grazing rights to the commune.[259] Therefore, to this day Schietfontein has many houses build on plots that do not belong to the house owner. Only five residences on the 22 plots at Schietfontein today are owned by individuals, and another three are legally owned by people living in Carnarvon. The others are not owned by anyone since the original owners passed away without a will and testament.[260] This situation has implications for water provision to some of the town's inhabitants.[261]

The first mission station in the area that later was to become Carnarvon was established by the Reverend Christian Wilhelm Alheit of Thuringen, Germany, who started his ministry in the Schietfontein area in 1847.[262] The mission station at Schietfontein was situated in close proximity to the mission station at Harmsfontein. Reverend Alheit originally pitched his tent near the site on which the first parsonage was to be erected in the 1850s.[263] The Rhenish Missionary Society (1847-1943) provided school education for the Xhosa settlement, eventually leading to the establishment of the Harmsfontein village in 1860. The original names of the settlements that would become Carnarvon both included the word *fontein*, meaning spring. This reiterates the preoccupation with water and related themes in the psyche of the

[257] *Ibid*.
[258] Personal interview, D.W. Nel – H.F. Klopper, Carnarvon, 9 July 2018.
[259] *Ibid.*
[260] Personal interview, L. Hendriks – H.F. Klopper, Schietfontein, 9 July 2018.
[261] See p. 94.
[262] W. Macdonald, *The Conquest of the Desert*, T. Werner Laurie Ltd., London, 1913, pp. 67-69.
[263] W. Macdonald, *The Conquest of the Desert*, T. Werner Laurie Ltd., London, 1913, pp. 67-69.

early inhabitants of this arid region. Harmsfontein was renamed Carnarvon in 1874 after Henry Herbert, Fourth Duke of Carnarvon. He was a British Under-secretary for the Colonies who, in the 1870s, unsuccessfully endeavoured to confer a federated self-government onto South Africa. A Dutch Reformed Parish was established in 1875 in Carnarvon.[264] Schietfontein is still a small settlement just outside Carnarvon today (see Figure 36, p.83).

Figure 38: A dwelling in Schietfontein, c. 2019. Source: Author's own.

Figure 39: A stone dwelling in Schietfontein, c. 2019. Source: Author's own.

Since the middle of the nineteenth century white livestock farmers, merchants and fortune seekers tried to take the Schietfontein area from the Xhosas and 'Basters'. Shortly after the Rhenish Missionary Society began work at neighbouring Amandelboom (today Williston), a Reverent Lutz went to Cape Town to have the rights of Xhosas and 'Basters' in the area guaranteed. The government was loath to formalise these rights, as it was in contrast to the wishes of European farmers.[265] Finally, in 1857 9000 hectares was formally granted to the Xhosas and 'Basters' of Amandelboom.[266] According to the Rhenish mission inspector L. Von Rohden, European farmers undertook to gain ownership of the Karee Mountain reserve in 1857. In collaboration with the Prospector General, plans were drawn up to divide the reserve into eighty farms, with 10 000 hectares kept aside for the Xhosas. Reverent Alheit, three Xhosas and two 'Basters' left for Cape Town by the end of 1857 to petition these plans. The government did not wish to formalise property rights of the Karee Mountain reserve unconditionally, and the petitioners had to return home unsuccessfully. Following another

[264] Anderson, "A History of the Xhosa of the Northern Cape 1795-1879", pp. 112-113.
[265] Cape Church Archive (Dutch Reformed Church) (hereafter CCA), "Minutes of the Managing Company of Schietfontein" (hereafter MMCS), 1/2/1857
[266] WCARS, LC 15/1, 25/1, "Loan Farms Register".

attempt to buy the reserve and move the Xhosas to an area near Kenhardt, the government agreed to certain rights for non-Europeans in the Schietfontein area.

On 16 November 1860 Governor Sit George Grey proclaimed that 98 000 hectares of reserve land would be divided as follows: 12 000 hectares were reserved for town layout, of which 200 plots had to be reserved for non-Europeans, the rest had to be kept as town commons. The largest part, 86 000 hectares, had to be kept as outer commonage, upon which plot owners, i.e. non-Europeans, had grazing rights. This agreement was made under the condition that each plot owner build a decent house on the property to the minimum value of £25 within three years or lose the rights to the property. The plots were not inalienable, and could be sold, including to Europeans.[267]

Although these conditions meant to ensure the full property rights of non-Europeans at Schietfontein, in practice, over time, many of them would lose ownership of their properties. The problem was that many of the new property owners were poor, due in part to persistent droughts, and could thus not afford to build adequate houses on their plots within three years. Others took out mortgages against their properties, and some even made debt in order to purchase alcohol. The Europeans, on the other hand, had interest in the properties and the financial means to buy it. Thus, the ownership of the properties went along with the grazing rights to the outer commonage. Since the 1860s the population pattern of Schietfontein changed rapidly. This is evident by the forty European children who attended the missionary school in 1864. Twelve years later there were 102 houses in the town, of which 43 belonged to Xhosas, 24 to 'Basters' and 35 to Europeans. In essence, the mission station became a town. Control of the town was vested in a management committee founded on 16 November 1860. From this date onwards the title deeds refer to "the village of Harmsfontein".[268]

The names Schietfontein and Harmsfontein were used interchangeably since 1860. Technically Schietfontein referred to the area surrounding the eponymous spring, and later the larger area used for grazing as part of a loan farm. The same applied to Harmsfontein, even though that spring was less known, and not situated on the route further north. When the Rhenish Mission became a congregation in 1847, it was known as the "Evangelischen gemeente te Schietfontein".[269] As mentioned above, plots were laid out in the town in 1860, and this new

[267] Strassberger, *The Rhenish Mission Society in South Africa, 1830-1950*, pp. 80-82, 86-89.
[268] WCARS, LC 15/1, 25/1, "Loan Farms Register".
[269] CCA, MMCS, "General Meeting Minutes", 1/1/1847.

layout was referred to as the "village of Harmsfontein" in the title deeds and prospector's documents.[270] Long after that the town was still referred to as Schietfontein. Even the town's management committee formed in 1860 was titled as the 'Management Committee of Schietfontein' without exception. The *Government Gazette* also referred to the town as Schietfontein when giving notice of the magistrate's visits. Reverend Alheit explained the names to a visiting Dutch Reformed Church ring commission, investigating the possibility of a church building and a division of the congregation. Alheit explained to the commission that Harmsfontein and Schietfontein were two separate places. Harmsfontein was the town, which also included 12 000 hectares of town commonage. Schietfontein was the 86 000 hectares of outer commonage used for grazing. In practice the two names were always used interchangeably. In summary, Harmsfontein was merely used in documents, as Schietfontein was commonly used to refer to the entire area combined.

On 23 September 1874 the areas of Harmsfontein and Schietfontein was proclaimed as a new magisterial district and received a new name: Carnarvon. As said, the town was named after Henry Howard Molyneux Herbert, fourth Duke of Carnarvon. The names Schietfontein and Carnarvon were used in parallel for a few years, but Schietfontein eventually fell out of use, and is only used to refer to a small piece of land just outside Carnarvon today.[271]

The population group most affected by social change in Carnarvon was the Xhosa. They were in possession of almost 100 000 hectares of land between 1839 and 1860. Yet, as mentioned earlier, the agreement made in 1860 meant that many Xhosas and 'Basters' lost ownership of their properties due to inadequate funds to meet the requirements for ownership, i.e. to build houses of suitable value, or lose their properties due to frivolous management.[272] The management committee of the outer commonage of Schietfontein made an attempt to remedy this through Act 18 of 1882, by which 110 plots, each 54 hectares in size, were transferred back to the original owners.[273] However, these plots were eventually bought by Europeans in the same manner as before. In 1894 Dr Schreiber, a Rhenish Mission inspector, reported that most

[270] WCARS, LC 14/3, "Title Deeds: Harmsfontein", 1860.
[271] CCA R6/1(e), "Notule van die ring van Beaufort-Wes" (hereafter NRBW) 10.10, 1964.
[272] WCARS, "Notule van die kerkraad van Carnarvon" (hereafter NKRC), 12/7/1897, G79 1/1.
[273] Act 18 of 1882, *Acts of Parliament*, Cape Town, pp. 475-478.

Xhosas had sold their plots and outer commonage grazing rights.[274] By 1926 only two Xhosa families owned a whole plot and sixteen families owned half a plot each.[275]

The town known as Carnarvon has evidently had a lively shuffle among property owners throughout its history. However, the details of these transactions and developmental patterns should not be distracted from the original reason for settlement at the location: water. With the arrival of the Xhosas in 1839, the Schietfontein River, which flowed north of the later mission station and town, was flanked by lush vegetation and provided enough water to this group. Due to prevailing droughts, however, waterholes disappeared and springs dwindled. In reaction to this problem the managing committee began the construction of dams in the 1860s, largely for irrigation of crops and rearing of livestock.[276]

The Rhenish Mission Society had constructed a furrow from the actual Harmsfontein to the centre of the town at an unknown date, which was cleaned at the expense of the managing committee in 1871. One of the first wells to be dug in Carnarvon became a public water source in 1873. The well was situated close to the Rhenish church located on a part of the church plain which would later become a market square. The managing committee installed a pump at the well, which was closed during Sunday church services, although it marked the beginning of a public water supply.[277] In the early 1880s the municipality initiated a project to divert water from rivers to the municipal dam. A loan of £300 was obtained for this purpose from the Standard Bank, which began doing business in Carnarvon in 1885. A further £800 was granted for the project by the Commissioner of Crown Lands.[278]

In 1910 a large catchment dam was constructed. This dam had to be filled with groundwater via boreholes, which was not an easy task due to limited groundwater and prevalent iron rock formations.[279] Through the perseverance of the municipality and the improvements in drill machine technology, a boreholes was drilled in 1946 which provided a sufficient water supply to the town. Since the beginning of human settlement in Carnarvon people have attempted to provide in their own water needs as well. Many wells were dug and water lifted with ropes and buckets, and later hand pumps. Shortly before the end of the nineteenth century the wind pump

[274] CCA, MMCS, "General Meeting Minutes", 26/4/1875.
[275] WCARS, 3/CAR, "Notule, Munisipaliteit, Carnarvon", 26/4/1896.
[276] CCA, MMCS, "Schietfontein Water Supply", 15/2/1869.
[277] CCA, MMCS, "General Meeting Minutes", 26/4/1875.
[278] WCARS, CARN 12/4/2, "Correspondence Letters, Municipality, Carnarvon", 1881-1883.
[279] CCA, NKRC, "Gemeente Verslag", G79 1/1, 12/7/1897.

emerged in Carnarvon, which was then commonly used to pump groundwater from private boreholes.[280]

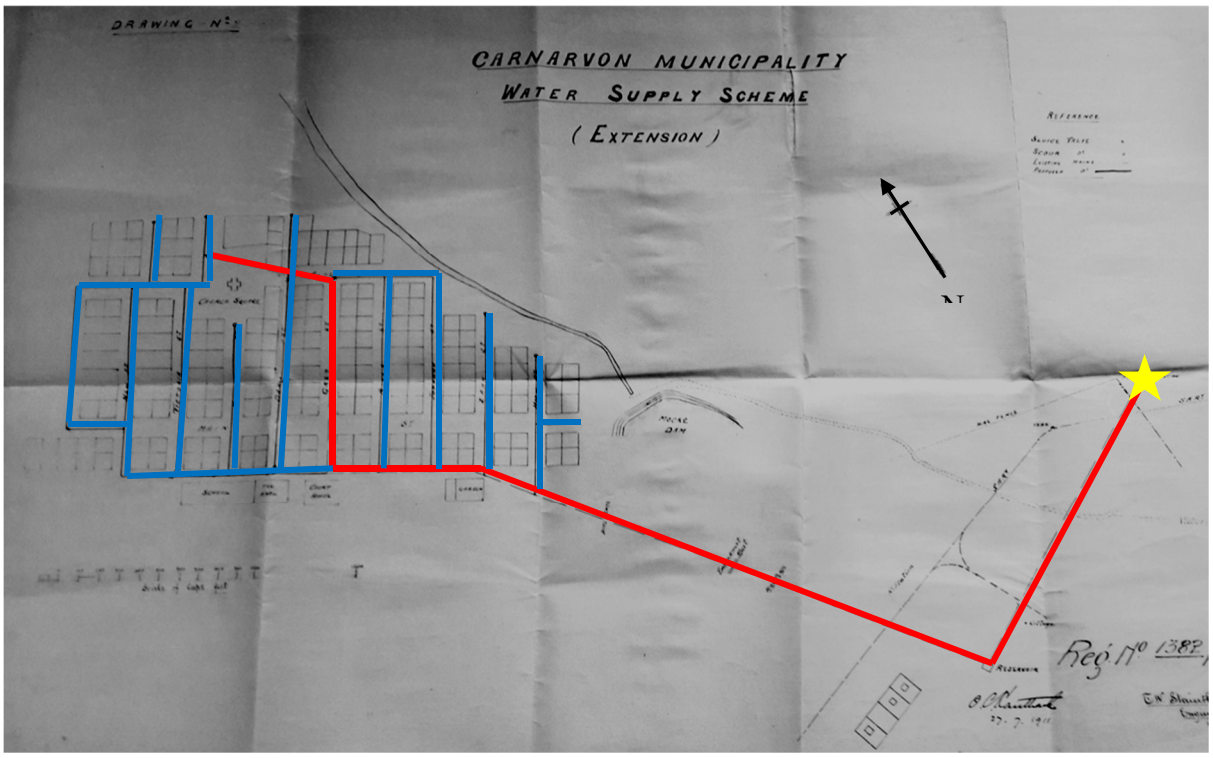

Figure 40: An extension of the Carnarvon Municipality Water Supply Scheme. Source: WCARS, Provincial Administration: Secretariat: Local Government (1902 - 1960) (hereafter PAS), 2/158, L19E, "Extension of Carnarvon Water Scheme", 1909.

By 1904 the population of Carnarvon had grown to 1563 inhabitants, of whom 613 were 'Europeans'. An informal census taken by the municipal council in 1909 estimated the population at 1399, of whom 674 were 'European', 433 'Coloured' and 292 'Natives'.[281] The town had 258 dwellings, as well as 42 huts in the African location. The total valuation of the town was approximately £105,190. The town grew slowly at approximately four new European dwellings per year, with no sudden growth spurts foreseen. Apart from Watkinson's Dam, constructed in 1884 through a government loan, and 25 hectares of commonage erven irrigated from it, the town had no permanent water supply. There were private wells of six meters deep on average on 95 of the town erven. In 1908, after a severe drought, all but six of these wells dried up. With their view to supplement the water supply the town council decided to drill a borehole on the commonage about 90 meters to the south of the town. A depth of thirteen

[280] W.A. Alheit, Manuscript of Sermon, Carnarvon Dutch Reformed Church, 17/5/1961, Carnarvon Church Archive.
[281] WCARS, Provincial Administration: Secretariat: Local Government (1902 - 1960) (hereafter PAS), 2/158, L19E, "Extension of Carnarvon Water Scheme", 1909.

meters was reached before dolerite was struck. A wind pump was constructed over the borehole, but the yield of 500 gallons per day was very little. In September 1908 the council employed a contractor to drill two boreholes on the commonage to the southeast of the town near the railway station. These holes were 15.8 meters apart, each drilled to the depth of 45.72 meters and 15.24 cm in diameter. The depths of these boreholes were average for the time.[282]

Following a geological survey in 1907, reports of a vast unnamed lake of oil beneath the surface of the Upper Karoo was made. Considerable effort was made to strike oil and to transform Carnarvon into a thriving crude oil production centre. One of the boreholes on the farm Dubbeldevlei, was sunk to a depth of five thousand feet; however, all that was excavated was dust.[283] It was said at the time that the most oil discovered in the region was the grease used to keep the drilling equipment functional in the dry and dusty conditions. After repeated attempts to strike it rich the search for oil was abandoned in 1921.[284] The area thus remained scarcely populated, despite the settlement of sheep farmers in the area.

The infrastructure of Carnarvon slowly expanded to support a growing population. In 1911 the water supply scheme was extended from a single pipe to pipelines carrying water to every street, providing water to all population groups in the town. No distinction was made between the races in the supply of water for domestic or irrigational use. The original pipes are indicated in red on figure 39, with the extended network shown in blue.[285] The estimated cost for the water supply scheme was £660 and the labour cost £400.[286] The town's water supply was extracted from boreholes by pumps, and then stored in a reservoir located on a small hill on the periphery of the town. A pipeline then transported the water to the centre of town. The reservoir was located at the end of the original (red) pipeline, indicated by the star on the right-hand side of figure 39. In addition to the water supplied by the municipality, many erven as mentioned before, also had private boreholes with wind pumps to supply domestic water.

[282] See Chapter three, pp. 63 – 66, for more information on boreholes in Boesmanland.
[283] E.M. Bordy & R. Prevec, "Sedimentology, palaeontology and paleo-environments of the Middle to Upper Permian Emakwezini Formation (Karoo Supergroup, South Africa)", *South African Journal of Geology*, 111, 2008, pp. 429-456.
[284] *Ibid.*
[285] WCARS, Carnarvon Municipality Records (hereafter CAR), 4/CAR/1/1/1 1382, "Extension of Water Supply Scheme", 1911.
[286] WCARS, PAS, 2/158, L19E, "Extension of Carnarvon Water Supply Scheme", 1909.

In the same year the reservoir storing the town's water supply had a roof added to it. This prevented pollution from entering the potable water, and equally important, it prevented the water supply from evaporating into the dry Karoo air.[287] The project cost £320 to complete.[288] The schematics for the reservoir roof are shown in Figure 40.

In 1913 the mayor of Carnarvon had to inform the Cape Provincial Administration that the municipal council would not be able to construct a 'proper' hospital for the town as per the recommendation of the medical officer. He referred to the recently completed water supply scheme, as well as the transfer of the public school building onto the municipal books. This last transaction was a 'heavy liability' to the municipality at the time.[289] The hospital would not be built until 1952, with extensions finished in 1973. The infrastructure thus developed, but at a very slow pace due to a lack of funds and adequate water supplies.

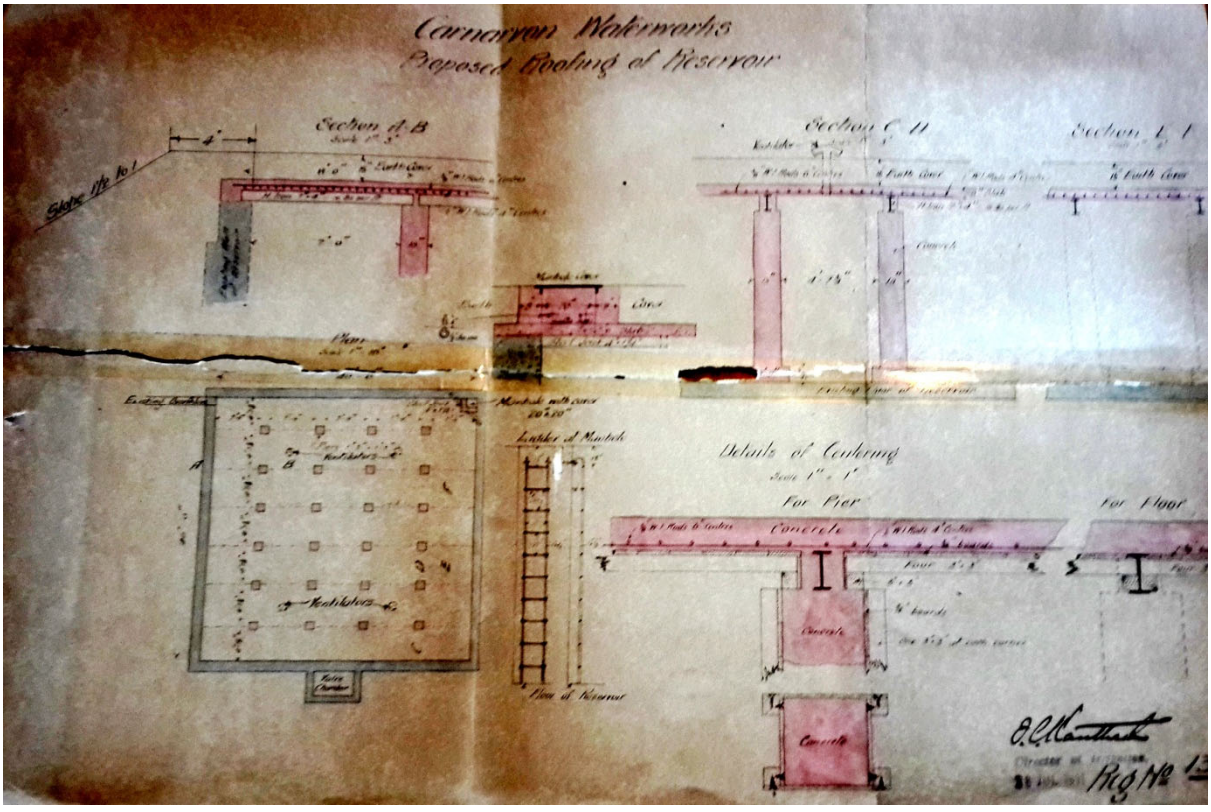

Figure 41: Roof placed on Carnarvon Reservoir, 1911. Source: WCARS, 4/CAR/1/1/1 1384, "Extension of Water Supply Scheme", 1911.

[287] WCARS, 4/CAR/1/1/1 1384, "Extension of Water Supply Scheme", 1911.
[288] WCARS, PAS, 2/158, L19E, "Extension of Carnarvon Water Supply Scheme", 1909.
[289] WCARS, Cape Provincial Administration, Hospital Department (1912 - 1970) (hereafter PAH), 26/H1/2, "Carnarvon Hospital", 1913.

In 1926 a circular was sent to each secretary of the divisional councils of the Cape Province, including the Divisional Council of Carnarvon. The letter, originating from the Administrator's office, made its position regarding dams and boreholes on public roads clear: "Section 318(5) of Ordinance 13 of 1917 empowers a Divisional Council to construct and maintain dams upon any road. By implication a Council would have power to procure water for such dams and for that purpose, if feasible, to sink a borehole upon any portion of road or upon a resting place fixed under Section 202, provided there is no-interference with the water supply of any private person."[290]

Dams in the Carnarvon division were not only constructed by the divisional council, but also by private farmers. In a newspaper article of 3 December 1895, C. Shaw Nicholson, a journalist, reports on Carnarvon as follows:

> "The harvest has, as anticipated, been one of the finest known in this part of the country for many years past. Vintage and fruit crops promise well; farmers, especially in the Karreebergen, are going in for irrigation works by means of large dams now in the course of construction. The rainfall during the past month has been 1.52 inches and has extended all over the division with the exception of a small portion on the North Western side. The pasturage is in splendid condition and large and small stock are doing well. The labour supply is weak."[291]

In times of plenty, farmers thus invested their resources in large projects like dams in order to store water in case of good rainfall. This water was used to irrigate small harvests of mostly animal feed like alfalfa and barley. This was made possible by Section 318(5) of Ordinance 13 of 1917 discussed above. Groundwater remained the most important water source in the area, but earthen dams made it possible to store rainwater for longer periods after it had rained. The animal feed that was cultivated enabled farmers to keep livestock alive during droughts, when the natural pastures dwindled. This in turn stimulated the town's economy, which was directly dependant on the surrounding farms.

[290] WCARS, 4/CAR 4/1/1, "Regulations for the construction of boreholes on public land", 1926.
[291] WCARS, Department of Lands (hereafter LND), 1/521 L8435, newspaper clipping, publication unknown.

The case study of Carnarvon thus highlights two important factors in Boesmanland water supply. The first is the vital role groundwater plays in making urban and agricultural settlement possible. The town has always been reliant on either wells or boreholes for its water supply. Earthen dams are used to store rainwater for agricultural use but cannot be relied on all year round. The second important factor that this case study highlights is the ever-pressing reality that the water can simply dry up. This remains the case today. During a typical summer in 2018, following a four-year drought, Carnarvon had no water. The water level of boreholes still providing the water supply in 2019 became too low for the pumps to extract water. The town's inhabitants were left without water on several occasions, sometimes up to three days. This is the practical implication for those homeowners of Schietfontein whose homes were built on plots that did not belong to them and where boreholes were thus not sunk.[292] Some municipal rate payers relied on their private boreholes, but those without private boreholes simply had to procure water from costly alternatives if possible. When the borehole levels slowly rose again, the municipal water supply was turned on, yet with extremely low water pressure. Groundwater thus made life possible in Carnarvon, if somewhat precarious at times.[293]

These conditions are not uncommon during a prolonged drought in the Carnarvon district. Residents with the means and foresight install water tanks to store rainwater, if any were to fall, or slowly pump water from the low pressure municipal supply, before pumping the water back into their household plumbing for domestic use. Others simply wait for the water supply to return after a few days.[294]

4.2.2 Springbok

Although technically part of Namaqualand, the town of Springbok constitute the extreme western boundary of Boesmanland and offers an excellent case study for the purposes of this project. Furthermore, the geographical conditions are similar to that of Boesmanland. The lived experience of the Springbok inhabitants was thus the same as that of dwellers in other towns in Boesmanland.

[292] See also p. 92.
[293] Telephonic interview, A. Venter – H.F. Klopper, 7 February 2019.
[294] *Ibid.*

Between 1660 and 1664, six Dutch expeditions travelled northwards from Cape Town in search of mineral deposits. These expeditions did not yield sufficient returns. However, with the arrival of Governor Simon van der Stel in the Cape Colony in 1679, four more expeditions set off between 1682 and 1685, this time travelling in spring.[295] The third of the expeditions was successful. Finding the Copper Mountain or Carolusberg (today part of Goegap Nature Reserve), the expedition returned to Cape Town with copper ore. Van der Stel was so delighted by the find that he personally led the last expedition, which dug three shafts into Copper Mountain and extracted some ore. But the ore did not yield as much pure copper as they first had hoped, and additionally, the hostile characteristics of the landscape with no trees and water, as well as the harbourless coast, made it impossible for them to establish a viable mining and extraction industry.[296]

Figure 42: Sketch of Springbokfontein by Hendrik Claudius in 1685 with Simon van der Stel's visit to Namaqualand. Source: *Simon van der Stel's Journey to Namaqualand in 1685*, Human & Rousseau, Cape Town, 1979, pp.7, 139.

Under the leadership of Hendrik Hop another expedition was despatched to Namaqualand in 1761. Close to the Copper Mountain area rich deposits were found, though the focus would be

[295] S. van der Stel & B.H. Pheiffer (eds.), *Simon van der Stel's Journey to Namaqualand in 1685*, Human & Rousseau, Cape Town, 1979, pp.7, 139.
[296] J.M. Smalbergen, *Aspects of the History of Copper Mining in Namaqualand*, University of Cape Town, Cape Town, 1969, pp. 1-35.

on certain deposits close to the Orange River in today's Richtersveld. But again, no means for building a mining industry, like sufficient wood or water were available, and the nature of the river made it unsuitable for navigation.[297] But again, by no means sufficient wood or water supplies for starting a mining industry were available, and the nature of the Orange River made it unstable for navigation.[298]

Figure 43: Simon van der Stel's camp site near Springbok in 1685. Source: *Simon van der Stel's Journey to Namaqualand in 1685*, Human & Rousseau, Cape Town, 1979, pp.7, 139.

Only in 1836 and 1837, when James Alexander launched an expedition to this area, interest in the copper deposits rose again when he found good copper-rich ore near the banks of the Orange River. The newly found South African Mining Company first began extracting the copper ore in Namaqualand in 1846.[299] Two years later a German named Von Schlicht went to Namaqualand and discovered by chance an immense deposit of copper ore on the farm Springbokfontein. In 1850 Phillips & King Company purchased the farm *Melkboschkuil*[300] and in 1862 the town of Springbokfontein was demarcated on the same location. The -*fontein* (spring) suffix was omitted in later years in the town's name.[301] Furthermore, town

[297] J.M. Smalbergen, "Aspects of the History of Copper Mining in Namaqualand", University of Cape Town, Cape Town, 1969, pp. 1-35.
[298] *Ibid.*
[299] Ferreira & Van der Waal-Braaksma, *Die Noordwest*, p. 7.
[300] *Ibid.*
[301] B. Kostka, "Namaqualand: A short history of nearly everything", [Online], http://stripedmouse.com/documents/HistoryofNamaqualand.pdf [Accessed: 9 October 2018].

dwellers were allowed the right to graze livestock, use water and build roads. This was the onset of the commercial exploitation of the copper deposits of Namaqualand and led to a copper mining mania.[302]

Figure 44: Springbokfontein in 1852. Source: O.J.O. Ferreira & G. Van der Waal-Braaksma, *Die Noordweste: Die Stoflike Kultuuruitinge van die streek se bewoners*, Perskor, Johannesburg, 1986, p. 7.

The Namaqualand district's annual rainfall is typically less than 250mm, and at times as low as 50mm. Due to the low precipitation, crop farming is limited and livestock farmers are forced to migrate with their animals from time to time. As in the case of Boesmanland, a striking pattern appears when one studies the accounts of explorers regarding climatological patterns in the region surrounding Springbok. According to Van der Merwe, discoverers and travellers such as Henry Lichtenstein, Van Hoesum, Pieter van Meerhof, Olof Bergh, Simon van der Stel, Charles Thunberg, Willem van Reenen, William Burchell, John Campbell, Andrew Steedman and Andrew Smith all referred to the incessant alternation between droughts and rain. A poignant characteristic of these droughts seems to be its severity. The droughts in question are

[302] Smalbergen, *Aspects of the History of Copper Mining in Namaqualand*, pp. 1-35.

not mere inconvenient periods of water restrictions or wilting domestic gardens, but rather extreme periods of animal loss and economic failure.[303]

Figure 45: Piet Cloete, owner of Springbokfontein in 1852. Source O.J.O. Ferreira & G. van der Waal-Braaksma, *Die Noordweste: Die Stoflike Kultuuruitinge van die streek se bewoners*, Perskor, Johannesburg, 1986, p. 7.

As the original name of the town suggest, the initial water supply for the town came from a spring or fountain. However, the initial rudimentary methods to obtain water, as reflected in the correspondence between colonial officials, reveal something of the problems to provide good quality potable water to the pioneer town dwellers. Water was originally drawn by hand

[303] G. van der Merwe, *Kroonjuweel van Namakwaland: Ned. Geref. Gemeente Namakwaland in Springbok, 1850-2000*, GLF Drukkers, Bloemfontein, 2000, pp. 5-7, 105.

and carted to the settlement by sentenced prisoners. The system was not very reliable, and a possible solution was suggested by a concerned Namaqualand district surgeon, Dr D.C. McArthur. On 5 October 1899 he wrote to the Civil Commissioner regarding the water supply of Springbok:

> "I would draw your attention to the fact that the scarcity of prison labour makes the supply of water very uncertain and scanty, to them dependent on this means of obtaining it. I consider that this dependency could be much minimised by the fixing of a pump at the spring which I would suggest be applied for. I would also take this opportunity of urging that the building around the spring be properly repaired and made so that no pollution from outside sources can occur, as is now possible in every way."[304]

The acting Civil Commissioner who received the letter, J.B. van Reenen, then forwarded it to the Office of the Civil Commissioner on 1 December 1899 in the hope to "state that on inspection of the fountain from which the water is obtainable I can confidently recommend that a pump be despatched to me at an early date as suggested by the District Surgeon and also that I be authorised to have the building around the spring put in proper repair."[305]

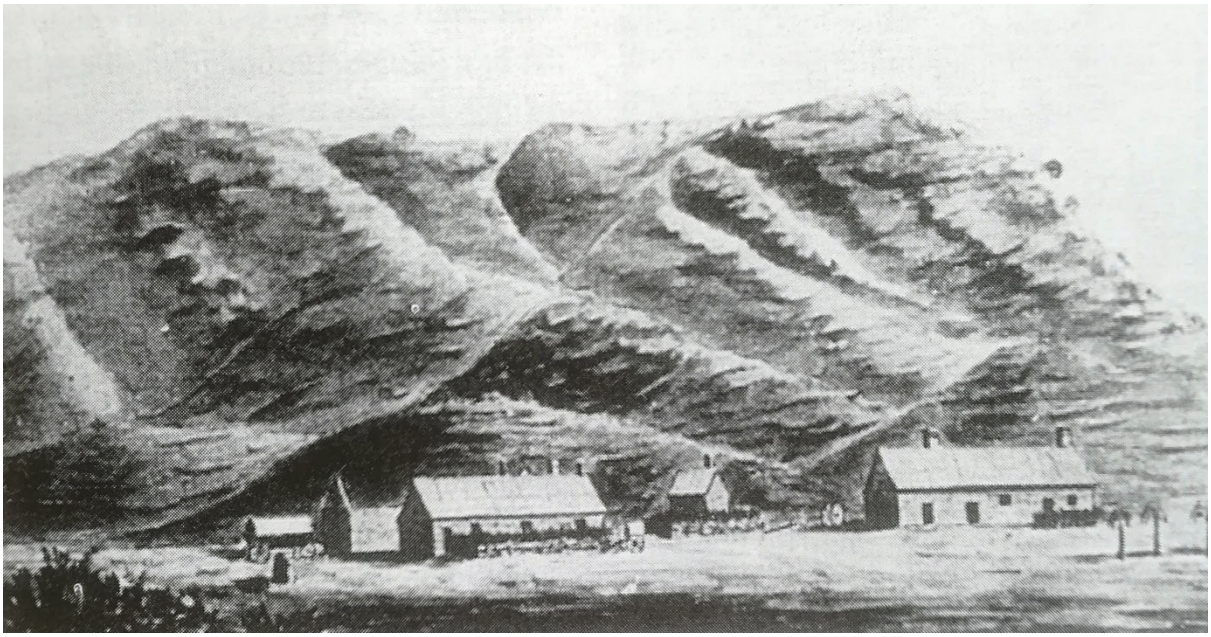

Figure 46: Springbokfontein in 1854. Source: South African National? Public Library.

[304] WCARS, Public Works Department (hereafter PWD), "Springbok water pump", 2/5/290 U24 9462.
[305] WCARS, PWD, "Springbok water pump", 2/5/290 4/54D/99.

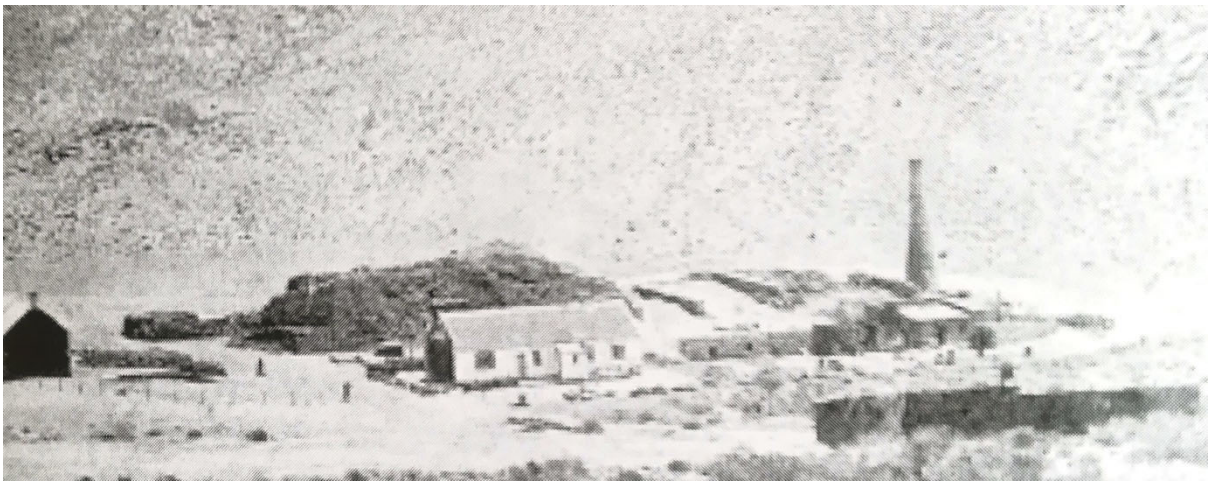

Figure 47: Mining activity in Springbokfontein in 1870. Source: South African National Library.

Figure 48: The village of Springbokfontein, c. 1878. Source: South African National Public Library.

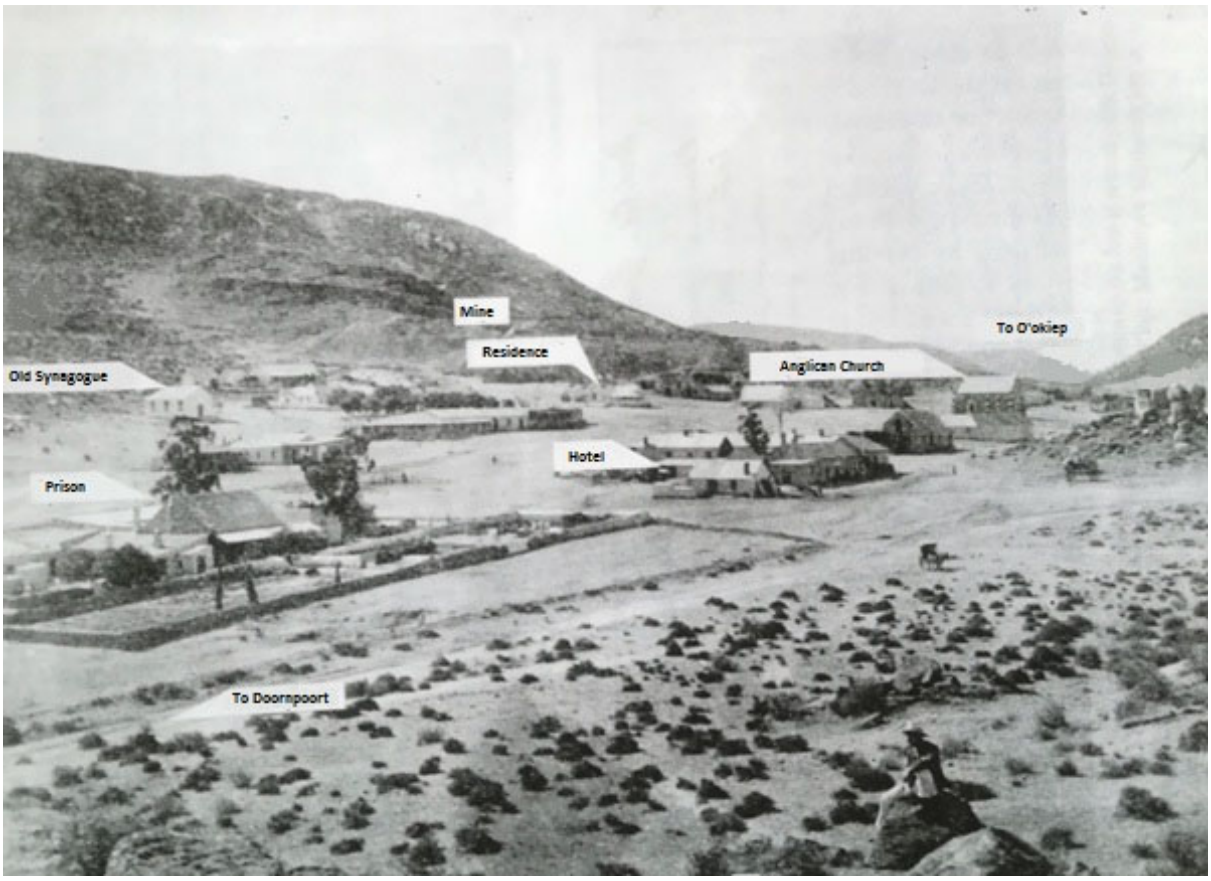

Figure 49: Springbok during the South African War. Source: G.J. Kotze, *Die Anglo-Boereoorlog in Namaqualand*, Private Publication, Springbok, 1999, p. 45. (Translation author's own).

On 10 January 1900 the Magistrate of Springbok requested that the Secretary of Public Works in Cape Town respond to the request urgently, as a case of typhoid fever had already been reported.[306] Two days later the Secretary requested an investigation and report on the matter.[307] In his report of February 1900, the Chief Inspector of Public Works stated that the fountain was situated about a mile from the village on the slope of a hill. There were no dwellings in the vicinity of the source and the drainage did not affect the fountain in any way.[308] The inspector did, however, discover that the source of contamination came from the public, especially washer women who dipped unsanitary buckets and utensils into the fountain, thus polluting it. He recommended that a lid of corrugated iron be placed over the fountain, and that a roofed wall with a lockable door be erected around it. Eight prisoners were tasked to draw the water

[306] G.J. Kotze, *Die Anglo-Boereoorlog in Namaqualand*, Private Publication, Springbok, 1999, p. 45. Typhoid fever is prevalent in areas with stagnant and unhygienic drinking water contaminated by sewage that contains *Salmonella typhi.*
[307] WCARS, PWD, "Springbok water pump", 2/5/290 U24 9462.
[308] WCARS, PWD, "Springbok water pump", 2/5/290 13/148/C29.

from the fountain and cart it to the village. The water cart had to travel 24 miles per day to deliver the necessary water to the village and this cart had been in use for ten to fifteen years. The inspector suggested that the barrels used for transporting the water be replaced with galvanised iron tanks. This would be easier to handle, as they were lighter and easier to clean. An engineer was not needed for the installation of the pump, but a fitter from the Copper Company was requested from O'Okiep, as there was no one in the town suitable for the job. Below is a sketch of the required pump drawn by the inspector.[309]

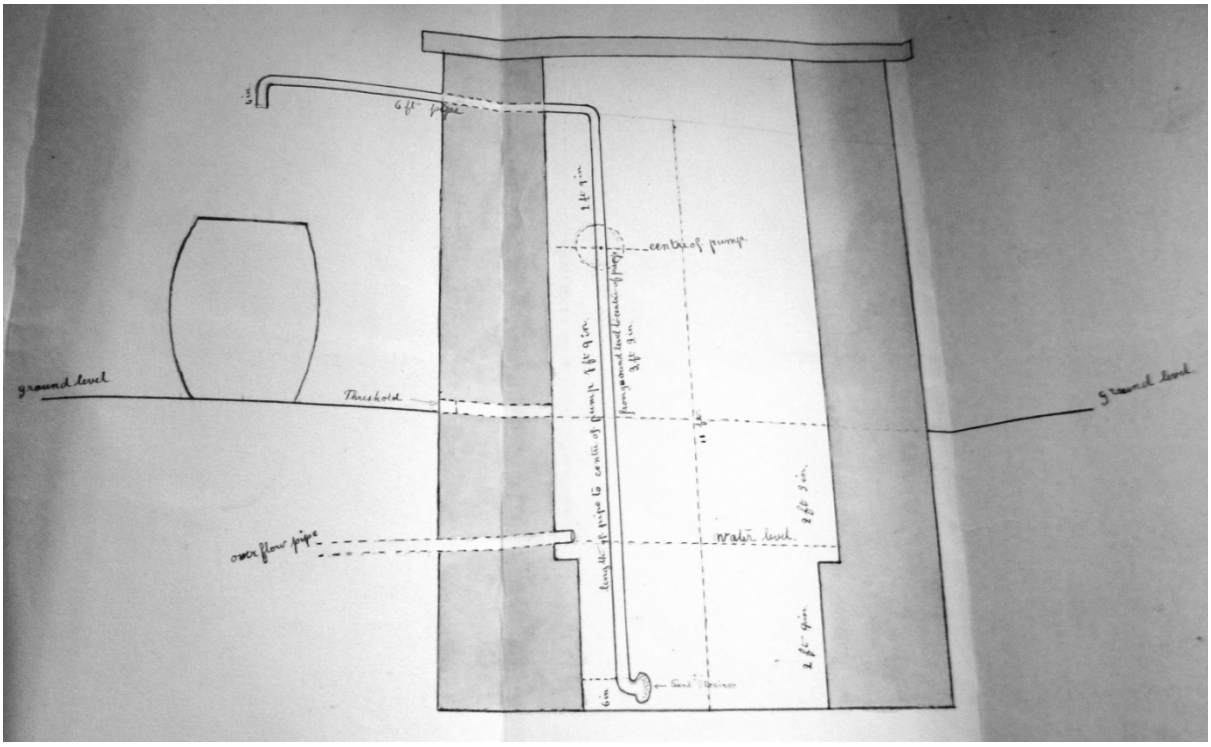

Figure 50: Schematic of water pump installed at fountain near Springbok. Source: WCARS, PWD, "Springbok water pump", 2/5/290 13/148/C29.

Consequently, a suitable pump was ordered from Cape Town, but no transport was available to deliver it to Springbok. On 5 June 1900 the pump was finally packed and ready for dispatch in Cape Town, but no further record regarding the proposed pump exists to verify if it had indeed been delivered.[310] Eight months lapsed between the first request for a pump and a telegram informing the inspector that the pump was ready and waiting for departure, but there was still no transport available[311] and there is no way of knowing exactly how long the residents of Springbok had to wait for a pump. This case study illustrates the laborious process it took

[309] WCARS, PWD, "Springbok water pump", 2/5/290 13/148/C29.
[310] WCARS, PWD, "Springbok water pump", 2/5/290 U24 T205/9462.
[311] *Ibid.*

for the installation of a simple but essential water pump in the remote North Western part of South Africa at the turn of the previous century.

The quest for the proper provision of potable water in Springbok continued. On 21 September 1927 the Controller of Educational Finance wrote to the Senior Foreman of Soebatsfontein Primary School in Springbok. He informed the foreman that the quest for providing a proper water supply to the Soebatsfontein Primary School, in conjunction with other schools in Namaqualand, "has engaged the Administration's attention for some time".[312] He continued:

> "The inadequacy of the water supply for the ordinary domestic purposes of the Soebatsfontein School is a real menace and source of danger to the children. The conditions at the school and boarding house are regarded as being so serious that unless something is done immediately to provide a proper water supply, there is a danger of a serious outbreak of sickness amongst the children. It is therefore considered that a borehole should be sunk as soon as possible."[313]

Thus far the letter contained no extraordinary information. The school had an inadequate water supply which, if left unremedied, could lead to serious disease. The administration rightfully proposed something be done as soon as possible.

However, the letter then goes on to state that the Director of Irrigation had been approached two years prior with a request for a drilling machine to proceed to Soebatsfontein to undertake the necessary drilling operations there. The Department was then informed that the machine had a definite programme to fulfil, which it thought would be engaged until July 1926. This was not the case, though. Through "exceptional bad luck experienced with operations for a Mr. S. Miller, where, instead of one borehole being drilled, several have had to be put down".[314] This meant that by 1927, the date of the mentioned letter, a proper water supply for the school had still not been provided. It took another two years before a borehole was drilled to provide water to the school.

From the time of the request for a proper supply of water to the boarding house children in 1925, it took four years before the borehole was eventually drilled in 1929. When the borehole

[312] WCARS, Provincial Administration, Works Department (904 – 1939) (hereafter PAW), "Water supply for Springbok boarding house", 146 SBB72/27.
[313] WCARS, PAW, "Water supply for Springbok boarding house", 146 SBB72/27.
[314] *Ibid.*

was finally sunk, the water pressure and quality was good enough for all intended purposes. The depth from the surface at which water was struck in the borehole was 22, 34 and 59 feet. The water filled the borehole to a depth of 15 feet from the surface. The borehole yielded an estimated 20 000 gallons of water per 24 hours.[315] A borehole penetrates through various layers of rock and soil. Dispersed in between these layers of rock, ground water is found. It is therefore possible, as was the case with borehole no. 13169, that groundwater could be present at different depths. Once such a borehole is drilled, the water seeps from the various layers into the shaft.[316]

Figure 51: Springbok in 1933. Source: Dutch Reformed Church Namaqualand Church Office and Archive in Springbok (hereafter DRCN), Notuleboek van Namaqualand 1832 – 1952, "Notule Kerkraad: Namakwaland", 12/12/1934.

[315] WCARS, PAW, "Water supply for Springbok boarding house", 146 SBB72/27.
[316] Dutch Reformed Church Namaqualand Church Office and Archive in Springbok (hereafter DRCN), Notuleboek van Namaqualand 1832 – 1952, "Notule Kerkraad: Namakwaland", 12/12/1934.

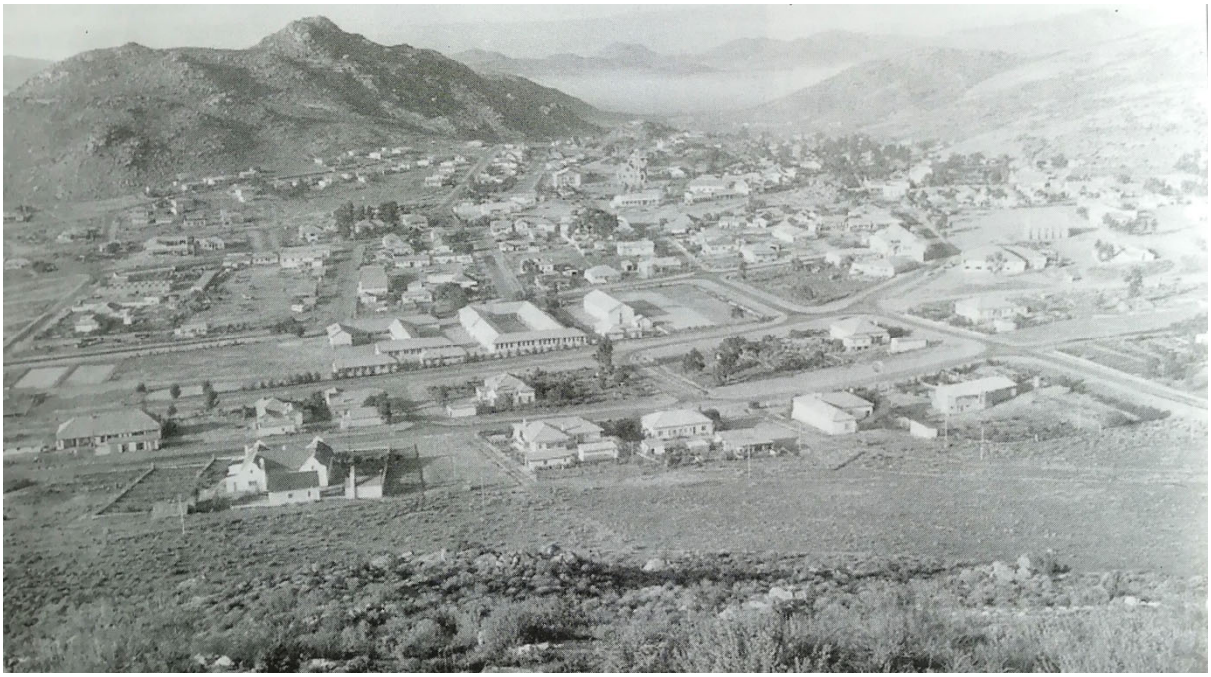

Figure 52: Springbok in 1963. Source: DRCN, Notuleboek van Namaqualand 1832 – 1952, "Notule Kerkraad: Namakwaland", 24/2/1963.

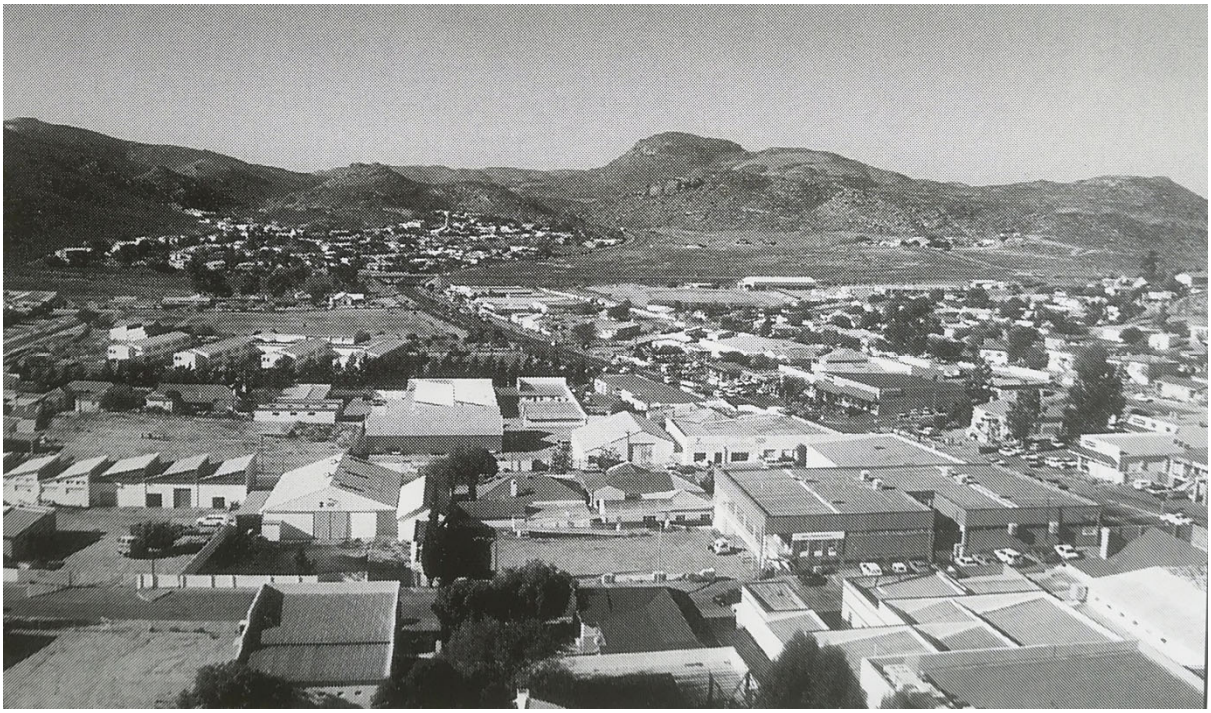

Figure 53: Springbok in 2000. Source: DRCN, Notuleboek van Namaqualand 1832 – 1952, "Notule Kerkraad: Namakwaland", 24/2/1963.

The case study of Springbok depicts the slow and difficult pace of water development in the interior of South Africa. The location of the town was initially brought to the attention of colonial authorities in the 17th century with the Dutch expeditions in search of mineral deposits. The process to establish the town stretched from 1660 to 1862. It took two hundred years from the first European penetration of the territory to the official demarcation of a small town in 1862, but the development of infrastructure was almost non-existent at the time. This case study illustrates the immense struggle, and frustration, of extracting water for the town's inhabitants. The development of the area around the fountain, the use of prisoners to transport water into the town, and the extremely long period it took to install a pump all testify to the lethargic pace of development in the town.[317] The colonial administration seemed rather unenergetic and lethargic in its response to the needs of this remote town. Because of the remoteness of the town supplies took very long time to arrive, even if it meant that the school's boarding house was deprived a safe water supply for a procrastinated period of time.

4.2.3 Loxton

Figure 54: Original hand pump and irrigation channel in the back. Source: Author's own.

Water provision to the town of Loxton differs from the previous case studies in the sense that its water infrastructure did not change much in more than 100 years of existence. The water history of Loxton is therefore reminiscent of many other smaller towns and hamlets of similar

[317] DRCN, Notuleboek van Namaqualand 1832 – 1952, "Notule Kerkraad: Namakwaland", 24/2/1963.

size in Boesmanland. Loxton was founded in 1899 as a new Dutch Reformed parish to serve the sheep-farming community of the surrounding area on the farm Phezantefontein (meaning pheasant spring). This farm was located on an ancient riverbed. The river no longer flowed but created a chalk bank on which the town was built. The dry riverbed was located on the east-north-eastern side of the town, and this is also the location of the town's fountain. This spring has not ceased to flow since its discovery by Europeans. The water from the spring ran directly into a wooden pipe laid 1.5m to 2m underground, and stretched about 600m into town, where a hand pump was installed on what was once the old transport route where it was used to water both horses and people (see figure 53).[318] Land for the village was purchased from Mr A.E. Loxton, after whom the village takes its name, by the Dutch Reformed Church for the sum of £7,500. Loxton contributed £50 to the "sustenance fund" for the new minister of the church. The first church council for the Loxton parish was elected on the day that the new village was established on 12 July 1899. The town's first church building and schoolhouse was built in 1900. A school with 40 children was opened on 13 October 1900. The town became a municipality in 1905 and the Loxton Dutch Reformed Church in the centre of the village was consecrated in 1924.

A dam wall was constructed in 1912 on the same spot as the spring. The dam stored surplus water from the spring, as well as rainwater. Before the dam wall was constructed, a wooden pipe transported the water from the spring to the town. The dam wall was built perpendicular across the pipe, which continued to transport water from the spring as well as rainwater stored by the dam (see Figure 54). The water from the dam was solely used for domestic irrigation purposes, as it was not potable. This wooden pipe transporting the water from the spring and later the dam ran through the dam wall. Sections of the original wooden pipeline were still in use in 2019. A stop valve was installed on the dam wall to regulate the flow of water into the wooden pipe but is no longer operational. By 1924 the water stored in the dam was transported via irrigation furrows running adjacent to some of the town's roads. The town clerk demarcated the furrows, which carried water from the dam into furrows adjacent to the streets. It was the responsibility of individual households to fetch their own water from the furrows. Some properties also had private boreholes with wind pumps.[319]

[318] Personal interview, A. Voster – H.F. Klopper, Stellenbosch, 21 January 2019.
[319] *Ibid.*

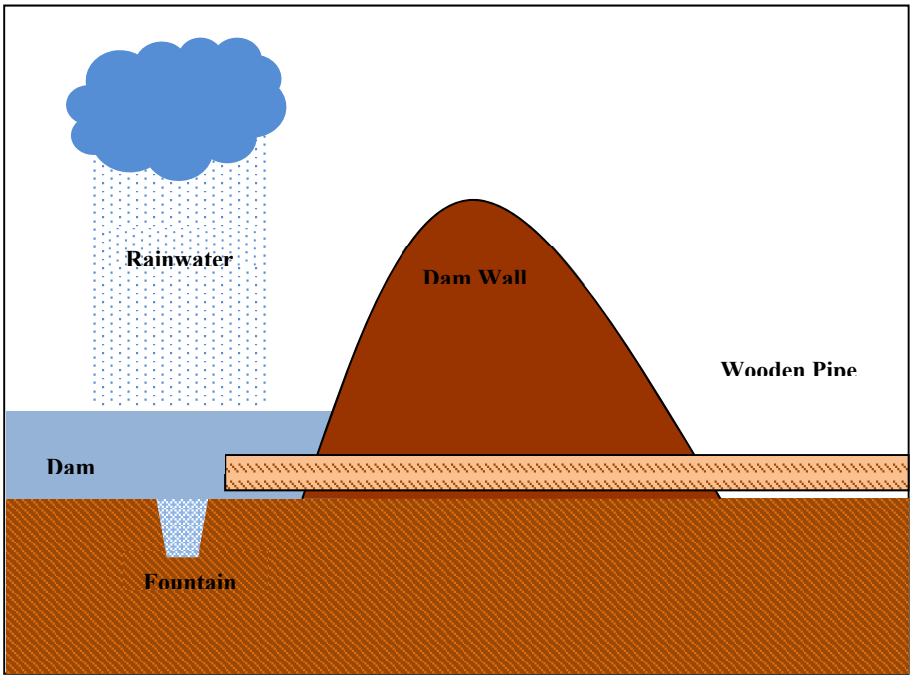

Figure 55: Diagram illustrating the dam wall built over the existing wooden pipe. The dam stores rainwater and water from the spring. Source: Author's own.

The adjacent supply of water, especially on the eastern side of the village, ensured that the plots of land sold in the village could be irrigated. Plenty of trees were planted on the roadsides. Originally pear trees and beef woods were planted along the streets, while cypress trees appeared in the graveyard, which were a feature of many Karoo towns. The plots that were within reach of the irrigation furrows had water rights written into their title deeds. The owners of these properties had to pay a monthly fee, which was R40.00 per plot per month (2018 rates). The Ph-levels of the irrigation water from the spring was higher than the drinking water, which was very alkaline, but, as mentioned, was not sanitary enough to be potable. The high level of calcium in the water caused the pipes to calcify, which in turn caused problems with water pressure. A roster was used to determine the distribution of the irrigation water. This roster ran daily from six a.m. to 11 p.m. At the allocated time the surplus water was channelled to small holdings on the other side of the town. These small holdings did not have water rights, and not all of them could be reached by the irrigation furrows due to the gradient. This led to conflict among the town's inhabitants and remains an ongoing problem. The licence for water distribution was the prerogative of the Loxton municipality, until the municipality closed down in 2010. The new Ubuntu Municipality, with its seat in Victoria West, 80 km from Loxton, is now responsible for the distribution of water in the latter town.

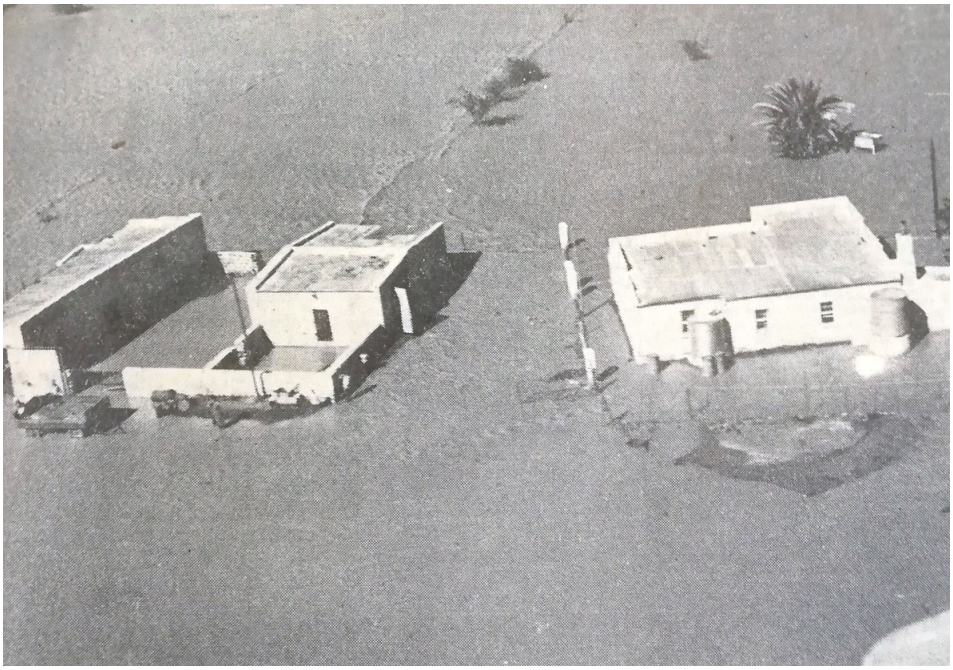

Figure 56: The Loxton flood of 1961. Source: Die Burger, 29 March 1961, p.1.

Figure 57: An aerial view of the Loxton flood of 1961. Source: Die Burger, 29 March 1961, p.8.

Figure 58: A bridge destroyed by the Loxton floodwater. Source: Die Burger, 29 March 1961, p.1.

In March 1961, after a prolonged drought, heavy rainfall, reportedly 125mm in five days, followed by another 125mm in one night, caused the town's dam wall to break. Before the dam wall collapsed, the water level rose enough for the sluices to be opened for the first time in eleven years.[320] On a nearby farm, Rooivlakte, owned by Andries Wiese, another dam wall also collapsed, adding to the disastrous impact of the flood sweeping through Loxton. Debris from the village was even found on the farm Visgat 20km beyond Loxton. Buildings in the village suffered severe damage and eleven houses were destroyed.[321] Alewyn Vorster is the last living survivor of the flood, who was three years old at the time. His father was the village telephone operator, who was tasked to inform all residents to evacuate to higher ground. He was thus the last person to leave the town. The town was then cut off from any communication with the outside world for three days at the time. Heavy rainfall caused floods across the region which was extensively covered by *Die Burger*. The newspaper initiated a disaster fund in aid of the victims of the flood, and the then Department of Water Affairs rebuilt the dam in 1963, this time with an extra safety wall.[322]

[320] "Carnarvon se stryd teen vloedwaters", *Die Burger*, 22 March 1961, p. 4.
[321] "Karoo - South Africa" [Online], https://www.karoo-southafrica.com/wp-content/uploads/2014/01/Loxton13.jpg [Accessed: 15 October, 2018].
[322] Personal interview, A. Vorster – H.F. Klopper, Stellenbosch, 21 January 2019.

Figure 59: The collapse of Loxton dam wall. Source: Die Burger, 29 March 1961, p.9.

Figure 60: Another aerial view of the Loxton flood of 1961. Source: Die Burger, 29 March 1961, p. 9.

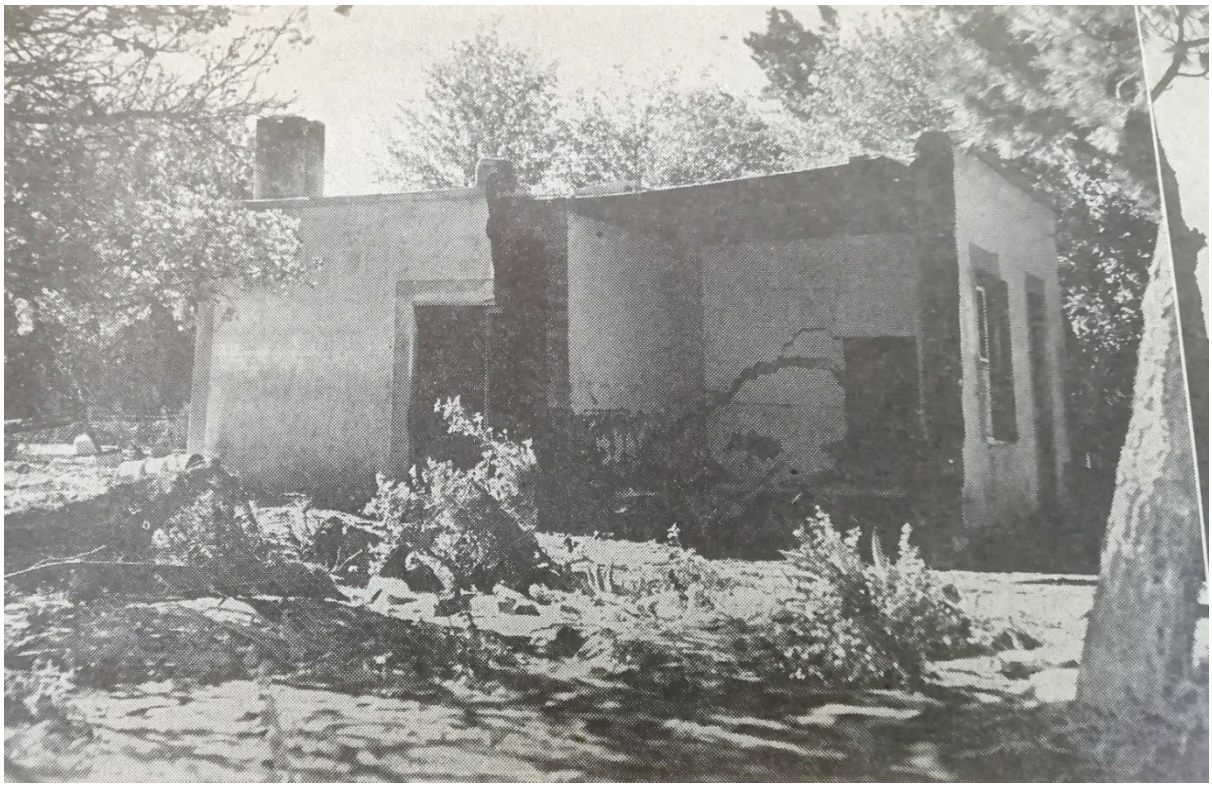

Figure 61: Floodwater damage to buildings. Source: Die Burger, 30 March 1961, pp. 8-9.

Figure 62: The Loxton flood of 1961 seen from eyelevel. Source: Die Burger, 30 March 1961, pp. 8-9.

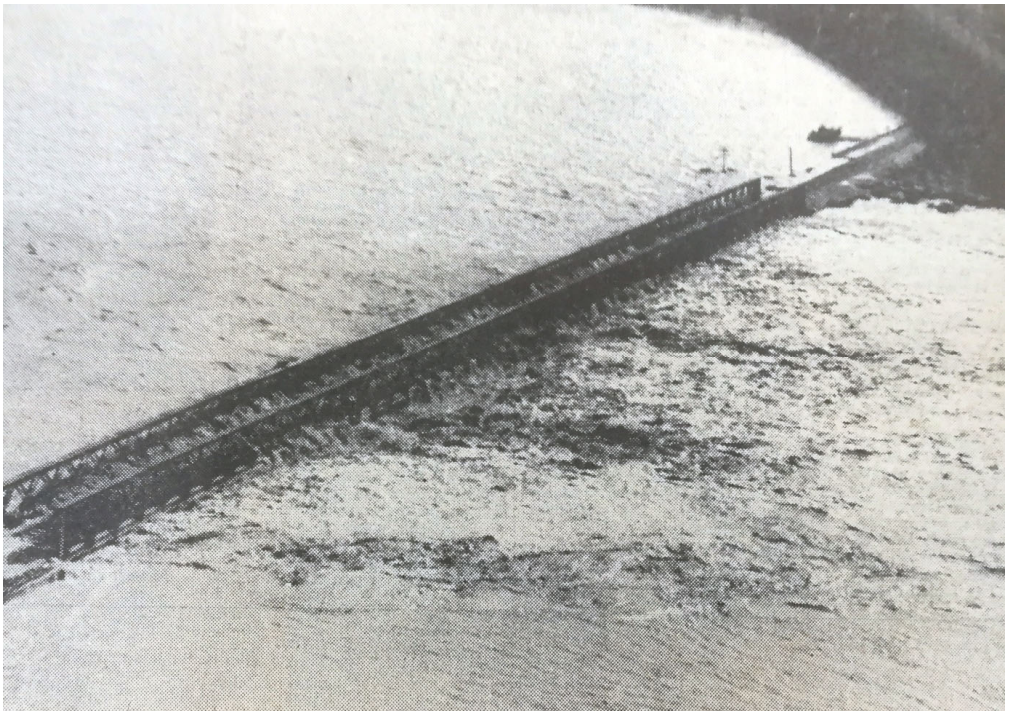

Figure 63: Floodwater sweeping through a railway bridge. Source: Die Burger, 30 March 1961, pp. 8-9.

Four boreholes were drilled to supplement Loxton's potable water supply in 2015. One was located near the road coming into the village from Victoria West, one behind the dam wall, another next to the road leading to Beaufort West, and the fourth near the refuse removal plant. Electric pumps were used to extract the water from the boreholes. Initially the water from these boreholes were stored in a reservoir with a filtration system, but at present (2019) four 10 000 litre water tanks are in use to accumulate the water before being pumped into a pipe reticulation system which provides running water to the town's inhabitants.[323]

The village of Loxton is a typical case study of the development of water provision to small Boesmanland towns. Each town has its own variables and eccentricities in terms of water provision, but there are distinct commonalities. The main reason for Loxton's settlement was to establish a church parish for surrounding farms. The closest neighbouring town, Victoria West, being 80km away, made regular church attendance there a real test of faith. Loxton never became a large industrial town but was surrounded by large commercial farms none the less. The presence of a spring at the location chosen for establishing a town is also in keeping with the trend in many other Boesmanland towns, which were mostly founded close to a spring, with boreholes as added supplements for a growing population.

[323] Personal interview, A. Vorster – H.F. Klopper, Stellenbosch, 21 January 2019. Also see Figures 64 and 65 on pages 121 and 122.

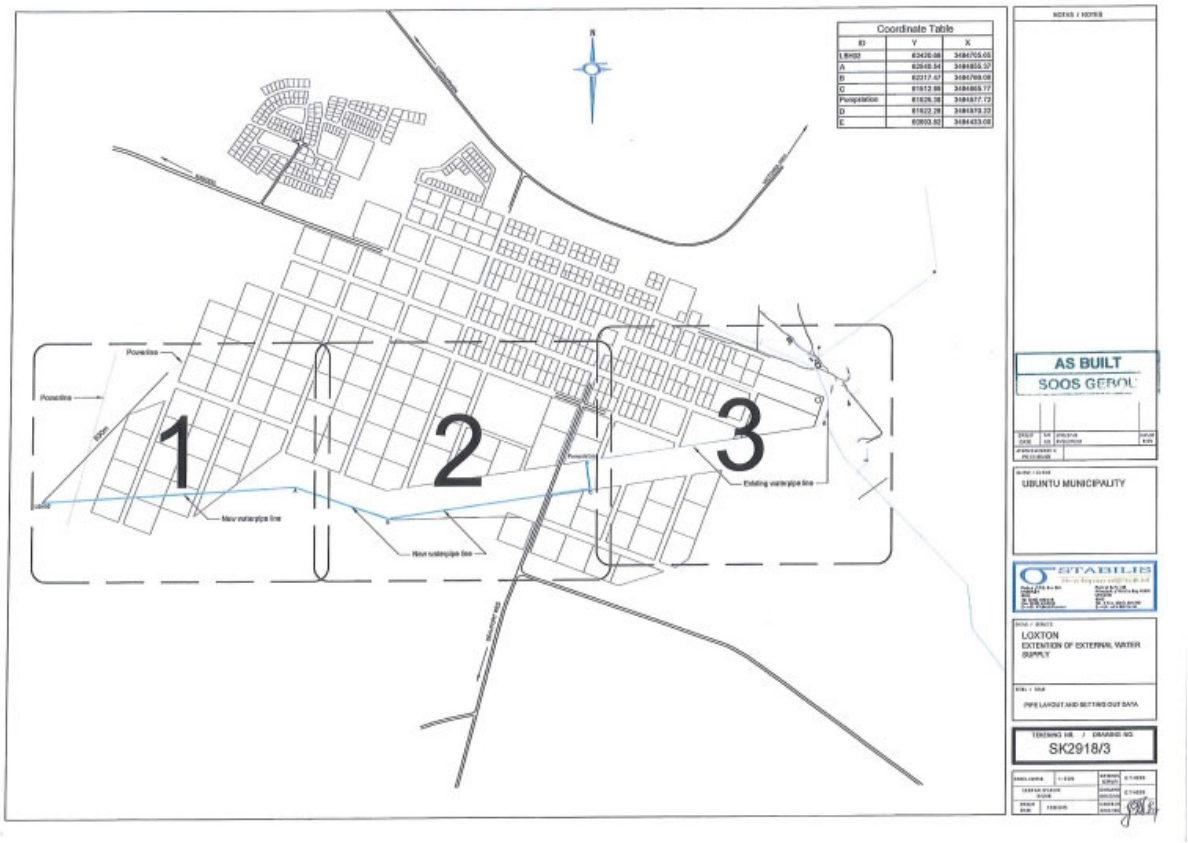

Figure 64: Extensions of Loxton Water Supply, 2015. Source: SAHRIS, [Online],*NEMA Section 24 G Rectification Process for the already established Loxton Low Cost Housing Development of approximately 26.6 ha on Portions of Erven 582, 545 and 533 Loxton, Northern Cape Province,* https://sahris.sahra.org.za/cases/nema-section-24-g-rectification-process-already-established-loxton-low-cost-housing [Accessed 28 May 2019].

One cannot read about Loxton's past without taking cognisance of the collapsed dam wall causing the flood of 1961. The eleven homes destroyed are perhaps placed into context by the fact that the permanent population of Loxton in 2018 was a mere 65. Eleven houses were therefore a large proportion of the town's entire buildings. Two salient features predominate over the case study of Loxton, the first being specific to Loxton, and the other a growing concern of many Boesmanland towns. In terms of water history Loxton is a Boesmanland town, because much of its original water infrastructure is still in use and clearly visible in the town. There are complaints that the water furrows and the historic wooden pipeline are not being maintained properly, but these structures remain partly in use for the time being. As a result of the village's small population the relative simple water distribution system was adequate to supply water up to the present (2019).

However, there are challenges similar to the more universal water problems faced by many Boesmanland towns. In many of these towns there is a growing hostility among the inhabitants regarding water supply. With aging infrastructure, prolonged droughts and growing

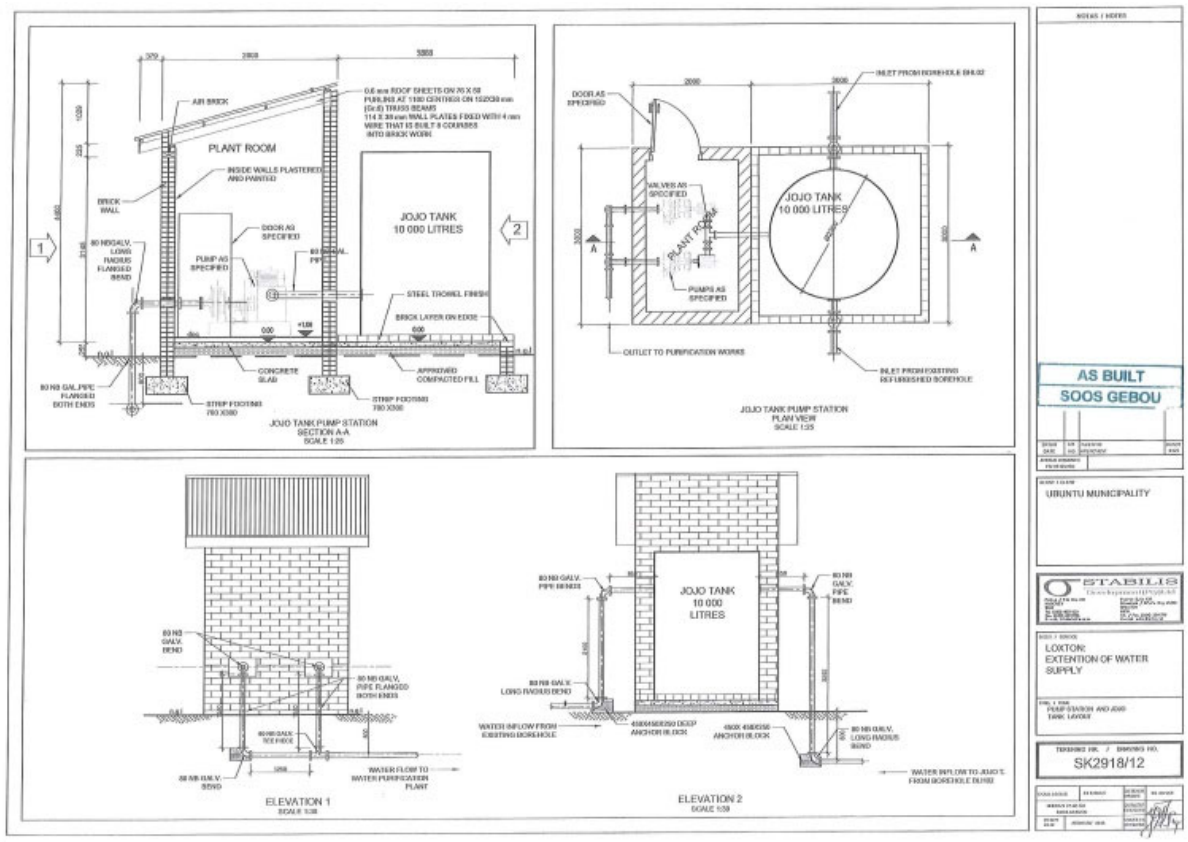

Figure 65: Schematics for the water tanks installed to store water for Loxton public supply, 2015. Source: SAHRIS, [Online],*NEMA Section 24 G Rectification Process for the already established Loxton Low Cost Housing Development of approximately 26.6 ha on Portions of Erven 582, 545 and 533 Loxton, Northern Cape Province,* https://sahris.sahra.org.za/cases/nema-section-24-g-rectification-process-already-established-loxton-low-cost-housing [Accessed 28 May 2019].

populations, many Boesmanland towns do not enjoy a seamless, uninterrupted water supply anymore and an analysis of the various factors contributing to the growing problem could provide valuable insights into water procurement efforts in rural South Africa in the 21st century.

4.3 Conclusion

This chapter discussed at the development of three Boesmanland towns and the process of water provision to each. Carnarvon, Springbok and Loxton were selected for the interesting and unique attributes each presents, but more importantly, they are good examples of the water histories of typical Boesmanland towns. The three case studies provide a fair cross section of towns in the area under investigation.

There are distinct similarities between the three towns, in terms of identifying typical Boesmanland town development, despite their varying water developmental histories. The first water source available near the place where Carnarvon would be founded was a fountain at

Schietfontein mission station. This was later supplemented by private wells and boreholes on the properties of the growing population. Municipal boreholes were later drilled, and water stored in a reservoir, linked to the town via an expanding pipeline reticulation system. The water history of Carnarvon illuminates the life-sustaining impact of boreholes in an otherwise arid region. This water supply, however, has not always been without challenges, as water levels fluctuate according to droughts and rainy seasons.

Springbok too was built on the location of a natural fountain. This case study explored the incredibly slow pace of development of the infrastructure around the fountain, as well as the provision of additional boreholes, water tanks and pumps to the town. The communication with the colonial administration and later Cape provincial administration highlights the often frustrating process of development in a remote Boesmanland town. Despite the presence of mining activity in the area, every new development in the town took years to complete from an initial suggestion to being fully operational, in which the limited availability of potable water played an inhibiting role.

Also, Loxton, as the smallest town of the three case studies had a fountain as its prime water source. The fountain remains a source of irrigation for the inhabitants today (2019). A dam wall was constructed in 1912 for the purpose of storing water from the fountain as well as rainwater. When the wall collapsed in 1961 after heavy rainfall, Loxton was inundated with floods, which destroyed many buildings. However, with the rebuilding of the town much of the original water supply infrastructure remained in use until the present time (2019), with extensions added to the supply scheme in 2015. As the town's population grew four boreholes were drilled to augment the supply of drinking water.

The salient feature which predominated over all three towns was the fundamental role of the extraction of groundwater sources. The three case studies exemplified the common presence of a fountain at the location of Boesmanland towns, and the subsequent use of boreholes to supply water to the growing populations. The settlement of humans in this area would therefore have been impossible without the extraction of groundwater sources. This conclusion echoes Van der Merwe's findings in *Pioneers van die Dorsland*. This study also added to his observations of the region by exploring the three case studies mentioned above. The town histories also provide examples of water extraction and utilisation in Boesmanland beyond the period of Van der Merwe's studies.

CONCLUSION

At the beginning of this study a few questions were asked about Boesmanland. These questions included: When did people begin to inhabit Boesmanland. How did people survive in this arid landscape and which factors made it possible? How did the availability or non-availability of water affect the mobility and patterns of settlement of people in the area? During the course of this study these themes were explored to get a better understanding of this area that is often shrouded in mystery by the popular imagination. Though not without mystery and intrigue, Boesmanland proves to be a place where reality is often more prevalent than the ideal.

In Chapter One the ecological conditions of Boesmanland were described. It became clear that despite high quality vegetation for the rearing of small livestock, a lack of surface water made the permanent utilisation of large sections of the area impossible for agricultural purposes. With the relatively low annual rainfall, perennial subsistence was not possible until the technology to tap into the underground aquifers arrived. This did not prevent humans from moving through the area. Hunter-gatherer groups lived in the area for thousands of years. Artwork made by these groups dates back 10 000 years and the use of ochre 8000 years. This district was inhabited by Khoisan, who highly valued the fountains on their hunting grounds. There they obtained drinking water and stalked game. When the trekboers and 'Basters' tried to occupy this water, the Khoisan consequently reacted with violence and aggression. Until now, however, the history of water appropriation and exploitation in this region has largely been neglected by historians.

Khoisan moved through Boesmanland in small groups for thousands of years but could not permanently settle in fixed locations for long periods of time due to a need to find water and food sources elsewhere. As European trekboers entered the area sporadically since 1760, the groups mixed and a new group of 'Basters' developed. These trekboers did not settle in one place either. It was only when the British began selling off crown land and serious prospecting for water started, that private ownership of farms became prevalent and sustainable.

In Chapter Two the process of dividing and allocating crown land was discussed. In 1760 the first farms in Boesmanland were allocated near the Kammies Mountains. It marks the beginning of expansion and permanent human settlement in Boesmanland, and thus the starting date for this study. From this time onwards wells were dug and later boreholes drilled to develop farms. The study showed the process of applying for grazing rights and water

prospecting rights. It also became clear that the colonial and later provincial administrations were often a hindrance rather that an aid to the development of the distant region. This meant that administrative guidelines sometimes prohibited large tracks of land from being cultivated. Farmers spent a substantial amount of time, labour and money on digging wells and later drilling boreholes on their farms. The amount of money spent on water prospecting often exceeded the original purchase price of a farm because the land was useless for permanent settlement without reliable, permanent water sources. The original initiative for drilling boreholes came after the successful exploitation of artesian groundwater in Queensland, Australia. The presence of dolerite formations in both South Africa and Australia lead early geologists to believe that the two countries would have similar groundwater systems. By discussing the Australian groundwater system and focussing on the Great Artesian Basin, it became evident that, despite some similarities in geological features like aridity, the countries are not the same. South Africa does not have a large underground basin on the same scale as Australia. Boreholes are still incredibly important in South Africa, but the yield is much smaller than that of Australia.

The third chapter describes the immense effort involved in digging the first wells in South Africa, and thus the remarkable progress the introduction of the drill machines brought. The importance of this technology in the unlocking of Boesmanland for permanent settlement cannot be overstated. With the introduction of drill machines and boreholes, came the humble yet momentous wind pump. Many methods of water extractions were used before this, but nothing changed the face of Boesmanland on such a large and lasting scale as wind pump technology. This piece of technology only underwent minor changes since its invention, making it a simple yet effective solution to lift groundwater in relatively large quantities to the surface. Drill machines must be operated by technicians, which subsequently lead to a new type of Boesmanland nomad: the *boorman*. These drill machine operators travelled across Boesmanland to unlock the subterranean water sources vital to agricultural success. An interview with Leon Swanepoel provided insight into the life and times of drill machine operators and wind pump technicians. Drill machine operators with high success rates in finding strong water sources became quasi-prophets to locals desperate for sustainable water. Boesmanland farmer, André Venter, explained the lived experience of Boesmanland farmers in the quest to find sufficient water for livestock rearing. He also explained the technical aspects of the different types of drill machines and their parts. Some of this technology, such as the

jumper drill, is quickly becoming extinct. Codifying the operational aspects, challenges and capabilities of this technology preserves it for the future.

In Chapter Four three case studies of towns were discussed. The town of Springbok provided an example of the tedious process to install small infrastructure like water tanks and pumps at the beginning of the twentieth century. This proved to be laborious as they were weighed down by administrative protocol and challenges posed by the distance between the town and Cape Town. The real consequence of this meant unsanitary conditions, unproductive modes of operation and uncertainty about the availability of water for the residents and had an arresting effect on the general development of the town. The case study of Carnarvon, in turn, showed the development of a typical Boesmanland town; from the role of the divisional council to the design of water delivery systems to the entire town. This illustrated how a small town with limited water resources designed and implemented infrastructure to provide water certainty to its population. The personal interview with Louisa Hendriks, resident of Schietfontein and descendent of one of the first inhabitants, confirmed the evidence of other sources about the founding of Schietfontein and Carnarvon. This interview was particularly useful in personalising the interaction between the various groups laying claim to Carnarvon in its former years, as well as the government's repeated attempts to ensure land ownership for the Xhosas and 'Basters' in the area.

Loxton differs from the other case studies in the sense that its water infrastructure did not change much in more than 100 years of its existence. The water history of Loxton is therefore reminiscent of many other smaller towns and hamlets of similar size in Boesmanland. The personal interview with Loxton inhabitant Alewyn Vorster provided invaluable insight and details regarding the town in general and its water disaster in particular. His personal account of that disastrous event serves as a valuable cultural narrative of a Boesmanland town.

The relevance of this study is twofold. Firstly, an attempt was made to add to the historiography of a unique and interesting region. With its challenging landscape and unique characters that constitute the population, Boesmanland and its relationship with water is worth studying in its own right. Apart from its historical interest, this study is also relevant to current affairs. With a national drought lingering in South Africa, the topic of water and the way humans exploit it, becomes more relevant than ever. South Africa is a largely arid country with a growing population. Formerly water-rich areas, such as the Western Cape, are struggling to provide water for its growing economy and residents.

Even though Boesmanland has a different geographical landscape and ecological context in comparison with the rest of the country, it can provide an example of how to the respond to a lack of easily accessible water sources. Providing adequate water to a community takes time, effort, skill, money and patience. Perhaps the most difficult lesson to learn from the Boesmanland example is to accept that sometimes there simply is no more water available. In a world of limitless digital storage space and perpetually updating devices we might find it difficult to accept that certain basic natural resources, such as water, is finite and non-renewable.

In many Boesmanland towns there is a growing hostility amongst the inhabitants regarding the availability or unavailability of a water supply. With aging infrastructure, prolonged droughts and growing populations, many Boesmanland towns do not enjoy a seamless, uninterrupted water supply anymore and an analysis of the various factors contributing to this growing problem could provide valuable insights into water procurement efforts in rural South Africa in the 21st century. During this study it became clear that growing populations in Boesmanland towns were not the result of a better utilisation of natural resources or economic development of these towns, but rather political factors such as the distribution of social grants. This seems to lead to an artificial increase in populations, without the natural and economic resources to support them. This phenomenon falls outside the scope of this study but would hugely benefit from further scientific investigation.

The final conclusion of this study is thus that Boesmanland was not an inviting terrain waiting to be conquered. The reason why people only moved through the region sporadically, never staying long enough to leave much of a trail, was that it simply was not possible. As drill machine technology advanced and became more readily available, the possibility of permanent settlement presented itself for the first time. But not without immense effort and the tenacity of the people who made this parched land their dwelling place. The towns and farms of Boesmanland slowly developed into sustainable and permanent settlements via the use of groundwater, but this development was limited by the scarcity of this vital resource and the difficulty in extracting it. Groundwater is thus the *raison d'être* for permanent human settlement in Boesmanland, but also the biggest challenge for continued human existence there.

BIBLIOGRAPHY

LITERATURE

1. Published Books

Acocks, J., *Veld Types of South Africa,* Third Edition, Research Institute for Botany, Pretoria, 1988.

Adhikari, M., *The Anatomy of a South African Genocide: The Extermination of the Cape San Peoples,* University of Cape Town Press, Cape Town, 2010, p. 85.

Allen, M.E., *Cleansing the City: Sanitary Geographies in Victorian London*, Ohio University Press, Athens, 2008.

Anon., *Atlas of Southern Africa*, Reader's Digest Association, Cape Town, 1984.

Anon., *First Inquiry Into Poverty*, Carnegie Corporation Oral History Project, Columbia University Libraries, New York, 2006.

Anon., *Geological Map of South Africa, Lesotho and Swaziland,* Council for Geoscience, Geological Survey of South Africa, Pretoria, 1970.

Anon., *Oxford English Dictionary*, Third Edition, Oxford University Press, Oxford, 2005.

Anon., *Reader's Digest Illustrated Guide to Southern Africa*, Fifth Edition, Reader's Digest Association of South Africa Pty. Ltd., Cape Town, 1984.

Anon., *Standard Encyclopaedia of Southern Africa,* Volume 3, University of California Press, Berkeley, 1971.

Anon., *Proceedings of the Royal Colonial Institute: The Railway System of South Africa*, Royal Colonial Society, London, 1898.

Barrows, W.J., *An Account of Travels into the Interior of Southern Africa in the years 1797 and 1798*, G.F. Hopkins, London, 1802.

Beck, R.B., *The History of South Africa*, Greenwood Publishing Group, Westport, Connecticut, 2000.

Blakeway, O.M., "Namaqualand Letter Book", in G.M. Theal, *The History of South Africa from 1873 to 1884: Twelve eventful years*, George Allen & Unwin Ltd, London, 1919.

Boonzaaier, E., Malherbe, C., Berens, P. & Smith, A., *The Cape Herders: A History of the Khoikhoi of Southern Africa*, David Philip, Cape Town, 1996.

Borcherds, P.B., *An Auto-Biographical Memoir*, Eureka, Cape Town, 1963.

Brown, J.C., *Hydrology of South Africa*, John Crawford Publishing, Kirkcaldy, 1875.

Bulpin, T.V., *Discovering Southern Africa*, Discovering Southern Africa Productions, Muizenberg, 1992.

Burchell, W.J., *Travels in the Interior of South Africa*, Volume 1, G.F. Hopkins, London, 1822.

Burman, J., *Early Railways at the Cape*, Human & Rousseau, Cape Town, 1984.

Conolly, D., *Conolly's Guide to Southern Africa*, Fifth Edition, Conolly Publishers, Scottburgh, 1992.

Corstorphin, G.S., "Geologist Report", *First Annual Report of the Geological Commission*, Department of Agriculture, Cape Town, 1896.

De Beer, H., *'n Storie oor Boesmanland*, SUN Media, Stellenbosch, 2012.

Dubow, S., *Scientific Racism in Modern South Africa*, Cambridge University Press, Cambridge,1995.

Eksteen, B., *BB's van die Boesmanland*, Private Publisher, Bloemfontein, 2005.

Esler, K.J., *et al.,* (reds.), *Karooveld: Ekologie en Bestuur*, Briza Publications, Pretoria, 2006.

Eybers, G.W., *Op die voetspore van die ou reisigers*", Maskew Miller Ltd., Cape Town, 1926.

Ferreira, O.J.O. & Van der Waal-Braaksma, G., *Die Noordweste: Die Stoflike Kultuuruitinge van die streek se bewoners*, Perskor, Johannesburg, 1986.

Floyd, T., *Town Planning in South Africa*, Shuter & Shooter, Pietermaritzburg, 1960.

Füredi, F., *The Silent War: Imperialism and the Changing Perception of Race*, Rutgers University Press, New Brunswick,1998.

Green, L.G., *Karoo*, H.B. Timmins, Cape Town, 1955.

Harrington, N. & Cook, P., *Groundwater in Australia*, National Centre for Groundwater Research and Training, Bedford Park, 2014.

Herbst, R.O., "Die Rynse Sendinggenootskap en die Kareebergbasters, met spesiale verwysing na die Amandelboomsendelinge, 1845-1860", Ongepubliseerde MA-tesis, Universiteit Stellenbosch, 2004.

Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G., *Roberts Birds of Southern Africa*, Seventh Edition, Trustees of the John Voelcker Bird Book Fund, Cape Town, 2005.

Horace, *The Satires of Horace*, University of Pennsylvania Press, Philadelphia, 2008.

Husselman, H., *Die Burger*, Oktober 2001, in H. De Beer, "*'n Storie oor Boesmanland*", SUN Media, Stellenbosch, 2012.

Kasrils, R., *Speech at Annual General Meeting of the Borehole Water Association of Southern Africa,* Borehole Water Association of Southern Africa, Johannesburg, 25 May 2000.

Kiple, K.F. & Ornelas, K.C., (eds.), *The Cambridge World History of Food.* Volume 1, Cambridge University Press, Cambridge, 2000.

Kitshoff, M.C., *Kudde van Carnarvon: Nederduitse Gereformeerde Kerk, 1874 – 1974*, Citadel Press, Kaapstad , 1974.

Kolbe, P., *Nieuwe algemene beschryving van de Kaap de Goede Hoop*, Petrus Conradi, Amsterdam, 1777.

Kotze, G.J., *Die Anglo-Boereoorlog in Namaqualand*, Private Publisher, Springbok, 1999.

Le Goff, J., *History and Memory,* Columbia University Press, New York, 1992.

Lewis-Williams, D. & Dawson, T., *Images of Power: Understanding San Art*, Southern Book Publishers, Halfway House, 1989.

Lichtenstein, H., *Travels in Southern Africa, 1803-1806*, Van Riebeeck Society, Cape Town, 1928.

Macdonald, W., *The Conquest of the Desert*, T. Werner Laurie Ltd., London, 1913.

Moodie, D., *The Record, or a Series of Official Papers Relative to the Conditions and Treatment of the Native Tribes of South Africa 1838-42*, Vol. 12, A.S. Robertson, Cape Town, 1960.

Nel, D.W., *Karoo Kaleidoscope: A Historic Perspective,* Private Publisher, Carnarvon, 2015.

Norman, N. & Whitfield, G., *Geological Journeys*, Struik Publishers, Cape Town, 2006.

Oberprieler, U. & Cillié, B., *Raptor Identification Guide for Southern Africa*, Rollerbird Press, Pinegowrie, 2002.

Olley, J., *Human- and Animal-Powered Water Lifters for Irrigation Practical Action*, The Schumacher Centre, Rugby, UK, 2008.

Palmer, E., *The Plains of Camdeboo*, Fontana/ Collins, London, 1966.

Parkington, J., *"*Kabbo's Sentence*"* in P. Skotnes (ed.), *Claim to the Country: The Archive of Wilhelm Bleek and Lucy Lloyd*, Jacana, Cape Town, 2007.

Parsons, R., *Geological Survey of South African Groundwater Sources*, Water Research Commission, Pretoria, 1989.

Penn, N., *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*, Double Storey Books, Cape Town, 2005.

Pink, B., *Australia's Environment: Issues and Trends*, Australian Bureau of Statistics, Belconnen, 2007.

Potgieter D.J. & Du Plessis, D.C., *Standard Encyclopaedia of Southern Africa*, Vol. 6, Nasou, Cape Town, 1972.

Pretorius, M.E., *Pretorius: Through three centuries, 1600-1900*, Private Publisher, Pretoria, 1992.

Raper, P.E., *Streekname in Suid-Afrika en Suidwes: Naamkundereeks Nr.*, Tafelberg, Kaapstad, 1972.

Raven-Hart, R., *Before Van Riebeeck*, Struik Publishers, Cape Town, 1967.

Rossouw, H.A., *Namakwalandse Kroniek*, UUB, Stellenbosch, 1973.

Scully, W.C., *Lodges in the Wilderness*, H. Jenkins, London, 1915.

Simons, P.B., (ed.), *John Blades Currey 1850-1900*, Brenthurst Press, Houghton, 1986.

Skotnes, P., *Claim to the Country: The archive of Wilhelm Bleek and Lucy Lloyd*, Jacana, Cape Town, 2007.

Slater, D. & Taylor, P.J., *The American Century: Consensus and Coercion in the Projection of American Power*, Wiley, New York, 1999.

Smalbergen, J.M., *Aspects of the History of Copper Mining in Namaqualand*, University of Cape Town Press, Cape Town, 1969.

Smith, N., *Man & Water: A history of hydro-technology*, Peter Davies, London, 1975.

Solomon, S., *Water: The epic struggle for wealth, power and civilization*, Harper Perennial, New York, 2010.

Stevenson, A. (ed.), *Oxford Dictionary of English*, Third Edition, Oxford University Press, Oxford, 2010.

Stoler, L.A. (ed.), *Haunted by Empire: Geographies of Intimacy in North American History*, Duke University Press, Durham, 2006.

Strassberger, E., The *Rhenish Mission Society in South Africa, 1830-1950*, Struik Publishers, Cape Town, 1969.

Stuart, C. & Stuart, T., *Field Guide to Mammals of Southern Africa,* Struik Publishers, Cape Town, 2007.

Thom, H.B., *The Journal of Jan van Riebeeck*, Vol. 1, A. A. Balkema, Cape Town, 1952.

Toynbee, A.J., *A Study of History: Abridgment of Volumes I – VI*, Oxford University Press, London, 1974.

Tvedt, T. & Jakobsson, E. (eds.), *A History of Water: A World of Water*, I.B. Tauris & Co. Ltd., London, 2006.

Tvedt, T. & Jakobsson, E., (eds.), *A History of Water: Water Control and River Biographies*, I.B. Tauris & Co. Ltd., London, 2006.

Van der Merwe, G., *Kroonjuweel van Namakwaland: Ned. Geref. Gemeente Namakwaland in Springbok, 1850-2000*, GLF Drukkers, Bloemfontein, 2000.

Van der Merwe, P.J., *Die Noordwaartse Beweging van die Boere voor die Groot Trek, 1770-1842*, W.P. Van Stockum en Zoon, Den Haag, 1937.

Van der Merwe, P.J., *Pioniers van die Dorsland*, Nasionale Pers, Kaapstad, 1941.

Van der Stel, S. & Pheiffer, R.H, (eds.), *Simon van der Stel's Journey to Namaqualand in 1685*, Human & Rousseau, Cape Town, 1979.

Van Tonder, G., *Karoo Groundwater Atlas*, SRK Consulting, Cape Town, 2012.

Vedder, H., *The Native Tribes of South West Africa*, Cape Times Ltd., Cape Town, 1928.

Venter, F.A., *Water*, Afrikaanse Pers-Boekhandel, Pretoria, 1970.

Vince, J., *Power Before Steam*, John Murray Publishers Ltd., London, 1985.

Wallace, R., *Farming Industries of the Cape Colony*, G.F. Hopkins, London, 1896.

Walton, J., *Watermills, Windmills and Horse-mills of South Africa*, Human & Rousseau, Cape Town, 1974.

Walton, J., *Wind pumps in South Africa*, Human & Rousseau, Cape Town, 1998.

Waterhouse, G., *Simon van der Stel's journal of his expedition to Namaqualand 1685-6*, Hodges & Figgus, Dublin, 1932.

Wilson, M. & Thomlinson, L., (eds.), *The Oxford History of South Africa*, Clarendon Press, Oxford, 1969.

Worster, D., *Rivers of Empire: Water, Aridity and the Growth of the American West*, Oxford University Press, Oxford, 1992.

Young, W.J. (ed.), *Rivers as Ecological Systems: The Murray-Darling Basin*, Murray-Darling Basin Commission, Canberra, 2001.

2. Journal Articles

Anderson, E., "A History of the Xhosa of the Northern Cape 1795-1879", *University of Cape Town Centre for African Studies,* 12, 1987, pp. 112-113.

Archer, S., "Technology and Ecology in the Karoo: A Century of Windmills, Wire and Changing Farming Practice", *Journal of Southern African Studies*, 26 (4), 2000, pp. 675-696.

Bordy, E.M. & Prevec, R., "Sedimentology, palaeontology and paleo-environments of the Middle to Upper Permian Emakwezini Formation (Karoo Supergroup, South Africa)", *South African Journal of Geology*, 111, 2008, pp. 429-456.

De Prada-Samper, J.M., review essay "The forgotten killing fields: "San" genocide and Louis Anthing's mission to Bushmanland, 1862-1863." *Historia*, 2012, 57 (1), pp.172-187.

Dyson-Hudson, R. & Smith, A.E., "Human territoriality: an ecological assessment", *American Anthropologist*, 1978, 80, p. 36.

Guelke, L. & Shell, R., "Landscape of Conquest: Frontier Water Alienation and Khoi Khoi Strategies of Survival, 1652-1780", *Journal of Southern African Studies*, 18 (4), 1992, p. 820.

Haswell, R., "South African towns on European plans", *Geographical Magazine*, July, 1979, pp.1-8.

Marks. S., "Khoisan Resistance to the Dutch in the seventeenth and eighteenth Centuries", *Journal of African History,* 13, 1972, pp. 55–80.

Moll, J.C., "Dorpstigting in die Oranje-Vrystaat: 1854 – 1864", *Contree,* No. 2, 1977, pp. 23-28.

Musemwa, M., "Flows of Water/ Flows of Power/ Flows of History: Current trends and Transdisciplinary Insights and Future Directions", *South African Historical Journal*, September 2019, p. 11.

Parsons, R., "Geological Survey of South African Groundwater Sources", *Water Research Commission*, 1989, pp. 251-258.

Roos, N., "The Second World War, the Army Education Scheme and the 'Discipline' of the White Poor in South Africa", *History of Education,* 2003, 32 (6), pp. 645–659.

Sahney, S. & Benton, M.J., "Recovery from the most profound mass extinction of all time", *Proceedings of the Royal Society: Biological*, 275 (1636), 2008, pp.759–65.

Schapera, I. & Farrington, E., "The early Cape Hottentots", *Van Riebeeck Society*, 13, 1933, Cape Town.

Smith, A.B., "Environmental Limitations on Prehistoric Pastoralism in Africa", *The African Archaeological Review*, 2, 1984, pp. 99-111.

Tempelhoff, J.N., "Exploring panarchy and social-ecological resilience: Towards understanding water history in precolonial southern Africa", *Historia*, 61 (1), 2016, pp. 76 - 112.

Tempelhoff, J.N., "Historical Perspectives on Pre-Colonial Irrigation in Southern Africa", *African Historical Review*, 40 (1), 2008, pp. 121-160.

Thornton, P.K., "Livestock production: Recent trends, future prospects", *Philosophical Transaction of the Royal Society B*, 365 (1554), 2010.

Turton, D., "War, peace and Mursi identity. In Warfare among East African herders", *Senri Ethnological Studies, (3),* 1979.

Van Sittert, L., "The Supernatural State: Water Divining and the Cape Underground Water Rush, 1891-1910", *Journal of Social History*, 37(4), 2004, pp. 915-937.

Visser, W., "Water as agent for social change, 1900-1939: Two case studies of developmental state approaches in establishing irrigation schemes", *Historia*, 63 (2), Durban, 2018.

Wilson, J.F., "Water Supply in the Basin of the River Orange, or Gariep, South Africa", *The Journal of the Royal Geographical Society*", 35, 1865, pp. 106-129.

3. Newspaper Articles

Advertensie, *Die Landbouweekblad*, No. 729, 27 Maart 1992, p. 19.

"Carnarvon se stryd teen vloedwaters", *Die Burger*, 22 Maart 1961, p. 4.

Nel, W., "Die donkie en bakkiespomp het die Noordweste laat vooruitgaan", *Woon Burger*, 17 Februarie 1996.

"Loxton dam breek", *Die Burger*, 29 Maart 1961, pp.1, 8-9.

"Vloedskade wydverspreid", *Die Burger*, 30 Maart 1961, pp. 8-9.

4. Government Publications

Act 18 of 1882, *Acts of Parliament*, Government Printer, Cape Town, pp. 475-478.

Australia – Our Natural Resources, At a Glance, Department of Agriculture, Fisheries and Forestry, Canberra, 2004.

"Regulations for the Hire of Government Drills for Boring for Water", *Union Gazette*, 15 December 1910, no. 1099, pp. 900-904.

Steward, T., Corstorphin, G.S & Saunders, H., *Report of Sub-Committee on Deep Artesian Well Boring*, *First Annual Report of the Geological Commission*, Department of Agriculture, Cape Town, 1896.

Steward, T., Corstorphin, G.S. & Saunders, H., *Geologist Report*, Department of Agriculture, Cape Town, 1896.

5. Online Sources

"£1 in 1900 → 2017 | UK Inflation Calculator." U.S. Official Inflation Data, *Alioth Finance*, [Online.], https://www.officialdata.org/1900-GBP-in-2017?amount=1 [Accessed 17 May 2018].

ANCOLD (Australian National Committee on Large Dams), [Online.], http://www.ancold.org.au/dam_register.html [Accessed 27 May 2016].

Booth,W. & Tubman, W., "Water Down Under: Understanding And Managing Australia's Great Artesian Basin", [Online.], http://www.environment.gov.au/water/publications/agriculture/great-artesian-basin-managing.html, [Accessed 27 May 2016].

Bureau of Meteorology, *Annual Australian Climate Statement 2005*, [Online.], http://www.bom.gov.au/lam/climate/levelthree/ausclim/zones.htm> [Accessed 27 May 2016].

Goodall, V., "Farmer's Rainfall Data: A Valuable Resource for Studying Changing Trends in Climate", *SAEON* [Online.], http://www.saeon.ac.za/enewsletter/archives/2012/december2012/doc08 [29 August 2017].

"Hydrological Map Series: Distribution of Boreholes", *Department of Water and Sanitation*, [Online.], http://www.dwa.gov.za/Groundwater/hydromaps.aspx [Accessed 28 September 2017].

"Karoo - South Africa" [Online.], https://www.karoo-southafrica.com/wp-content/uploads/2014/01/Loxton13.jpg [Accessed: 15 October, 2018].

Kostka, B., [Online.], "Namaqualand: A short history of nearly everything", http://stripedmouse.com/documents/HistoryofNamaqualand.pdf [Accessed 9 October 2018].

NWC (National Water Commission), *Australian Water Resources 2005*, [Online.], http://www.water.gov.au/WaterAvailability , [Accessed 13 September 2017].

"Shaduf Irrigation", *Alamy*, [Online.], https://www.alamy.com/stock-photo-shaduf-irrigation-na-well-using-shaduf-irrigation-at-the-ancient-city-95558869.html [Accessed 31 January 2019].

Vink, N, "The Global Sheep Industry", *Merino Focus*, [Online.], http://merinosa.co.za/wp-content/uploads/2014/09/globalsheep.pdf [Accessed 1 May 2017].

"Wool Production Since 1910", *Cape Wools SA* [Online.], http://www.capewools.co.za/documentlibrary/wool-production-history [Accessed 14 November 2016].

ARCHIVAL SOURCES

WESTERN CAPE ARCHIVE RECORD SERVICES, CAPE TOWN (WCARS)

Surveyor General Collection

Land Division Regions (LDR)

LDR, "Allotment of Farms", 110 5624/ D1885.

LDR, "Allotment of Farms", 110 5624 / C0166

LDR, "Allotment of Farms", 110 5624/ G1260

LDR, "Allotment of Farms", 110 5624/ G1213

LDR, "Allotment of Farms", 110 5624/ G1260

LDR, "Allotment of Farms", 110 5624/ G2435

LDR, "Allotment of Farms", 110 5624/ G3421

LDR, "Allotment of Farms", 110 5624/ G363/ 9

LDR, "Allotment of Farms", 110 5624/ G363/ 9

LDR, "Prospecting of Farms", 110 5624/ D1283

LDR, "Prospecting of Farms", 110 5624/ D1336

LDR, "Prospecting of Farms", 110 5624/ D1886

LDR, "Prospecting of Farms", 110 5624/ F5816

LDR, "Prospecting of Farms", 110 5624/ F5816

LDR, "Prospecting of Farms", 110 5624/ F6084

LDR, "Prospecting of Farms", 110 5624/ G416/ 09

Department of Lands Collection (LND)

LND, 1/521, L8435, newspaper clipping, publication unknown.

Divisional Council Collection

Carnarvon Municipality Records (CAR)

4/CAR/1/1/1 1382, "Extension of Water Supply Scheme", 1911.

3/CAR, "Notule, Munisipaliteit, Carnarvon", 26/4/1896.
4/CAR 4/1/1, "Regulations for the construction of boreholes on public land", 1926.
4/CAR/1/1/1 1384, "Extension of Water Supply Scheme", 1911.
CARN 12/4/2, "Correspondence Letters, Municipality, Carnarvon", 1881-1883.

Springbok Division Correspondence (SBK)

1/SBK 5/1/14, "Letter Book June 1895", H M Blakeway, Civil Commissioner, Springbokfontein to Under Secretary for Agriculture, 1895.

District Engineer Collection

Public Works Department (PWD)

PWD, "Springbok water pump", 2/5/290 U24 9462
PWD, "Springbok water pump", 2/5/290 13/148/C29
PWD, "Springbok water pump", 2/5/290 4/54D/99
PWD, "Springbok water pump", 2/5/290 U24 9462

PWD, “Springbok water pump”, 2/5/290 U24 T205/9462

Provincial Administration, Works Department Collection, 1904-1939 (PAW)

PAW, “Water supply for Springbok boarding house”, 146 SBB72/27

Cape Colonial Parliament Collection (CCP)

CCP, “Cape of Good Hope, *Report of the Hydraulic Engineer*, 1878-85”, 2/1/68, G27.
CCP, G32-92, 11-12. “Cape of Good Hope, *Report of the Geological and Irrigation Surveyor,* 1878-85”.
CCP, G14-95, 23, “Cape of Good Hope, *Report of the Inspector of Water Drills,* 1894”.

Land Commissioner Collection

Registrar of Deeds, Cape Town Ltd. Co. (1861 – 1942) (LC)

LC, 15/1, 25/1, “Loan Farms Register”.
LC 14/3, “Title Deeds: Harmsfontein”, 1860.

Provincial Administration: Secretariat Local Government Collection, 1902 – 1960 (PAS)

PAS, 2/158, L19E, “Extension of Carnarvon Water Scheme”, 1909.

Cape Provincial Administration, Hospital Department Collection, 1912-1970 (PAH)

PAH, 26/H1/2, “Carnarvon Hospital”, 1913.

DUTCH REFORMED CHURCH ARCHIVE, STELLENBOSCH (DRCA)

Managing Company of Schietfontein Collection (MMCS)

MMCS, “Minutes of the Managing Company of Schietfontein”, 1/2/1857 Carnarvon, 15 December 2016.
MMCS, “General Meeting Minutes”, 1/1/1847
MMCS, “General Meeting Minutes”, 26/4/1875.
MMCS, “Schietfontein Water Supply”, 15/2/1869.

Ring of Beaufort-Wes Collection (NRBW)

NRBW, R6/1(e), “Notule van die ring van Beaufort-Wes”, 10.10, 1964.

Church Board of Carnarvon Collection (NKRC)

NKRC, “Notule van die Kerkraad van Carnarvon”, G79 1/1, 12/7/1897, “Gemeente Verslag”.

Minutes of the Church Board of Carnarvon Collection (NKRC)

NKRC, “Notule van die kerkraad van Carnarvon”, NKRC, 12/7/1897, G79 1/1.

DUTCH REFORMED CHURCH NAMAQUALAND CHURCH OFFICE AND ARCHIVE, SPRINGBOK

Notuleboek van Namaqualand, “Notule Kerkraad: Namakwaland”, 12/12/1934.
Notuleboek van Namaqualand, “Notule Kerkraad: Namakwaland”, 24/2/1963.

CARNARVON CHURCH ARCHIVE

Alheit, W.A., Manuscript of Sermon, Carnarvon Dutch Reformed Church, 17/5/1961.

ORAL SOURCES

Personal interview, L. Swanepoel – H.F. Klopper, on the farm *Dankbaar*, district of Carnarvon, 15 December 2016.

Personal interview, D.W. Nel – H.F. Klopper, Carnarvon, 9 July 2018.

Personal interview, L. Hendriks – H.F. Klopper, Schietfontein, 9 July 2018.

Personal interview, A. Vorster – H.F. Klopper, Stellenbosch, 21 January 2019.

Telephonic interview, A. Venter – H.F. Klopper, 7 February 2019.