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Grahamstown’s Water Supply: a brief history from 1812 to 2008

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Prepared for the ‘Kowie Catchment Campaign’ c/o Albany Museum, Grahamstown

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ABSTRACT

The relatively abundant supply of water in the upper catchment of the Blaauwkrantz River (Kowie System) was an important reason for the founding of Grahamstown in the Eastern Cape. As this frontier town grew from a small trade and military outpost to an important administration and education centre, a number of reservoirs were constructed to cater for the needs of an expanding human population. This paper provides an account of the relentless search for more water that has been a recurring theme for almost two centuries. Increasingly sophisticated solutions have been sought to deal with this problem — from simple wells and furrows in the town’s High Street to the construction of the Glen Melville Dam, supplied by the Orange-Great Fish Interbasin transfer scheme. Water challenges, in terms of both quantity and quality, continue into the 21st Century.

INTRODUCTION

The founding of the small city of Grahamstown in the Eastern Cape Province of South Africa related to a need for water and periodic shortages of this precious resource motivated a relentless drive to find new water sources and increase the capacity of storage systems. The end result of this process is the complex of impoundments and transfer schemes that presently surround the city (Figure 1).

After the second British occupation of the Cape, the Governor ‘Sir John Cradock’ sent an expeditionary force under Colonel John Graham to establish control of the area east of the Sundays River, where Xhosa-speaking tribes — the amaGqunukhwebe, amaMbalu and amaNdlambe — disputed possession with the Dutch-speaking ‘trekboere’. In a three-pronged drive, in 1811–1812, Graham’s force succeeded in sending the tribes eastward across the Great Fish River. In order to maintain the Great Fish as a boundary between the

rases, it was deemed necessary to establish a suitable military settlement with access to the forts that were to be set up along what the British now regarded as the official border¹. The autobiography of Sir Andries Stockenström describes how, towards the end of the so-called 5th Frontier War he, then a young ensign serving with the British forces, led Colonel John Graham directly from the deserted farm ‘Nantoe’ (also ‘Noutoe’, now ‘Table Farm’), on a weak tributary of the Bushman’s River, to the burnt-out homestead of Lucas Meyer’s farm, ‘De Rietfontein’. Under Graham’s instructions he pointed out various other possibilities for headquarters, but recommended Meyer’s farm, saying that he knew of no stronger water-source in the area².

Graham accepted his advice. The headwaters of the Blaauwkrantz River (a tributary of the Kowie River), with a mean annual rainfall of 680 mm, is subject to frequent drought periods (Appendices i, ii). Since its inception the town has struggled with water supply as the population has grown (Appendix iii). Because of its position above the coastal plain and the Great Fish River valley there are few streams at higher elevations that allow for gravitational feed into the town.

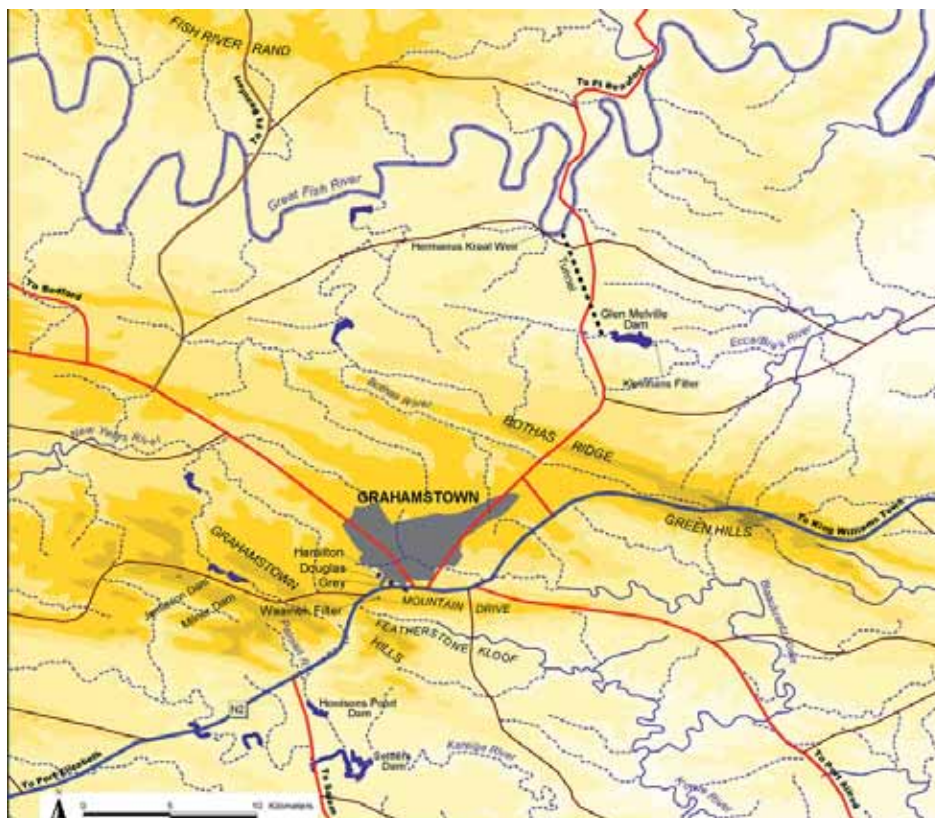


Figure 1. Rivers and impoundments in the vicinity of Grahamstown (compiled in 2009 by Gillian McGregor; Geography Department, Rhodes University)

The present sources of Grahamstown's water are: the Gariep Dam³ on the Orange River via the Orange-Great Fish River tunnel to the Glen Melville Dam, Settlers Dam and Howison's Poort Dam in the Kariega River catchment, and the so-called 'Slaaikraal dams' on a tributary of the westward-flowing New Years River. Earlier schemes were developed within the Grahamstown basin to provide for the military and the growing civilian population.

The following brief history is built around the account⁴ of Dr Keith Hunt, a distinguished past professor in the Rhodes History Department, registrar of the University and mayor of Grahamstown. Further additions, gleaned from sources listed in the acknowledgements and references, complete the account. I hope to trace the small town's struggles to supply water, to provide some insight into relations between the citizens and their Council, and to briefly assess the way forward into the 21st Century.

THE GARRISON TOWN: 1812–1860s

Early days

Although proclaimed in August 1811 as a town named 'Graham's Town', by 1819 there were only 25 houses and 32 civilian men capable of participating in the Battle of Grahamstown against the amaNdlambe under the leadership of the famous prophet Makanda (also known as 'Nxele', the left-handed). An 1814 map shows a surveyed High Street ingeniously placed along the spine of a spur stretching west to east and flanked by 22 erven. This 'street' enters a triangular 'square', later to be known as Church Square, with a further 13 erven around it. At the western head of the street, it was planned, would be the Drostdy or administrative centre and residency of the Deputy Landdrost (or Magistrate)⁵.

The earliest water sources for the village were the courses that run into the town from the hills to the south, the so-called Rietberge. Small reservoirs diverted the water into furrows. Those that now run into Grey Dam in what the army called 'Water Kloof 1', poured into a wooden trough crossing the 'Waterkloof 2' (Douglas Dam) stream. From where the beautiful Drostdy Arch now stands, stone canals led the water down High Street, from which each household drew its share according to a timetable. The storage tank next to the Drostdy Arch, installed in 1818 and restored in 1979, permitted an extension to the system.

The town's population received a considerable boost after 1820 when British settlers, drawn to the new district of Albany on the promise of farmland, found the conditions in the outlying areas so difficult that many were forced to leave their plots and return to the urban lifestyles to which they were accustomed. New streets were surveyed and by 1830 there were about 400 houses. Trade had begun to flourish and water supply became a far greater problem.

A report to the 1867 City Council describes the excavation of a well at the intersection of High and Bathurst Streets in 1831–1832 (Figure 2). It must have been a considerable mining feat for it went to a depth of 75 ft (22.9 m), with a further 30 ft (9.1 m) bored before water was struck. This water was found to be undrinkable, so 40 ft (12.2 m) of soil was returned into the well to create a bottom well above the unsuitable water. Run-off from High Street was led into it, and a windlass set at the head⁶.

Municipal commissioners face the problem

In 1836 a Government Ordinance required that ward commissioners be elected in Cape municipalities, with duties to protect public health, provide water, and promote the welfare of their citizens. They were elected in 1837 and, although hindered by inadequate funds, immediately set about instituting improvements. But the water supply remained inadequate. Citizens constructed wells in likely places, but the less fortunate had to either beg for water or draw off at the dead of night. Others saw the shortage as a source of income, carting purchased water and selling it at ‘a penny a bucket’. The amaMfengu, who during the 6th Frontier War had accompanied the British colonial forces out of King Hintsa’s land across the Kei River, arrived in town in 1835 and soon saw the financial benefits of carrying buckets to back doors⁷.

The supply was inadequate and unhygienic. In 1841 the ward-master of Ward 1, Mr Loxton, reported, ‘*the water supplied to the upper end of New Street is defiled and rendered unserviceable for domestic uses by persons washing clothes and otherwise ...polluting the said water*’. Furrows became blocked with town rubbish and wagons and horses



Figure 2. The old Shepperson Well (High Street, Grahamstown) presently covered by the war memorial (painting done in 1835 by Frederick Timpson I’Oons (1802-1887); courtesy of the Albany Museum archives)

fouled the streets and smashed the furrows. Following a measles epidemic, people blamed various illnesses on the poor water quality. In 1840 there were demands for a better scheme.

In 1844 the commissioners decided to invest £766 of their £1 576 revenue to open a subscription list to buy iron pipes. Mr MW Ogilvie the Chairman of the commissioners, initiated negotiations with Messrs Theophilus Richards & Co in England, with payment to be made through the Rev. William Shaw as Treasurer of the Wesleyan Missionary Society in Grahamstown. The pipes that had been shipped in the *'Mary Anne'* arrived in Algoa Bay in February 1845. Mr WC Davies later laid them down the centre of High Street at a cost of £136. It had been planned that they should follow the old furrow line down the south side, but property owners on the north had complained about the extra cost that they would face. In 1847 Mr Stephen Gradwell laid the New Street line at a cost of three shillings per joint. Townspeople were warned that stock found grazing within the catchment would '... be sent to the pound forthwith'. There were graded tariffs for consumption ranging from £1 per annum — for less than 75 gallons (341 l) per day — to £3 for over 150 gallons (682 l)⁸.

Fire hazards and teething problems

In November 1845 the Eastern Province Fire & Life Assurance Company applied for permission to attach fire plugs to the mains, but because the commissioners wished to charge for their installation and use, the matter rested. In 1849 an annual charge of £25 was proposed but the company was again refused. A great fire in Cape Town wakened the commissioners to the dangers, however, and they decided to install 28 plugs as a public amenity, the wall closest to each to be marked with an *'FP'*⁹.

The new system was by no means satisfactory. The pipes had been laid too close to the surface and suffered frequent damage. Their quality was also thought to be inferior. A young lad was fined ten shillings, or one week in jail, for fiddling with the stop-cocks. Back in 1846 the commissioners had begged citizens not to fill bottles and casks without the use of a funnel. Clearly the system required supervision and in 1850 a 'Supervisor of Water' was appointed. His responsibilities included turning the water on at daybreak and off at sunset, to supervise leadings, maintain public fountains, supervise horse troughs, and on a weekly basis visit the reservoirs.

But shortages remained. The commissioners tried various contractors without success. One had built a reservoir that leaked '*...so much that the water runs out nearly as fast as it runs in*'¹⁰.

The Fort England spring

After the long and debilitating war of 1846–1847 the Governor of the Cape, Sir Harry Smith, declared the annexation of the territory between the Fish and the Kei Rivers. The military headquarters were moved to King William's Town and the importance of Grahamstown to the British Army began to decline. Yet the Army was to remain until 1870 and co-operated with the Council several times in providing water for the troops and the town¹¹.

A reservoir was built in Hope's Garden in 1850, chiefly for the benefit of the 32nd Light Infantry at Fort England (formally the Cape Corps Barracks, which Lord Charles Somerset had ordered to be constructed in 1816). The tank later collapsed during heavy rains and

was replaced by a smaller one, which still exists and was even used in the 1973 drought¹².

What would have been the source of that water? It is likely that it would have been led or piped from *The Spring* (*Umthombo* in Xhosa) that gushes from the hillside next to the Kowie road at a level above Hillside road where the tank is situated (Figure 3). *The Spring* was an important source of supply to Fort England from the beginning. Colonel John Graham himself described the site of the barracks thus: ‘...on an elevated tongue of land formed by the Kowie [viz. Blaauwkrantz/Amatyana¹³] and another stream which joins it below the barrack, and both of which streams can be led over the said ground, by which, including the whole space under the level of the water course from where the dams must be constructed, downwards, 20 to 30 acres of land may be irrigated...’.

Dr William Parrott, and later Holloway of the Royal Engineers, submitted reports in 1827 and 1828, respectively, that mentioned that ‘a mountain stream and a small spring’ supplied ‘sufficient’ water. Holloway, however, also described the quarters as unsatisfactory, ‘with an indifferent supply of water, overrun with vermin and totally unfit for the reception of British troops’¹⁴.

In the kloof above the present Fort England hospital there is still a rectangular stone reservoir with the remains of an open furrow leading down into the grounds. I have not yet



Figure 3. The popular Grahamstown spring. The neat surroundings are testimony to the efforts of Kowie Catchment Campaign members, who have worked hard to protect this important source of high-quality drinking water (photo: Jim Cambray)

discovered its age, but it seems likely that it would have preceded the Hope's Garden tank. The reservoirs mentioned by Graham may or may not have yet been built.

Grey Dam: the first real reservoir (Figures 4, 5 & 6)

In 1858–1859 a serious drought emphasized the urgency of building a larger scheme. Some households received no water at all for a month, although they had had to pay for it, and the poor were reduced to begging. The Chief Justice suggested that the supply was so poor that, if the Eastern Province separated from the Western Province, then Uitenhage, not Grahamstown, should be declared the capital. The Chairman sought audience with the Governor, Sir George Grey, who permitted the commissioners to sell 'waste land' to finance the construction of a large reservoir. At a public meeting the commissioners were authorized to incur expenditure of up to £5 000. In April 1859 Mr Hoggan was appointed City Engineer to supervise public works. Plans for the new reservoir were passed in September but the inevitable red tape, the temporary absence of the Governor, and shortage of funds, delayed progress¹⁵.

With courage and generosity the commissioners pledged their private credit as guarantees



Figure 4. Grey Dam (downloaded from *Google Earth*)



Figure 5. Grey Dam showing the author surrounded by alien trees; the vehicle is parked on the dam wall (photo: Jim Cambray; 18 January 2008)



Figure 6. Grey Dam the early days: picnic scene painted by Admiral Montagu Buchleugh Dunn; note the alien trees planted around the reservoir (Albany Museum Archives)

of payment. The contractor, Mr Kerr, reported the work completed in December 1860, but the City Engineer declared that various details had not been done according to the contract. However, the town looked upon its handiwork with justifiable pride. *The Journal*¹⁶ of 16th February 1861 describes the reservoir thus: ‘*The Waterkloof ... slopes down to the Botanical Gardens [with a side stream entering it at right angles]... A more skilful selection of the site could not have been made. The dam is formed by throwing a bund or dam and by excavating or scooping a basin, the same simple plan on which the famous tanks of southern India are built... The overflow which is to be cut out of solid rock is nearly finished, and it is to be observed that the surplusage ... will flow into No. 1 water house three or four hundred yards below the dam*’¹⁷.

The reservoir could hold 15 million gallons (68 000 kl) and had cost little more than £6 000. Mr Godlonton of *The Journal* wrote that the reservoir would supply Grahamstown even when ‘... five times its present size’ and that it was ‘... so situated as never to be dry’¹⁸.

During his tour of the Eastern Cape, Sir George Grey presided over the official opening on the 25th January 1861. *The Journal* described the grand event: ‘*Long before the time [of Grey’s arrival] the somewhat steep slopes of the valley ... were covered with a vast concourse of people in their holiday costume. Carriages and horsemen thronged the left bank of the Dam. The procession consisted of the Freemasons, the Municipal workmen, the Albany Brethren, the bands of the Cape Corps and H.M.’s 10th, the clergy, the heads of departments and the members of Parliament. These walked to the sluice valve. His Excellency received and replied to an address from the Commissioners, turned the key and let the waters out into the kloof, the Arch-deacon offered a prayer and the ceremony was over*’¹⁹.

The town council begins its work

The difficulties that the commissioners had faced demonstrated the need for the town to have greater powers at its disposal and Act 29 of 1861 incorporated the town as a municipality to be governed by a mayor and councillors²⁰. But drought and difficulties at the new reservoir soon had them seeking other water sources. A ‘*water finder*’, Mr Karl Kohl, was hired, but his efforts came to nothing. Plans were discussed over how to increase the carrying capacity of Grey Dam. Should further excavation take place while the reservoir was almost empty? Or should the wall be raised? Col. Hamilton’s advice was sought and he suggested that excavation upstream and on the right bank was possible²¹.

But, more importantly, more reservoirs were necessary. The drought of 1865–1867, forced the council to reluctantly propose a second reservoir. A letter from the Military Secretary threatened to remove the troops from Grahamstown unless a better water supply was provided. Council asked Sir Percy Douglas, the Lieutenant Governor of the Eastern Cape Colony, to receive a representation from Messrs Caldecott and Shepperson as such a departure would be disastrous to the city. Council accepted a tender from a Mr Morgan totalling £285 for the construction, including puddling and piping, of a reservoir in ‘*Waterkloof No. 2*’²².

The Douglas Dam (Figure 7)

Sir Percy Douglas gave permission for the military to help in the construction of a new

reservoir. Colonel Hamilton of the Royal Engineers directed the work of men of the 11th Regiment at ‘1 Shilling a day’. Morgan, the contractor who had started work on the Waterkloof 2 reservoir, had found it to be so difficult that he requested to be released from the contract, with a payment of half its value for the work completed. The Council agreed to pay him off for an amount of £97 10 s, although several councillors wondered at the looseness of the contract agreement: it had stipulated a six-month completion period, yet he had already been working for eight or nine months. In the contractor’s defence, it was pointed out that that a scoop was unable to penetrate the extremely hard ground. In the meantime, Council employed fifty ‘rank and file’ and ten artificers (i.e. masons). They would require 50 wheelbarrows, 100 pick-axes, 100 shovels and 25 spades. Work would begin on the reception of the tools. Douglas, in reply, expressed the wish that the dam construction should go ahead — if not with pick and shovel, then by blasting²³.

By 13th August Waterkloof 2 was under way, and another, The Artillery Dam to the west of Gunfire Hill, was set to begin within the week. The Board of Works envisaged that this would serve the west side of town, while Waterkloof 2 fed the centre, and a third reservoir above Fort England costing £1800 was planned for the east. Grey Dam, which had sprung

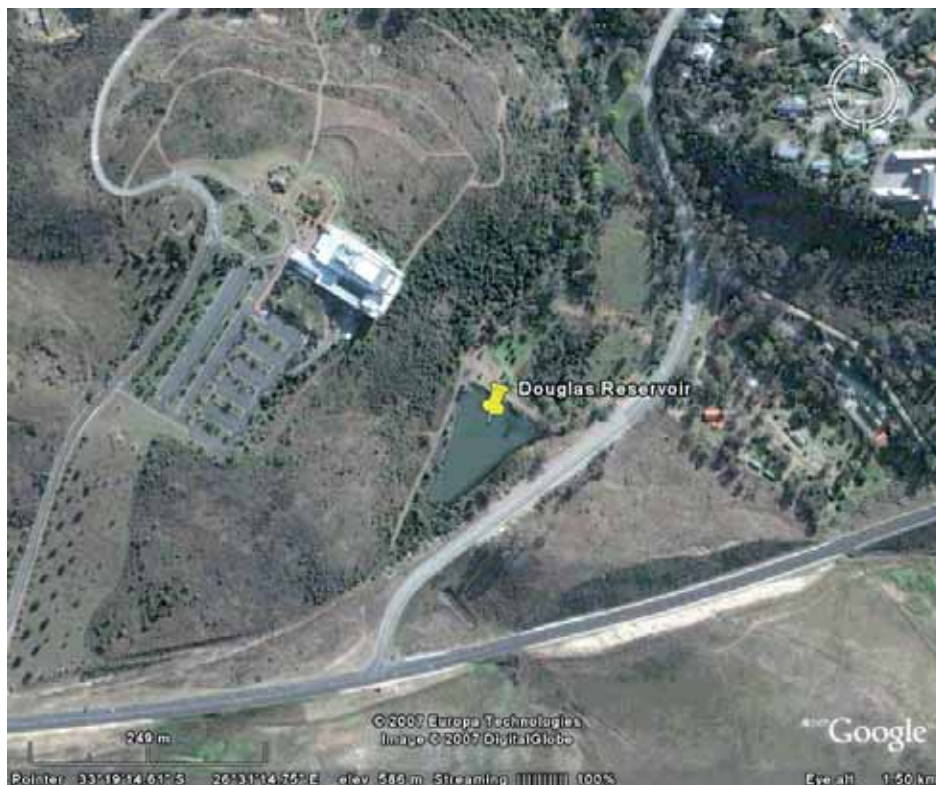


Figure 7. Douglas Dam with the 1820 Settlers Monument on the left (downloaded from *Google Earth*)

a leak, would be a standby source²⁴. At the same meeting Councillor James Wood proposed that permission be asked of Sir Percy Douglas that his name be attached to one of the new reservoirs. His Excellency, just before departing for England, accepted the honour with pleasure. His reservoir, though, would be some time in the completion. Councillor Roberts, in reply to questions to the Board of works, estimated that if the military labourers worked well it should be completed by the end of February 1867²⁵.

Drought continued to plague the decade and citizens in the higher parts of town complained of the unequal distribution of water. Councillor Wedderburn moved that the Superintendent of Water (a.k.a. 'the waterman') should be required to give detailed information regarding those who did, and those who did not, receive water. He also wondered how this man was earning his pay, for he was seen '*... riding about turning off one stop-cock and turning on another apparently in the most capricious manner, and much to the annoyance of the rate-payers*'. Councillor Watson countered, saying that the waterman was at work from morning to night doing his best to supply water in an equitable manner. He did not have the time to perform secretarial work as well. Councillor Watson remarked that '*... [his] own casks were so long without being filled that they were dropping to pieces*'²⁶.

Trees on the Mountain Drive

At the 3rd December 1866 Council meeting Councillor W Smith, who had been propagating 10 000 exotic trees '*... for the embellishment of the hills*', requested the services of a labourer to assist him with their planting and watering. Council agreed unanimously, hailing Mr Smith as a benefactor of the town. The idea of planting above the Grey Dam had previously been withdrawn when townspeople objected that the trees would pollute the water. This was the unfortunate start to the spread of alien invasive pines and gums and, later, various wattles across the bare hillsides. Had Smith, the tree-lover who saw little value in local trees and extolled the virtues of blue-gums, only known what effect his 'benefaction' would have!

In March of 1867 the first line of trees was planted within a hundred yard square (0.008 Ha) enclosure in the vicinity of Grey Dam: gums, blackwoods, 'firs', casuarinas and a 'golden willow' all supplied by the Botanical Gardens²⁷. [Author's note: there is a stone wall enclosing the side stream that enters the reservoir, but it is more likely to have been built to protect the stream from stock].

By 1932 Council was already working on the removal of encroaching pine trees, and by 1955 long-leafed wattle had advanced '*... in a broad belt from the Radio Station to beyond Mayor's seat*'. Uncontrolled fires swept across the hills six times between 1961 and 1998. Throughout his time in charge of the Department of Parks & Gardens, Mr Garth Timm concentrated on clearing the north slopes of the Mountain Drive down as far as Grey Dam. In 1981 the Lions Club planted a number of indigenous trees at this spot, some of which have survived together with the remaining aliens. Since 1997 the Albany Working for Water project has continued with the enormous task of removal of invasive alien plants — with an evident beneficial effect upon the natural springs²⁸.

Hamilton Dam (Figure 8)

The so-called ‘Artillery Dam’ appears to have been built without discussion or fanfare in Council. As already mentioned, it was due to be started in August 1866 by 30 to 40 military workmen. A letter in *The Journal* appears to indicate that it was already in use in 1867:

‘C.M.R. Camp, Grahamstown, 11th January 1867.

*Sir – I have the honour to request that you will kindly obtain permission for me from the Town Council to prohibit people from bathing and washing in the Artillery Dam; for in consequence of the scarcity of water, the large pond made last year has been appropriated for the use of the troops. I should therefore like to keep the water ...for the use of the horses in the detachment under my command. I have &c. Edw. Van Renen, ens., C.M. Riflemen*²⁹.

Yet another letter, written later in the same year by Council left the Board of Works, creates a different impression:

At the Council meeting on 15th April 1867 Councillor Roberts moved that the ‘Artillery Dam’ ‘... now under construction’ should be named for Col. Hamilton ...as a lasting memorial ... of the service he has so efficiently rendered’. In his reply on 29th April the good colonel referred to the ‘...dam about to be constructed in No. 3 Waterkloof’, expressing his pleasure at the honour bestowed upon him³⁰.

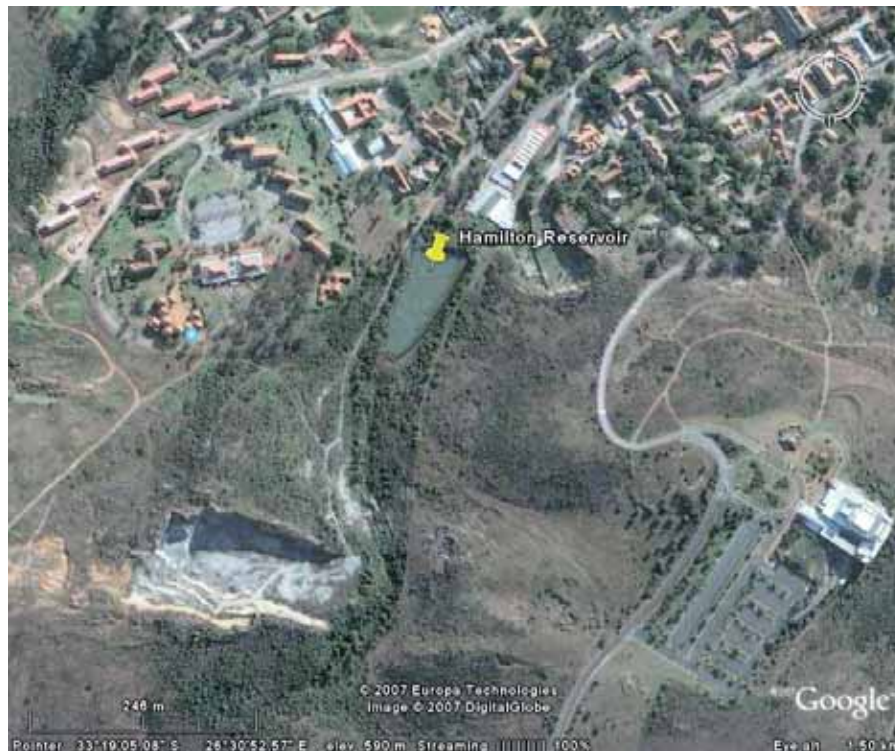


Figure 8. Hamilton Dam with Rhodes University buildings northwards (downloaded from *Google Earth*)

We now have a confusion relating to the time when construction of this dam might have been started, going back into the previous year. [Author's note: Melanie Gibbens (previously of the History Department, Rhodes University) records its completion as October 1868³¹, but regrettably the *Journals* of the second half of 1867 and the whole of 1868 issues appear to be missing from the Albany Museum].

A reservoir never built

Council's brave efforts at solving the water problem were not without their humorous moments. Councillor King pointed out the difficulties that faced many citizens, '*... hundreds begging buckets, so great was the scarcity*'. He moved that permission should be gained from the Cathedral and the Commemoration Chapel to lead water from their roofs into the well at the top of Bathurst Street after it had been cleaned out. [Author's note: this well is now covered by the SA War memorial]. Councillor B Wood, in seconding the motion, wondered whether it would be '*... to provide the inhabitants with holy water and establish a monopoly ...for christenings*'³². In April 1867 Councillor Roberts reported that he had remonstrated with a man who had thrown his dog into Grey Dam, but had not pressed him too far, for the man was large. On being taxed by his colleagues, Roberts replied, '*... He would have made four of you*'. The matter of polluting the water, however, was taken more seriously. The man should have been reported to the Magistrate³³, it was felt.

Distribution remained a serious problem. Complaints came from householders in New and African Streets: '*.... one half of one side of the streets are fully supplied and the water running to waste, while the other have not a butful between them...in consequence of the neglect or worse of the man [Mr William Pocock, the waterman] who has attended to the supply*'³⁴.

An interesting debate took place on 17th June. The householders of Oatlands had been pressing for a pipeline for some time, offering to pay for extra leadings. Pipes had now arrived from England, so it seemed to some members that it would now be possible. It would increase the attraction to the area, thereby increasing the value of the properties. Councillor Roberts asked whether that area should receive preferential treatment. '*Were the claims of Kowie Street, Chapel Street and a part of Beaufort Street to be set aside in favour of Oatlands?*'. It was agreed that there was a prior claim on the other side of town³⁵.

The third reservoir planned for the valley above Fort England was never built. But the streams that flowed off the north slopes of Signal Hill clearly still supplied the troops at Fort England.

In March 1867 Councillor Roberts moved that the Board of Works '*...be empowered to raise, clean and re-lay the pipes conveying water from the Fort England springs to Hope's Dam*'. Councillor J. Wood suggested that the better public wells in the town should be covered and provided with pumps so that the water '*... be preserved in a clean, proper and Christian condition*'³⁶. Councillor Walter Smith proposed that the Board of Works investigate a possible supply at the top of the quarry [Author's note: perhaps this is the old one below the Old Bay Road?], for there were '*... vast amounts running to waste from the Old Toll to Wei Nek [sic]*'³⁷. [Author's note: 'vast amounts' no longer run down from Waainek!]

BEYOND THE GARRISON

Social changes

It was in 1867 that the Colonial Secretary, Sir Richard Southey, placed a diamond, 'The Star of Africa', upon the table in the House of Assembly in Cape Town, declaring, '*Gentlemen, this is the rock on which the future success of South Africa will be built*', and that people had begun to set out to seek their fortunes³⁸. Three years later the Army withdrew from Grahamstown.

Through the 1860's and 70's the white population remained static at about 5400 while, across the Amatjana stream, the 'non-white' population rose from 2700 to 6900 (Appendix iii). The 'British City' (so described by a visitor in the thirties) now faced problems which it was barely capable of solving and of which it seemed hardly aware. It would still concentrate its efforts on the west side of the dividing stream for some time to come.

Fortunately for Grahamstown's future prosperity, it was surrounded by well-run farms needing a trading centre. It had also become a centre of senior school education: by 1876 the Assumption Convent, St. Andrew's College, Graeme College, the Diocesan School for Girls and St. Aidan's College had opened, drawing students from near and far³⁹. In addition, although somewhat isolated, the town with its Supreme Court opening in 1865, was the legal centre of the Eastern Cape. The Albany General Hospital opened in 1858; in 1875 Fort England was converted into a 'mental hospital'; and in 1882 the barracks at the west end of Prince Alfred St. became the Prince Alfred Infirmary for the 'chronic sick'⁴⁰. These institutions were not long in contributing to Council's water-supply headaches.

In August 1876 Mr JG Gamble delivered his report to the Commissioner of Crowned Lands and Public Works regarding the state of Grahamstown's water supply. There were leaks in both Hamilton and Douglas reservoirs and indeed the latter was bone dry. The engineer recommended that these be excavated and filled with puddle clay, the banks be raised and the overflows be enlarged. He also suggested that the Grey Dam's overflow was inadequate. He proposed that the valley above Fort England, with its small spring, was an excellent place for a reservoir⁴¹.

Cradock Dam (Figure 9)

The plans for the new rail-link with the main Port Elizabeth line included a viaduct across the Cradock Road stream. Mr Gamble proposed that Council should hire a surveyor to measure the extent of the catchment and to establish the possible capacity of the reservoir created by the viaduct. This would depend upon the height of the rail level. He suggested that material for the construction would come from the line's cuttings⁴².

This minor, often-dry, development produced more acrimony and noise than its contribution towards Grahamstown's water supply warranted. Councillor RW Nelson proposed 'the West Hill Dam' as a project that could be built in conjunction with the Cape Government Railways. By September 1878 the railway engineers had made considerable progress from Alicedale Junction, but Council was still arguing over Nelson's proposal⁴³. On 4th October 1878 he moved that Council apply for a loan under the Irrigation Act of 1877 to the value of £2000. Mr Watson argued that this would be a waste of money and would only

benefit a few West Hill residents. It was pointed out that there were sources of supply about the town in the form of tanks at Dundas Bridge, Fort England and Market Square, as well as pumps at the Botanical Gardens and in Huntley Street⁴⁴.

The Divisional Council meeting on 30th October 1878 acknowledged the generosity of the Council in its making water available to the town's cattle at 'Graham's Dam', a small structure on the site of the future Cradock Dam. Councillor Wood saw this as a confirmation of the new reservoir's importance. The Government had responded positively to the application for a loan, so it was now up to the Council to proceed. Finally it was agreed that the Railways would build the reservoir at an estimated cost to Grahamstown of £1554⁴⁵.

In 1879 the Railways offered to take over the entire project for its own use, but again Council jibbed. Quarrels within council continued into 1880 along class lines: the moneyed 'West Hill' versus 'Market Square', the latter group proposing the Fort England scheme. 'West Hill' prevailed⁴⁶.

Whether or not Cradock Dam ever added to the town water supply I have not yet discovered, although there were brick tanks at West Hill Railway Siding that may once have watered the engines before their ascent of one of the steepest inclines in South Africa. On the west bank of the reservoir a small pump station was installed, perhaps in the 1960s, to drive water up to the Grahamstown Golf Course. In 1960 St Andrew's Preparatory school



Figure 9. Cradock Dam, built by the Cape Government Railways as a viaduct across the 'Kowie Ditch' (photo: Jim Cambray; 18 January 2008)

acquired permission to gravitate water from the reservoir to its sports fields. Both these projects foundered due to a lack of water. The first train evidently crossed the viaduct in August 1879, for young Hubert Mullins, who was to die from diphtheria within weeks, was permitted to get up from his sick bed to watch this important event. Mullins’ family legend has it that his father, the Rev RJ Mullins, visited the resident engineer while he was constructing the overflow pipe on the east side of the wall. He warned the engineer that this would be most inadequate in times of flood. The engineer rejected the advice of a mere parson. The drought broke, and the water level rose above the outlet, threatening the very safety of the wall. Soon afterwards, work began on the much larger and much lower tunnel at the west end of the wall⁴⁷.

The Slaaikraal Dams: delays and debates

Three years of drought in the early 1880s again awakened the City to its predicament. In March 1884 HL Spindler produced a report, accompanied by beautifully drawn maps and plans, recommending that the only suitable streams for dam sites were the Slaaikraal tributary, which flows into the New Years River (Figure 10), and the Berg-Palmiet streams at the bottom of Howison’s Poort on the southern side of the escarpment. The drawings, incidentally, include a ‘Green Hills’ plan bringing water by gravity from the upper ‘Caps’



Figure 10. Slaaikraal reservoirs on a tributary of the New Years River (downloaded from *Google Earth*)

(Kap) River. At that stage it was accepted that the Howison's Poort scheme, which would involve pumping, was too costly to contemplate⁴⁸.

During the serious drought in 1893 pressure for such a scheme increased. Councillors WA Smith and Stocks visited Slaaikraal to find a good stream flowing, in spite of the drought. Smith recommended that citizens should receive water once instead of twice a week⁴⁹. The Mayor, JS Willcox, had previously demanded an investigation. Council was now presented with the following plans: (a) a small intake reservoir leading by a 5½ inch (14 cm) pipeline into the Hamilton Dam estimated at £6 400; (b) a 7-inch (17.8 cm) main leading to filter-beds and a service reservoir in Brickmaker's Kloof at a cost of £20 839, and (c) a 7-million-gallon (31 823 m³) storage reservoir at a cost of £20 813⁵⁰.

The Journal of 12th February, 1898 contains a letter from Mr JH Wood, the previous owner of 'Slaai Kraal' and 'Slaai Kraal Outspan'. This illustrates the issue of the relationship between riparian landowners and reservoir construction, which had the potential to prevent the free flow of previously-exploited water. He had sold his farms to Mr Munro in 1893, while absent in Cape Town, and reports in the letter that he had then sent a telegram to his brother Henry, saying, '...*You may inform the meeting [in Grahamstown to discuss the proposed water scheme] that I will require no riparian rights. Mutual arrangements can be made for supply of water to the farm*'. His letter continues, '...*I reserved the riparian rights for the benefit of the citizens of Grahamstown. But for that Mr Munro would have made a claim for these rights and would have been as fully justified in demanding £5 000 as Mr Thomas White would have for the riparian rights of Table Farm...I have not received acknowledgement [from the Council] of the gift*'⁵¹.

A public meeting took place on 3rd July 1893 at which the Mayor proposed that Spindler's third suggestion should be followed at a cost of £26 813 with a sum added to it to provide for farmers with riparian rights. It was proposed that the money should be borrowed from the Government under the Irrigation Act and should involve an extra 1.5 d (= a penny ha'penny) increase on rates charged in order to pay off the loan within 25 years. Arguments for and against the Slaaikraal scheme, both at the meeting and through the year, continued in spite of the serious drought that forced Council to reduce the household water supply drastically. One Councillor, F Jardine, had on the 29th June 1893 declared ironically, yet — had he known it — prophetically: '...*If a scheme was proposed to go to the Orange River and bring water from there it would be more sense [than to go to Slaaikraal]*'. Dr Fitzgerald regarded the supply as undrinkable. Mr TH Grocott said he would be willing to pay double for pure water, but pointed out the unfairness of setting a universal charge for water: £2 to both the washerwoman in Chapel Street and the rich man on West Hill. The meeting supported a motion to ask the Council to come back to the public as soon as possible with its decision⁵².

As the drought worsened, correspondents wondered at the inaction of the Council, within which there appears to have been a significant 'No' lobby. Rain then filled all the supply reservoirs. Yet, despite the Mayor's urging, as the *Journal's* editor said, the citizens were in earnest but the Council had fallen asleep '...*as soon as the noise [of rain] outside ceased*'⁵³. It was not until 21st September 1893 that Council agreed to hold a special meeting to dis-

cuss water. There was even a suggestion that a reservoir should be built in Goodwin’s Kloof at a cost of £10 000. Small wonder that the editor thought little of that idea: the ‘Kloof’ is actually a shallow valley right at the headwaters of the New Year’s River with limited catchment and no permanent spring⁵⁴. The public was told that Council was awaiting an engineer’s expert opinion. Time dragged on.

Milner Dam (Figure 11)

In July of 1894 the consulting Engineer, Mr Thomas Stewart arrived and the mayor again urged Council to ‘... go on with the matter until this city has an abundant supply’. On 26th July 1894 he moved that ‘Mr Stewart, C.E. be requested to furnish an assistant [to take] levels...in order to ascertain whether water can be brought ...from Slaaikraal’, and at last his motion was carried⁵⁵.

Among the groups in need of a more reliable water supply were residents of the ‘African’ and ‘Coloured’ ‘Locations’⁵⁶. The Anglican Bishop of Grahamstown, Bishop Allan Becher Webb, led a delegation seeking an increased supply, the remarkable reply from the



Figure 11. Undated photograph taken by the old firm of Hepburn & Jeans (circa 1897) showing progress in the construction of either Milner, or Jameson, Dam. There are at least 120 workers at rest on the bank. Note the ox- or mule- drawn scotch-carts, which could be tipped to release their payloads. In the foreground stands an imposing figure, perhaps the engineer (Albany Museum Archives: SM Pic. 5801)

mayor being that there was already a tank ‘...over Dundas Bridge which was kept full for several hours twice a week expressly for the natives’. The matter was referred to the Water Committee. *The Journal*’s editor saw this as a significant step forward in racial attitudes and looked forward to an improvement⁵⁷.

But there was to be a long wait before Slaaikraal water finally ran into Grahamstown. It was necessary to dig tunnels at ‘Munro’s’ (i.e. Slaaikraal Farm) and at a point along the pipe-track referred to as the ‘Nek.’ In February 1898 the resident consulting engineer, Mr D Gerrand, suggested that the scheme would be completed by October, although that would depend upon the completion of the tunnels. The hand-excavation of the ‘rock tunnel’ was foundering on the shortage of adult male workers. Steam was tried but abandoned. Gerrand’s report to the Council in April indicated that there remained 304 ft (92.7 m) of the 1046 ft (318.8 m) to complete the Nek Tunnel. At Munro’s Farm 254 ft (77.4 m) of the 376 ft (114.6 m) had been completed, presumably with powder, sledge hammer, crowbar and cold chisel, through hard Witteberg rock. [Author’s note: interestingly, the present owners of Slaaikraal and Strowan Farms across which the pipeline passes were unaware that the Nek tunnel existed. Investigation along that section suggests that the tunnel mouths had at some stage, been closed]. Five hundred tons (508 metric tonnes) of pipes had been strung along the 10 000 yard (9.14 km) track ready for laying. At the reservoir itself, excavations for the wall’s foundations were almost complete: the concrete foundations for the valve tower and forebay walls had been laid and half of the concrete pillars to carry the 12-inch (0.3048 m) outlet pipes had been erected⁵⁸.

Council had to plan for the repayment of the Government loan of £35 000. The figures supplied in the Special Meeting of 1st October provide an interesting insight into the lifestyles and living standards of Grahamstown’s white population at the end of the 19th Century. Tariffs per leading ranged as follows: £3 for the 673 houses of up to £400 in value; £4 for the 283 houses valued between £401 and £1500; and £5 for the 29 houses with a value greater than £1500. A tariff of £6 was charged per leading for the 11 hotels, 18 boarding houses, four clubs and restaurants, seven schools, three livery stables, five bakeries, ten gardens, and ten dairymen. A tariff of £7 10s was charged for three mineral water works, five steam engines and two tanneries⁵⁹.

The rural and residential nature of the town demonstrates how, from being second only to Cape Town in importance, it had become a backwater, bypassed by road and rail leading to the mining and industrial heartlands to the north. Had it retained its earlier significance, the problem of water supply would have been further exacerbated. Even so, the Black population count now being on a par with that of the Whites was forcing Council into considering the city as a whole – albeit gradually.

An editorial in the September 1898 *Journal* raised the urgent question of water supply to the Location, that was to drag on for years to come: ‘...we have every hope that it will receive due attention ...The claim of some 4000 natives to be considered...adds powerfully to the urgency; and the approach of the Public Health Bill... warns us that if we don’t solve the water question it will be taken out of our hands...probably at great cost to the citizens...’⁶⁰.

With Grahamstown’s Great Exhibition, held in 1898 to celebrate Queen Victoria’s Jubi-

lee⁶¹, due to open at year's end and with the drought continuing, completion of Slaaikraal was ever more urgent. Then, at last, during the meeting of 12th November 1898, Mayor JS Willcox was able to move that the engineer be instructed to run water into Grey Dam and at last he was able to rejoice '... *at the solving of the water problem*'. The scheme, however, was not quite complete. Mr Gerrand was asked to supply plans for conveying the water from a gauge tank in Brickmaker's Kloof to the city mains and he offered to work free of charge until 11th December⁶².

The reservoir was named for the Governor of the Cape Colony and High Commissioner for South Africa, Sir Alfred Milner. A mayoral party travelled by train as far as the 'No. 9 plate-layer's cottage', walking from there down to the new reservoir, already 17 ft (5.2 m) deep and with a strong stream running into it. In his speech the Mayor declared, '*Altogether, once this huge dam is full we shall never want [for] water again*'. Impressively, it held 45 million gallons (204 574 kl) and threw the water back for 0.75 miles (1.23 km)⁶³.

Jameson Dam

In 1903 tenders were called for the construction of a new reservoir above the Milner Dam. The meeting of 5th February 1904 discussed a letter from Mr Gerrand which had recommended that the tenders so far received should be rejected, since they were above his estimate of £6 000. Councillor Knight pointed out that the Milner Dam contractors had made no profit out of its construction and that labour was now more expensive. He felt that if the Department of Public Works undertook the job it would cost even more. He moved that Council should call for more tenders. Councillor Wood argued that if a satisfactory tender was not received, then the work should be undertaken by the department. This amendment was carried⁶⁴.

Water for all?

Back in 1876, Council received a memorandum from '... *persons residing in the Location requesting that a foot bridge might be erected over the stream which in wet weather almost completely cuts off the connection with the town; also that attention may be given to the streets and water supply of the Location*'⁶⁵. No further mention was made of these issues in the *Journal* that year, although the inadequacies of the water supply — for example, Douglas Dam leaked and was entirely empty — continued to be discussed throughout 1876 and for many years thereafter.

In 1904 it was considered necessary to increase the outflow of Milner Dam to 100 ft (30.5 m), which would require an exchange (with Mr George Palmer) of 18 acres (7.3 Ha) below the wall for a similar-sized area near Waainek⁶⁶. Council rejected a request from the Department of Public Works for 15 600 gallons to be supplied daily to the Asylum (now Fort England Hospital) and the Chronic Sick hospital. The Medical Superintendent complained of frequent shortages, while the reservoirs were overflowing⁶⁷.

The 17th May 1904 meeting discussed 'Water for the Natives', a discussion that displayed the councillors' differing racial attitudes. Councillor Lloyd moved that a pipeline be laid requiring a thousand 3-inch (7.6 cm) pipes from Currie Street via Grave Street and Wylde Street as far as the Ethiopian Church [which seems a tortuous route!]. The 'Natives'

would pay 3 pence in the pound to cover the loan. Councillor Oliver complained that the scheme and its cost would place Black people on a much better footing than Whites. Councillor Knight hoped that there would be no opposition to providing the water. ‘...*There was a time when we were almost willing to give them water free, but now we are making a charge which will pay the full interest on the money we will have to use*’. He argued that with the availability of water the death rate would be reduced and that, with the extra supply from the new reservoir, there was no excuse for not providing water to the Location. ‘*We... will be setting a good example to the Colony*’, he added. In support, the Mayor, Councillor John Webber, pointed out that Council would merely be carrying out what it had already promised ‘*At present they carry water from the town*’. Nevertheless the counter-proposal that the pipeline scheme should be delayed until it was ascertained that the government would grant the money for the construction of the new reservoir was carried⁶⁸. Once more, the side of town that was most in need would have to wait.

The construction of Jameson Dam

At the same meeting it was agreed that the new tender of £6 946 offered by Messrs Green & Co. should be accepted. Councillor Knight said that the Water Act authorized towns to borrow up to £60 000. Grahamstown had spent £40 000 of the loan, so work could begin⁶⁹.

In June 1904 Councillor TB van der Riet raised the meter issue. A house in Oatlands had burnt down because, as was the practice, the water had been switched off for the night. The only answer was to install meters so that water might be supplied night and day⁷⁰.

At the beginning of 1905 the council was calling for water restrictions. At the 8th April meeting Councillor Marshall reported that Slaaikraal had only ten weeks supply left, recommending that citizens should receive their leadings once a fortnight. There were calls for the prosecution of wasters and that gardens should not be watered. Within a week, though, the autumn rains came, the reservoirs filled and Council could propose bi-weekly leadings⁷¹.

The construction of the new dam was not proceeding at the expected rate. Mr Gerrand proposed that the contractors, Green & Webber, should be held to the extended completion date of 15th August 1905. Debate in Council for and against the time extension followed. Councillor Oliver moved that Gerrand’s proposal should be adopted, noting that it would cost £40 per month to permit an extension. The penalty was £100 per month. He recommended strict compliance with the contract. Councillor Marshall pointed out that Mr Green had recently died, which would have delayed progress. He suggested that it was not a matter of life or death to rush the job, and proposed an extension to September 1905⁷².

More heated debate took place on 5th August 1905. Mr JH Webber, the remaining contractor, replied to charges that he had drastically reduced his staff, asserting that over the contract period he had employed 227 men⁷³. His participation in the construction thereafter is not clear, but the Clerk of Works, Mr S Barbour, had temporarily taken over the supervision. Pipes were ordered to link the new reservoir to the main Slaaikraal pipeline. The spring rains came; the new reservoir, empty a few days before, filled on the 14th October 1905, before the job could be completed⁷⁴.

On 21st October 1905 Council was able to vote a daily supply to citizens, knowing that

it had an extra 140 million gallons (636 453 kl) to play with. Councillor Flanagan moved that Mr Barbour, who had intimated that work would be completed by 10th December 1905, should be recognized for his devoted service and asked to accept an honorarium of £50⁷⁵. More disagreement ended the year. It was debated whether or not to set aside £500 to purchase meters for the larger consumers; and whether or not to recompense the contractor Green & Co. for the pump that languished at the bottom of the full new reservoir. Mr Gerrand eventually signed off the contract on the 18th December 1905, but not before there had been further dispute over payment to Green & Co. Councillor Oliver persisted in his opinion that the contractors should be charged for the delay in completion⁷⁶. It was finally agreed that the balance of £1 283 due to them should be paid in full⁷⁷.

But at the beginning of 1906 there was still no water finding its way from the new reservoir into town. Councillors argued over the old question of unequal supply in different parts of town. Councillor H. Wood grumbled that '*...Douglas Dam has a bottom like a sieve, Hamilton is no better, and Grey is no good after about 14 ft*'. Water diverted into any of these reservoirs was wasted⁷⁸. The *Journal's* editorial of 6th March 1906 added that residents on the higher ground suffered from shortages while those lower down received a super-abundance, with water running to waste. As a result of the old, leaky infrastructure Council had to reduce leadings from daily to bi-weekly⁷⁹.

In May 1906 Mr Thomas Clark found and repaired two leaks along the pipeline from Slaaikraal. He had had to excavate an entrance down into the 'Nek' tunnel to find one of these⁸⁰. [Author's note: this solves the mystery of the lost tunnel. It is there, even if it cannot be found!].

The reservoir was named for Dr Leander Starr Jameson who was the Member for Albany and Prime Minister of the Cape. A planned celebratory picnic had to be cancelled because of poor weather⁸¹. Grahamstown now had a total of 230 million gallons (1 045 601 kl) for a population of 15 000, sufficient for the Municipality to have tanks placed in the Location, which provided the people with more water than they had ever had — yet hardly sufficient to satisfy any claim of there being enough for all.

Health and sanitation

Several issues remained. Complaints were repeatedly made regarding the cleanliness of Slaaikraal water. While the Jameson Dam was under construction, Council instructed Mr Webber to remove his cattle which, it was claimed, were polluting the water. To this the contractor responded with a blank refusal, saying that his cattle had a perfect right to be there, and if a fence were erected he would simply cut it⁸². Disease and high mortality in the Location was ascribed not only to the lack of a sewage system, but also to the water supply. At the Albany General Hospital in 1905 there had been several cases of typhoid, and water tests had shown the water from the reservoirs to be polluted⁸³. Yet the Council was reluctant to go ahead with the construction of filter beds, fearing the consequences of increased rates. However the 1897 Public Health Act forced its hand, although the Council was slow to respond. A letter from Mr D Knight⁸⁴ recommended that it was time the council acted and that it should consult Mr Gerrand, the engineer. Only in August of the next year did the Board of Public Works suggest that this was a good idea⁸⁵. A Medical Officer of Health

(MOH) was appointed in 1898 to monitor the situation. It was the habit at that time to pour slops and urine into the gutters or the streambeds, and cesspools were dug in back gardens. An expensive 'tub sanitation system' was agreed upon with regular removal of excrement and slops. This was to be given out to contract, 'nightmen' removing the tubs at six pence per tub. Deposit pits were constructed in 1905⁸⁶.

In June 1908 Council gave authority to the Board of Water to propose improvements to the water scheme. In his 'Mayor's Minute', Councillor Henry Fitchat demanded that all causes of complaint should be removed. Premises in the lower sections of the city were receiving more than their fair share of water; lavish users should have meters attached; Fort England, the so-called 'Asylum' needed more water; the supply to the Location '*... cannot be considered satisfactory [providing] only 10 gallons per diem per family*'. The Board had decided '*... the main water pipe in the Kafir Location should be extended*' and '*... to extend the main pipe in Currie St. in the Hottentot Location*'. [Note that the terms in this sentence were classificatory, not pejorative, though reflecting the racial attitudes of the time]. The Mayor could proudly declare that the '*... coloured population ...are all...furnished with a supply which although somewhat unduly limited is nevertheless regular... and the great majority have to pay no more ...than ten shillings per annum, provided that they do not require leadings, but fetch the water from the iron tanks*'⁸⁷.

In December 1910 the priority plan to construct filter beds was summarily delayed by the discovery of a serious leak in the Milner Dam, which drained from full to empty within four months. In 1911 Fitchat delivered a report based on a paper by the District Surgeon, Dr EG Dru-Drury: '*The kloofs on the south side [of the Milner Dam] end in bogs and morasses... the water is stagnant, and it is from these that the excessive organic matter and the albuminoid ammonia is derived...Recent events have compelled you to empty Milner Dam. Now is the time for action... You are providing dirty, brack water which may cause a dangerous outbreak of disease*'⁸⁸.

Other experts entered the argument. Professor George Cory agreed that filter beds were essential, yet felt that the quality of the water was acceptable. In 1912 the MOH, Dr FA Saunders, declared that the water was of doubtful purity⁸⁹. Councillors accused him of '*... vindictiveness, unprofessional behaviour, and of blackening the name of Grahamstown*'⁹⁰. This is not surprising, judging from what he had to say to them. There had been two deaths from enteric fever in the Location. In a confrontation with the Sanitary Committee he reported that, within four years, solids in the Slaaikraal water had increased from '*10,5 to 17 grains per gallon, chlorides from 3 to 7, and albumoid ammonia from 0.025 to 0.034 parts per 100 000*', ideal conditions for the breeding of bacteria. '*Enteric germs will breed in their millions. Then look out!*' he said. '*...You have done nothing towards removing this filth or providing the first necessity of life — clean water. ... Men have been lynched before now by an infuriated public for less than this. Think of the 2 000 children who use your schools...[or] the feelings of enraged parents if they lose their children through cold-blooded neglect and meanness in spending public money for the public good...You only want a sick [person] to infect your water supply and you as a town or a centre of education are finished... Your attention has been drawn to the polluted state of your location and very*

little has been done to clean it... Look out, I say.'

The unfortunate chairman, Councillor Ayliff, walked out of the meeting. At the next Council meeting opinions differed. Councillor Wood felt that Councillors should support each other; Councillor Ayliff was fully justified in leaving the Chair and the room. Dr Saunders should be called upon to apologize for his rudeness. Councillor Whiteside said it was unfortunate that Council should be sitting like a lot of children discussing whether the Dr Saunders had been rude or not. The matter at hand was whether or not to accept his report. They accepted it, and the Sanitary Committee placed on record that the time had now come when filtration of the water should be undertaken⁹¹.

The arrival of government bacteriological and chemical test results vindicated Dr Saunders' strong opinions. It was found that both Slaaikraal reservoirs were polluted with the *E. coli* bacterium⁹². [Author's note: it should be noted that the Colonial Bacteriological Institute with the first official bacteriologist in the Colony, Dr Alexander Edington, had been established in the old Royal Engineers' building in Prince Alfred Street in 1897. Information about water quality could be obtained on Grahamstown's doorstep⁹³].

The first filtration plant

Council consulted Dr TM Tomory, the MOH for Bloemfontein, who recommended the Candy System of filtration. In November 1913 it was, however, decided to import the Mather & Platt plant through their agents, Murray & Stewart, together with an expert to oversee its erection. Council agreed to provide £100 towards the engineer's passage⁹⁴.

The Journal reported on the arrival of the new plant. Mr ME Carolyn, the engineer, described the system thus: '*the water would come in from the Slaaikraal dams under a 7 ft [21.3 m] head of pressure to be treated in a chlorine contact tank before passing into the three huge, 8 ft [2.44 m] diameter filters. In them it would drain through a bed of graded quartz crystals into their collecting chambers, and thence into two de-chlorinators, through a meter and into the 6' [15.2 cm] service mains. The system could handle 16 000 gallons [72.74 kl] an hour*'.

The final commissioning only took place in August. The three filters were loaded at the railway station on to trucks that were drawn by a traction engine to Brickmakers' Kloof, then up the hillside to a wood-and-iron shed. On the way up the hill a faulty hawser snapped, sending a filter tumbling into the kloof. Its extrication evidently took some doing, for in requesting in May for another two months, the engineer mentioned the delay caused by the disaster⁹⁵.

The Mayor, Councillor TFB van der Riet, officially opened the plant on the 4th September 1914. The MOH, Dr Purvis, had tested the water and found it satisfactory, but he would now have to test it after it had been through the mains. The reservoir levels being so low, the filters would have to be washed frequently. As explained by the visiting chief engineer, Mr CR Ledger, who had come from England to adjust the chemical plant, this entailed purified water from a storage tank squirting through 400 nozzles up into the bed to drive it into suspension, and a propeller churning the granules. The process was demonstrated to the dignitaries before they enjoyed a cup of tea made with clean Slaaikraal water⁹⁶.

More attempts to improve

In the meantime, there was more discussion regarding the filthy state of the town. Sanitary regulations were instituted requiring householders to provide their own refuse containers to be emptied by the Municipality twice a week. In the Location, it was felt, the prickly pear thickets should be removed to prevent indiscriminate fouling of the area, a borehole should be provided for the much-needed supply, and concrete dustbins built. It was even suggested that Fingo Village should have water closets, but it was not clear who would pay for these — the Government or the residents⁹⁷.

In order to alleviate the Location's water crisis the Public Works Department reported that it had received tenders for the digging of a well at a site chosen by Mr TF Stowe. This expert had asserted that for £85 he would find a supply of 30 000 gallons (136.4 kiloliters) per day and that, if not, he would dig a second at no cost to the town. The doughty Mr JJ Vroom suggested that boreholes were preferable, that with lining and other expenses a well would cost £385 not £85, and that the well would be money wasted. He lost the vote⁹⁸. [Author's note: I have not yet found any information on the progress of this project].

In November, after it had transpired that people were being extravagant with the very limited available water, it was agreed that the meter system should be introduced⁹⁹. Indeed, the district was suffering a serious drought once more: the Jameson Dam was empty, and with 200 000 gallons (909 kl) being consumed each day, it was judged that there was only two months' supply left. The editorial of the *Grocott's Penny Mail*¹⁰⁰ questioned the Council's inadequate response to an inadequate supply¹⁰¹.

Council, though, did make proposals on 2nd October 1914: that the bi-weekly supply should be reduced to weekly; supply to gardens should be cut off; no hoses to be used; two water inspectors should be appointed to enforce the regulations; that these regulations should be implemented immediately. The plight of the people in the Location was also raised. There were 7 000 people who had to depend on the tanks, receiving '... *about a paraffin tin per week*'. The tanks were soon emptied and people were obliged to go to Grahamstown West for relief¹⁰².

On 20th November 1914 the Board of Works proposed an approach to Government for the provision of an engineer who could advise on raising the wall of Jameson Dam. It had been estimated that its capacity could be doubled by adding four feet (1.22 m) at a cost of £500. Councillor Stead, with some quaint reasoning, queried the proposal, suggesting that too much water would be lost by evaporation. He gained no support¹⁰³.

Howison's Poort Dam: a long wait (Figures 12–14)

Within 20 years of Jameson Dam being completed — in which eleven of them received below-average rainfall — the town was yet again crying out for more water. Council and Senate of Rhodes University College agreed that it should not expand beyond 295 men and 175 women, but even with this cautious decision, the numbers, together with the growth of the town's schools, had already placed an extra strain on the existing schemes. In 1915 a meeting of 13 educational institutions under the chairmanship of Canon PWH Kettlewell of St Andrew's College stressed their importance to the prosperity of the town, pressing for the introduction of water-borne sewage as well as a reliable water supply¹⁰⁴.

Various schemes were considered. To improve run-off from the hills above the Slaaikraal reservoirs, Council decided to shorten the ‘herbage’ by letting them out for grazing. In January 1917 the Council accepted options to purchase ‘Green Hills’ from Mr A Greener and ‘Howison’s Poort Farm’ from Mr JA Tomlinson. The City Engineer was also requested to investigate the rainfall at both localities. The ‘water expert’, Mr Stowe, indicated a likely site at Slaaikraal at which to bore. Attempts were made to improve the supply to the Location well. Messrs Wade & Cragg were hired to try another borehole above Jameson Dam. As the drought worsened Council even sanctioned the construction of an 8 000 cubic foot tank (226.5 m³) to capture the run-off from the market shed’s roof. In June 1917 Council

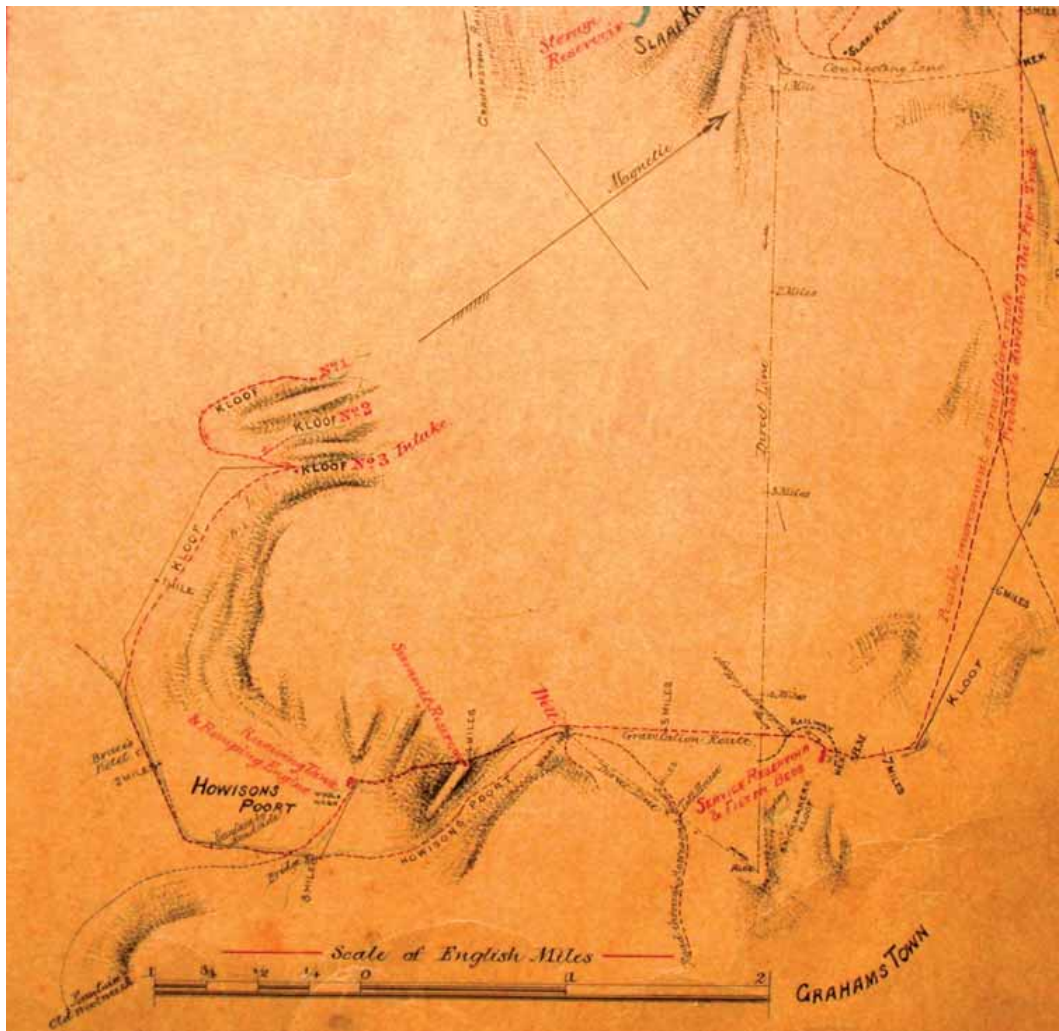


Figure 12. Mr Spindler’s drawing of Howison’s Poort water scheme, from his report of March 1884 (Albany Museum Archives: SM 5081/3)

commissioned Mr RW Menmuir to draw preliminary plans for a scheme to produce 50 000 gallons (227 kl) at a cost not exceeding £75 000¹⁰⁵.

The Mayor from 1919 to 1920 was CW (later Sir Cuthbert) Whiteside whose ‘Minute’ describes water as the most important matter before the Council; ‘... *the essential element of health, comfort and progress*’. Yet he also reports, ‘*After having investigated the Kareiga, the Blaauwkrantz and the Hilton schemes the Committee decided to abandon them all*’. (The ‘Kariega Scheme’ refers to Howison’s Poort below the confluence of the Palmiet and Berg streams; the ‘Blaauwkrantz’ presumably to the gorge; ‘Botha’s River’ to the stream north of Grahamstown that cuts through Botha’s Ridge to the Great Fish River; the ‘Hilton Scheme’ to one on the New Year’s River).

A farmer, Mr W Wilmot, had drawn attention to yet another possible site: the Baltrasna or Lower Broekhuizens Poort scheme in the hills to the west of Town and south of the Highlands road. The Committee instructed the City Engineer to investigate its merits. ‘*The Council was unanimously satisfied that owing to the precipitous nature of the catchment... and owing to the strong spring yielding 40 000 gallons a day...*’ a reservoir of 60 million gallons (272 765 kl) capacity could be built at an approximate cost of £100 000¹⁰⁶.

The City Engineer, Mr Stuart Chandler, made numerous tests at the bottom of Howison’s Poort, coming to the conclusion, just as Spindler had done, that that was the only reasonable source. In 1926 Mr George Stewart, consulting engineer, was commissioned



Figure 13. Howison’s Poort Dam (downloaded from *Google Earth*)

to produce a plan. *Grocott’s Daily Mail* of that year contains editorials, letters and reports vigorously debating whether the city could afford either the reservoir or a stormwater sewage scheme¹⁰⁷.

An editorial proposed that the issues of the reservoir and the sewage system, which would cost £150 000, should be separated for fear of the scrapping of both schemes. Sir Cuthbert Whiteside, the past mayor, raised the question of rates. He argued that the municipality should ‘... *make each man pay for what he gets, and give him only what he pays for...*’¹⁰⁸. This should be achieved through the installation of meters, a practice already followed in other cities. Mr RH Struben argued that the water supply was of prime importance for the continued reputation of the ‘*scholastic institutions*’¹⁰⁹. The Association of Registered Tank-owners declared that they would support the scheme. Mr FK Young wrote that tourists were charmed by Grahamstown, but ‘...*impressed most unfavourably by the absence of water supply*’¹¹⁰. ‘*Old Citizen*’ declared that a new scheme had become necessary through neglect. He asked whether it was seriously thought that the population had increased by 25% in 30 years. ‘*Are we to have a new water scheme at a cost of £110 000 every 40 years?*’¹¹¹ he asked. Mr Vroom reasoned that the proposal was far too costly, that the old pipelines would not take the increased pressure, and that the existing schemes were sufficient.

At an informal meeting on the 14th May, Mr George Stewart answered questions. The



Figure 14. Howison’s Poort dam wall with the old pumping station in the foreground and the new pumping station in the left background (photo: Jim Cambray; 18 January 2008)

scheme allowed for a 50% increase in the adult white population. The catchment area was 43 square miles (111.37 km²). The water would be pumped up to Waainek in one lift, using the best modern centrifugal pumps. Treatment would consist of the addition of chemicals, followed by passage into sedimentation tanks, and thence into the filtration plant before being stored for reticulation into the town. The design of the reservoir wall provided for siphons to pass silt from the bottom over the top and into the stream below. The pipes were of steel and would stand up to great pressure. There would be ample water for a sewage scheme¹¹².

The Mayor, Councillor MG Godlonton, presided over a packed official meeting on 20th May 1926. In his introductory speech he declared that Grahamstown was the finest residential and educational city in the Country, but that ‘...our water supply is a standing disgrace’. He moved that the meeting authorise the raising of a loan not exceeding £110 000. The proposal was carried by 241 to 47. Financial aid would be sought from the Cape Provincial Administration¹¹³.

By February 1930 the construction was well under way. A detailed report appears in the *Grocott’s Daily Mail* listing progress, which includes: the placing of a railway siding at Waainek; construction of the pipeline; the electric power line leading from a transformer station near Douglas Dam; reservoirs at Waainek; 12 ft (3.7 m) of concrete already thrown into the 57ft (17.4 m) thick base of the wall. The reporter was intrigued by the planned expansion joint in the wall allowing for heat and cold, and the siphons that, it was hoped, would extract silt. The pumps would lift the water in steel pipes 1170 ft (356.6 m) up to Waainek into settling tanks. Cast iron pipes would gravitate it to the filtration plant above Brickmakers’ Kloof and the service reservoirs where it would link up with the Slaaikraal supply. The electric line would travel underground from the Grahamstown Power Station (then housed in the old gasworks next to the railway station), to the transformer and thence above-ground to the reservoir¹¹⁴.

Grocott & Sherry Publishers produced a special souvenir pamphlet for the opening of this scheme by the Administrator of the Cape Province, the Hon. JH Conradie on 8th April 1931.

This gives a detailed description of its features, some of which may be added here:

- There were 12 siphons, two of which would extract the silt;
- Concrete steps on the downstream face would break the force of discharge;
- The pump-house was incorporated in the wall, with the pumps in the bottom floor and the electrical transformers above;
- The Mackley centrifugal pumps could deliver at 450 gallons (2 m³) per minute up the 1490 ft (454 m) lift to Waainek [Author’s note: at the time this was the highest lift in the country];
- At Waainek, the water received its preliminary dose of chemicals while it settled, assisted by baffle walls within the tanks;
- The filtration plant, on the hillside above Brickmakers Kloof, which still received the water from Slaaikraal, had been renovated, the water passing through four Bell filters before being pumped to the storage reservoir 100 ft (30.5 m) above;

- The scheme included metering for all properties evaluated at over £200;
- The scheme was designed by consulting engineer, George A. Stewart and the supervising engineer was Mr James MacCartney¹¹⁵.

Water-borne sewage

At last it appeared to the Council that water-borne sewage — a proposition that had been thought to be both necessary and possible a decade earlier — was now feasible, and an amount was set aside for 1931 estimates for a survey to be conducted. The editor of *Grocott's* commented that '...until the water-borne sewage scheme has been installed the city cannot be regarded as up to date'¹¹⁶.

It was to be another six years before the consulting engineer, JC Hawkins, could report that the excavations for the percolating filters, the sedimentation tank and the sludge drying area were completed, and that the sewage works would be ready by September 1936. Heavy rain and the tank, which had to be dug to a depth of 30 ft (9.1 m) into solid rock, had caused considerable delays. Because of the rains, many stretches of the reticulation system had to be concreted in. Householders also suffered some inconvenience, yet had not placed difficulties in the path of the contractor¹¹⁷. There were still parts of the city that would be served by the bucket system: 'night-wagons' had to be purchased and a receiving station constructed south of the King Williamstown road.

Mr WA Hodge, the City Engineer, reported in November 1936 that, despite work being delayed by 16 days of rain, the sewage works were now ready to receive wastewater and that on the 1st December 1936 Zones 1, 5 and 6 would be connected. Zones 3 and 4 would follow soon after. In this enterprise, 178 black, and 39 white, workers had been employed¹¹⁸.

In 1937 the water-borne system was in place in a large section of the city. The council was now faced with the problem of forcing some institutions to link up to the system. The Prince Alfred Infirmary had its own septic tank and people in the vicinity complained of the odour. The Provincial Department of Health refused to accept the expense of installing water closets, indicating that it would be cheaper to transfer the patients to Cape Town and close the hospital. Council hurriedly offered a free connection: 200 000 gallons (909 m³) of water per month, and a contribution towards the installation of the closets.

Neglect of the sewage system, apparently because the council had not employed an engineer's assistant to oversee it, eventually resulted in a total blockage in 1943¹¹⁹ [Author's note: fair warning to future councils].

Letters to the editor, 1936

Water issues produced some interesting, sometimes combative, opinions in the press. BM Fuller raised the question of de-rated properties, proposing that they should be required to pay for their water to a figure approximating with the cost to the town. They would then be paying their fair share, he suggested¹²⁰.

A Mr JJ Vroom regarded the Howison's Poort scheme as a white elephant. '*It's going to cost you 3d every time you use the W.C.*' he said, asserting that the pumps were only turned on to keep them in running order, and that nearly all the water came out of Slaaikraal. He also recommended that '*Howison's Poort can be used as a fishing pond*'¹²¹. In reply '*T.M.*'

(full name not traced) wondered how Mr Vroom had come by his ‘...weird calculations’. Water did not cost 14S 3d per thousand gallons (4.6 m³) but 6S 6d, and not 3d each time you pulled the plug, but one fifth of a penny. Furthermore, the estimated amount required for the new sewage system would be 75 000 gallons (341 m³) per day. It was Slaaikraal, with its weak supply, that was the white elephant, he asserted¹²².

Problems in the Location continue

Water; Sewage; Health: these are issues that the City wrestles with to this day, and they all require considerable funding. As mentioned above, the ‘white’-centred council, although seeing Grahamstown as an English city and concentrating its efforts on the problems west of the Amatyana stream, nevertheless had begun to see the importance of providing water and proper sanitation to the burgeoning population on ‘the other side’¹²³. The drought of 1927 forced the Council to tap into a pipeline from a borehole in the Location that supplied the old power station, at first requiring householders to buy 2S 6d tickets for three months’ supply, but finally allowing free access to the tanks along the way.

In 1934, £2000 was allocated to replacing the old mains with the idea of using the old pipes for extra supply into the Location¹²⁴. ‘T.M.’ in his column, ‘*Town Topics*’, reported in 1936 that the City Engineer had proposed installing a booster pump at Slaaikraal to increase the flow, to save the necessity of pumping up from Howison’s Poort at greater cost. Later he wrote, ‘... we have the fuller and most welcome supply ... to the Location’¹²⁵. Then in 1938 a new line was laid and 53 stand-pipes brought water closer to people’s homes¹²⁶. The citizens of Tanti, Fingo Village, ‘Hottentot Location’ and other ‘Locations’ would have to wait well over half a century to be linked directly to the mains.

In the 1930’s Council came under fire for its ‘... utter disregard for human values’. In 1935 the Young-Barrett Commission reported the communal bucket system of sewage disposal to be ‘deplorable’ and two others — F Rodseth and FW Jameson — were highly critical of Council’s apparent lack of concern. They reported that the Location was ‘... actually a vast latrine’. House-holders dug their own pit privies, so this was taken up as a scheme to be pursued by the municipality. However, because of unsuitable subsoil, these privies soon filled up. Council was forced to revert to the bucket system, one that is only now, in 2007, being converted¹²⁷. In an article in *Grocott’s Mail* (25th September 2007) it was reported that ‘*The Directorate said 40% of water-borne toilets had already been constructed in Extension 7. The estimated value of the project is R5,3 million and is from the Municipal Infrastructure grant.... Of the 385 structures that had been built 90 toilets are flushing while the rest need some plumbing work...Dabula Njilo said the bucket eradication project would be completed on October 25, 2007*’¹²⁸.

With an increase in the black population from 6000 in 1921 to 9000 in 1936, largely due to influx from the surrounding districts, the town was faced with a huge health and housing problem¹²⁹. The MOH, Dr Heathecote, reported the deaths of 388 children under the age of one¹³⁰.

Drought and Settlers’ Dam (Figures 15 & 16)

The period 1950 to 1970 had only six years of above-average rainfall, four years receiving

below 500 mm. In January 1960 the *Grocott’s* editor pointed out that ‘... it is little more than 3 years since education was threatened with a disastrous shut-down’. He argued for the proposed construction of the new Kariega Dam, the payment of compensation to riparian owners as laid down by the Water Court, and the calling for tenders, pointing out that for £200 000 Grahamstown would have an extra 880 million gallons (4 000 559 m³)¹³¹.

The 1956 drought tells a story that Grahamstown should pay attention to, for it will happen many times again. The *Grocott’s* headline begins, ‘City in for a Grim Time...’¹³². Water levels had dropped through consumption and evaporation by 2.45 million gallons (11 138 m³) in a month. It was estimated that the town had enough for only another four months. Council instructed the City Engineer, Mr TR Morton, to ‘throttle down’ the supply into the pipelines. Appeals to the public for economy had gone unheeded. Council appealed to builders to obtain their water from the unfiltered sources (Grey and Douglas dams). The Station Master was approached asking him, if possible, to find his requirements out of town. On 21st August the Churches applied for higher assistance: a week of prayer, each denomination taking its turn, began on 4th September¹³³. Councillor GT Krige, the Mayor, declared the position critical, reporting that boreholes down African Street that had previously been used in the great 1927-28 drought would be re-opened. Council announced that supply would be cut off from 2.00 pm each afternoon to 7.00 am the next morning. That was on 11th September¹³⁴. On the 19th 2.5 inches (63.5 mm) fell in Town and a strong flow was running into Howison’s Poort Dam. Citizens drove down to watch the reservoir fill as a further 6 inches (15.2 cm) were recorded¹³⁵.

Mr Morton chose the crisis to announce that a new scheme was about to begin in the Kariega valley. Riparian farmers had already been consulted as to compensation and work would begin within 12 months¹³⁶.

During the long drought a different water scheme was being debated in Parliament. It was the Member for Albany, TB (‘Uncle Tom’) Bowker who persistently urged the Government to develop a scheme that would divert surplus Orange River water into the Great Fish and Sundays River systems. In later years this would have a huge influence on Grahamstown’s water troubles¹³⁷.

Financing the Kariega Dam was an issue to be debated: whether to apply for a subsidy from the Department of Water Affairs or to look elsewhere. The advice of the consulting engineers, Stewart, Svidirov and Oliver, was that there would be an 18-month delay if the application were made. The Mayor, Councillor AK Rautenbach, announced that the City would not be seeking the subsidy¹³⁸.

The urgency of proceeding was accentuated in March 1960, when the City Engineer reported that there was now seven months’ supply remaining. Restrictions were instituted on the 24th, gardens could only be watered between 4.30 and 5.30 pm¹³⁹. White citizens were consuming 30 gallons (136.4 l) per head per day when Council reckoned that 15 gallons would be reasonable, while it was noted that black citizens, who had to carry their supplies from stand-pipes, were only using three or four gallons (13.6–18.2 l) per head per day. With the daily consumption continuing at too-high levels, further restrictions were added: household supplies were again to be ‘throttled down’¹⁴⁰.

The editor of *Grocott's* suggested that the sand dumped into Howison's Poort Dam in the flood of 1950 should be extracted while it was exposed. Mr Felix Oliver, the consulting engineer, saw no advantage to doing so: it would cost at least £15 000 to remove it, whereas an additional foot (30.5 cm) to the new Kariega Dam wall would provide the same amount of water for only £3 000¹⁴¹.

In August 1960 tenders were announced, ranging from £156 000 to £189 000. The estimate back in 1955 had been £110 000. Murray & Stewart, who had offered the lowest tender, won the contract¹⁴². Gentle rains began to fall, gradually filling Howison's Poort Dam, but Jameson and Milner catchment received hardly any run-off. Council considered limiting the restrictions. Citizens were clearly ignoring them in any case; after all, Howison's Poort was only four feet (1.2 m) below the overflow. On the 15th December 1960 *Grocott's* reported, in proud anticipation, that the first concrete was about to be poured at the reservoir site¹⁴³.

Within 13 weeks the contractors had cleared three roadways to the site, built a wide-gauge track across the kloof, and installed a mobile 'jib-crane' that could reach every section of the wall and a trolley to convey the materials to the crane. Electric generators would provide the power to drive all the machinery. A quartzite quarry nearby would supply the stone. Water would be pumped to the mixer from an earth reservoir down in the kloof. The



Figure 15. Settlers Dam showing the confluence of the Kariega and Palmiet rivers above the wall (downloaded from *Google Earth*)

resident engineer, SH Exter, had shown the reporter around the site of the wall that would throw water back almost three miles (4.8 km) up the Kariega. The depth of water at the wall would be 60 ft (18.3 m); evaporation would be minimal at that point because of the depth and narrowness of the kloofs. They calculated that the construction should take 59 weeks. By the end of February 1962 Grahamstown would have a huge new source¹⁴⁴.

The 22nd February 1962 arrived with an empty new reservoir and 136 million gallons (618 268 m³) left to supply a population that was now consuming water at an average rate of 800 000 gallons (3 637 m³) per day. With the start of the University term, the military base in full swing and the trains to Port Alfred requiring refills at the station, Grahamstown was once more facing a serious situation. Consumption had risen steeply from 19 million gallons (86 376 m³) in 1960 to 25 million (113 652 m³) in 1961. By March 1962 the water stored had dropped to 14% of capacity, and water levels were published daily¹⁴⁵. Yet both the editor of *Grocotts* and members of Council denied that Grahamstown had a major water problem. The City Engineer agreed, stating that Howison’s Poort could supply 800 000 gallons (3 637 m³) per day, while the Slaaikraal reservoirs had been delivering over 500 000 gallons (2 273 m³) and that the admittedly-old filtration plant was still capable of coping with a million gallons (4 546 m³) per day. With the autumn rains slowly raising the Howison’s Poort level until eventually it overflowed in early May, Council felt free to relieve the



Figure 16. Recreational area around Settlers Dam within the Thomas Baines Nature Reserve (photo: Jim Cambray; 18 January 2008)

restrictions somewhat¹⁴⁶.

It was an almost-empty Kariega reservoir that was opened by M.P. 'Uncle Tom' Bowker on the 6th September 1962. In her introduction, the Mayor, Mrs DM Baines, noted that the reservoir had cost R440 000, taken 20 months to build, and would hold 880 million gallons (4 000 559 m³). Mrs Baines welcomed Mr Felix J Oliver, who had served as the City's consulting engineer for over 35 years and had designed both the Howison's Poort Dam and what would now be called the Settlers' Dam. Replying, Oliver remarked that it was a tragedy that the reservoir should be opened when still empty: '*I call on a greater Engineer than myself to take care of the filling up*'. In introducing Mr Bowker, the Mayor told the gathering that Grahamstown owed him a deep debt of gratitude, for it was through his efforts that it would after all receive a subsidy for the construction.

Mr Bowker then delivered what he called a history lesson, listing the names of early white settlers in the vicinity: Johan Keulder who had settled on the banks of the Palmiet and served as the local Veld Kornet, and 1820 settlers, George and Harry Parr, George Gilbert, Charles Hill, Alexander Howison, David Hume (whose name is commemorated in Hume-wood, Port Elizabeth), John Henry Featherstone (of Featherstone's Kloof) and inn-keeper Nicholas Lake. It was appropriate, he declared, that the new reservoir on Newing Green Farm should be named Settlers Dam. He had been assured that this would be sufficient for the next 35 to 50 years, but he hoped that Grahamstown's development would be '*...so abnormal as to demand waters from the Drakensberg via the Orange-Fish River Project*'.

Mr Oliver rounded off the celebration by presenting the MP with a large parcel, saying that it was his firm's practice to do so. '*We thought that an umbrella would be tempting providence too much*', he said, as the opened parcel revealed a plastic gallon can¹⁴⁷. It was only in the next year that there was sufficient rainfall to begin filling his reservoir: in March 1963 a good rain of 4.5 inches (114.3 mm) caused Howison's Poort Dam to overflow and Settler's Dam caught about 400 million gallons (1.82 million kl)¹⁴⁸.

The firm of Stewart, Svidirov & Oliver (SS&O) also consulted in developing an addition to Port Alfred's water supply. A low weir just above the Kowie River's ebb-and-flow would divert water through a four mile-long pipeline into the main pipeline from the Mansfield Dam. This would require a lift of 500 ft (152.4 m). At a public meeting held on 9th October several speakers raised the '*old bogie*' of possible pollution from Grahamstown's sewerage. Others, though, felt that that '*... outdated viewpoint carried little weight*'¹⁴⁹ [Authors note: It is interesting to note that Grahamstown ecologists no longer believe the '*old bogie*' to be out of date. It is believed by many that what flows from Grahamstown will indeed affect both the river and Port Alfred's water quality].

Settlers Dam raised

There was a serious flood on 24th July, 1979. '*...The worst storms in nine years*' which washed away low-lying housing in the town, led to a relief appeal being launched. The floods filled all the storage reservoirs, yet by January 1981 there remained only enough water for eleven months¹⁵⁰.

Engineers were busy raising the wall of Settlers' Dam by 2.3 metres, which would in-

crease its capacity by a third. In flood times this would inundate some 16 hectares of farmland, and in 1979 the SS&O consulting engineers, found inaccuracies in the survey maps that needed correction before a proper assessment of the problem could be made. Two possible methods of raising the wall had been suggested: by steel radial spillway gates, or by ‘post-stressing’ the existing wall in order to build on top of it. This entailed drilling vertically through the wall into bedrock and grouting in reinforcing cables. After test-drilling to establish the quality of the rock, the consultants recommended the post-stressing method¹⁵¹. A picture in *Grocott’s*¹⁵² shows workers constructing the steel gantry along the top of the reservoir wall, which would carry the drilling rig along its length to bore the required 47 holes into which 450 tons of cable would be embedded. Mr ND McColl of L.T.A estimated that the job would be complete by mid-August 1981¹⁵³ [Author’s note: this plan had been awaiting the decision of the Water Court back in 1973, the estimated cost being R0.5 million at that stage]¹⁵⁴. Then, in late March 1981, there were several deluges. On 27th March Settler’s Dam was 55% full and four days later the sluices had to be opened to prevent damage to the new construction¹⁵⁵. *Grocott’s* was silent about progress through the rest of 1981. [Author’s note: should we assume that this significant increase to the dam’s height and to Grahamstown’s supply was completed without celebration?]



Figure 17. Waainek filtration plant: on the right (below palms) are the settling ponds; the brick building at the back and the white building are used for storing alum and lime store, respectively; the building on at the left front houses the filtration plant, where chlorine is added (photo: Jim Cambray; 18 January 2008)

In spite of the increased water resources, the City Engineer could see problems ahead. It was estimated that consumption would increase from 2 221 000 kl in 1980 to 3 390 000 kl by the year 2000. If water was to be supplied to each house in the Location, the increase would be to 6 900 000 kl. In addition, the existing plans for enlarging the purification works and reticulation system would satisfy the town's needs only until 1985. These plans provided for water to pass through Waainek at 6 Megalitres (Ml) per day, an increase of 0.5 Ml, costing R572 000. Extension of the reticulation would cost R884 000. A new reservoir next to the 'Town Filters' had to be built for R300 000. The new Industrial area at Goodwin's Kloof would increase consumption further by 1 150 000 kl. It would be cheaper to find a new source and build an entirely new purification plant there¹⁵⁶.

Glen Melville Dam: the Orange River connection (Figs 18-22)

The major water-source for Grahamstown is now the Gariiep (Orange) River with its tributaries in the Lesotho Highlands. In 1842 John Centlivres Chase wrote, 'If this river were diverted from its course ...its waters could irrigate thousands of acres of the richest kind, and afford food for an immense population'. Nearly a hundred years later, in 1928, Dr AD Lewis, the Director of Water Affairs, mentioned the possibility of diverting water through a tunnel into the Great Fish River Valley. Field surveys took place in 1944; test drilling was done in 1947; further investigations followed in 1959. Finally, in 1963, the official report — the Orange River Development Project — appeared¹⁵⁷.



Figure 18. Glen Melville Dam with filtration and pumping station east of the dam wall (downloaded from Google Earth; 18 September 2007)

This great scheme began with the construction of the Hendrik Verwoerd Dam (now called the ‘Gariep Dam’) upstream of Norval’s Pont. The wall itself is a marvel of engineering, blocking the gorge by means of a great 88 m high arch between two gravity wings that tie into the hillsides. Two huge gates control the release of flood water down six spillway openings with concrete aprons below to prevent erosion. The storage capacity of the full lake, which covers an area of 360 km² is 5 673.8 million m³.

The wall was completed in 1971. The reservoir feeds the PK Le Roux Dam further downriver, which supplies the Gariep’s irrigation schemes. It also diverts about 25% of the Gariep’s water into the Great Fish River Valley via the Orange-Fish Tunnel, which passes from Oviston on the Gariep Dam to Teebuspruit, a distance of 83 km, and from there into Grassridge Dam on the Great Brak, a tributary of the Great Fish River. This part of the scheme was completed in 1973. A further tunnel near Cookhouse, completed in 1975, transfers water into the Sundays River catchment via Lake Mentz (now named the Darlington Dam). It was in that year that water first passed through the tunnels to begin supplying farms down the Fish and Sundays River valleys.

The Oviston-Teebus tunnel is another engineering marvel. The investigative drilling began in 1944, continuing through to 1967. The 5 m diameter tunnel has a gradient of 1:2000 and a maximum flow of 57 m³ sec⁻¹. Its construction was divided into three contracts, starting from each end and along the central section. Because of the varied rock formations through which it passed 2 million tons of concrete was used to line it. The intake



Figure 19. Glen Melville dam wall (photo: Jim Cambray; 31 July 2008)

tower at Oviston has its base 9 m above the original riverbed and 30 m below the water level when the reservoir is full. Water may be drawn from four levels up the intake tower, with a further two levels provided for the future heightening of the wall. It was calculated that at the present rate of siltation (of 0.46%, as opposed to the 2% measured in the Great Fish River), the capacity would be halved within 120 years. In order to slow this rate, the first thing will be to persuade farmers within the catchment not to denude their veld by overstocking and burning; the next will be, when necessary, to construct sediment storage reservoirs; the third will be to raise the wall, which will amply compensate for the present rate of siltation¹⁵⁸.

The Lower Fish River government water scheme

Our immediate concern however is the newer Lower Fish River Government Water Scheme, for after requesting an investigation by SS&O — later known as SSI (Stewart Scott International), — into a possible reservoir on the Kowie at Silverdale farm that would have cost R40 000, Council decided in April 1983 on the principle that future supplies would come from the Orange River Scheme¹⁵⁹.

That was a scheme that would cost millions. A report by Mr MD Hall of SSI on one of the company's many visits to Grahamstown said, *Mrs [Pamela] Paton [the mayor] has grave doubts about the whole GM [Glen Melville] scheme as she considers GHT cannot afford it. I said that the other alternatives that have been raised, namely reclamation [of used water], purchase of lower riparian rights, and underground water could not make up sufficient quantity to meet the expected needs...over the next 10 years, hence the GM Scheme had to go ahead. She felt however that if water was to be that expensive few industrialists could be persuaded to set up in Grahamstown*¹⁶⁰.

In July 1987 SSI sent a letter to the Town Clerk detailing three possible views of Grahamstown's requirements, taking into account increased waterborne sewage, schools, municipal use and water-losses. The following estimations are extracted from an annexure to the letter (Table 1).

The statistics presented here show the rapid climb in population envisaged and the vast increase in demand¹⁶¹.

Table 1. Estimated water use from 1980 to 2010 at three demand levels

Year	Pop. 1	Pop. 2	Pop.3	Demand 1 (Ml/day)	Demand 2 (Ml/day)	Demand 3 (Ml/day)
1980	45 000	45 000	45 000	0.79	0.79	0.79
1987	56 870	56 870	56 870	3,17	3.17	3.17
1995	74 310	69 410	92 640	3.98	3.74	5.32
2000	87 830	76 640	118 230	4.69	4.09	7.00
2005	103 810	84 610	139 740	5.70	4.51	8.46
2010	122 700	93 420	165 170	6.85	5.09	10.22

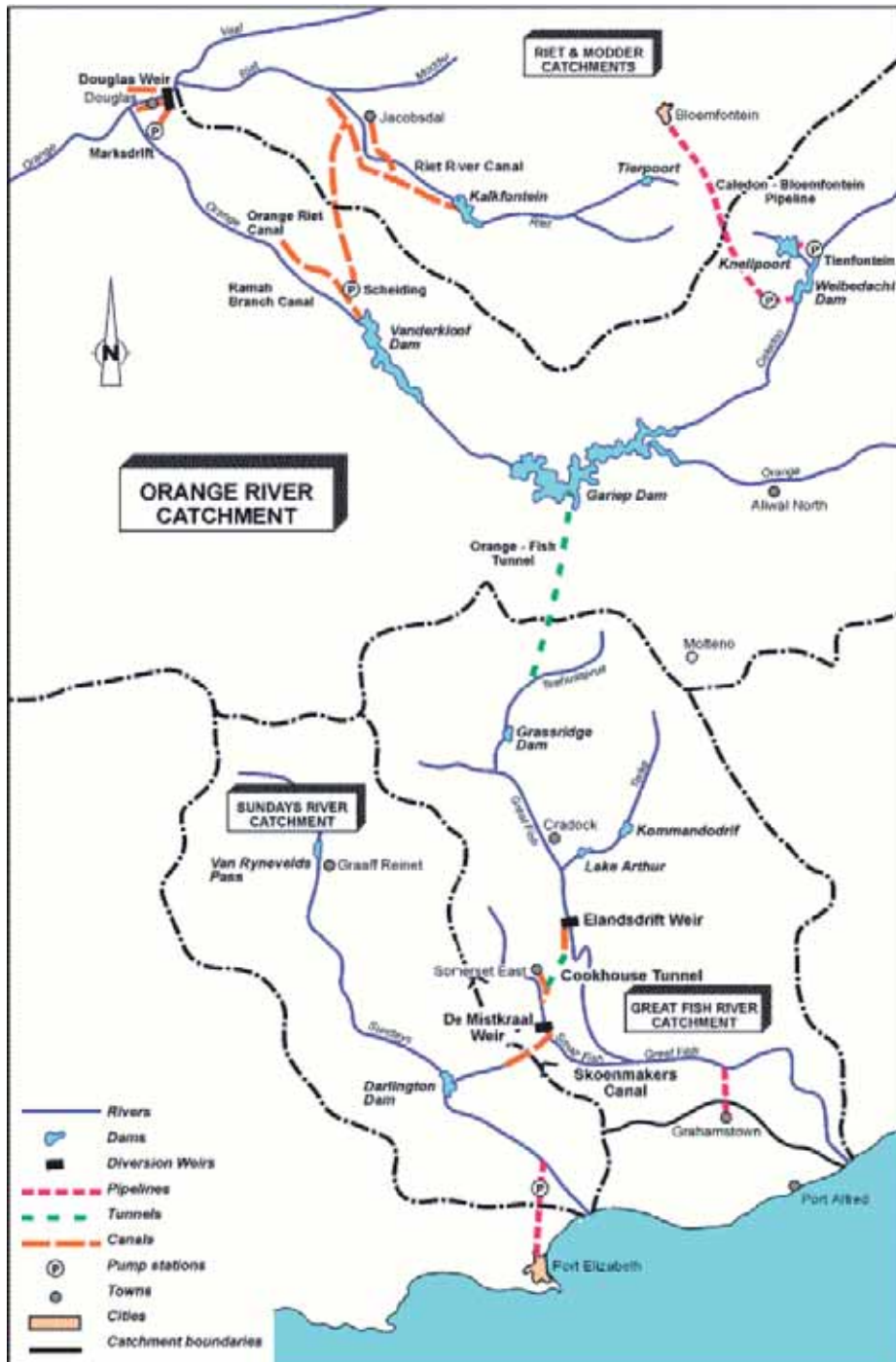


Figure 20. The Orange-Great Fish River Scheme (DWAf archives)



Figure 21. The Hermanuskraal Weir on the Great Fish River near Fort Brown (photo: Jim Cambray; 31 July 2008)



Figure 22. The exit point of the tunnel which carries water via the Hermanuskraal Weir, Great Fish River, to the Glen Melville Dam (photo: Jim Cambray; 31 July 2008)

The Glen Melville scheme and current water management (Figures 23-27)

The plan was to divert 'Orange River' water via a weir upstream of Fort Brown (Hermanuskraal) on the farm Brandeston, through a tunnel into the Ecça River (or Brakrivier) into the Glen Melville Dam, close to the bottom of the Ecça Pass. The intention was to supply water for irrigation projects down-river and also to Grahamstown.

It would seem that the aim of the scheme was at least partially political. Under the policy of Apartheid (or Separate Development) the White National Government had initiated separate 'States' in the 'Homelands' (tribal areas), the quasi-independent 'Bantustans' of which the Republic of the Ciskei was one. The South African Government poured money into the Ciskei in an attempt to relieve the distress of the over-populated and impoverished area, into which people had been forcefully dumped in large townships like Sada and Dimbaza. A smaller such 'dump', named Glenmore, was on the left bank of the Great Fish River, between the Republic of South Africa and the Republic of the Ciskei. There was a great protest about this move but the government proceeded to relocate 3000 people from an overcrowded Fingo Village. At Glenmore it was hoped that intensive agriculture would take place¹⁶².

The DWA Director's report stated that the scheme would not only provide water (45 million m³ per annum) to the irrigation projects on either side of the river, and 6 million m³ per annum for urban use, but also promote good relations between the two republics (SSI Archives 1986-1987). The Ciskei had formally requested the supply of water to the Tyhefu Irrigation Scheme on the east bank in 1976, and its implementation was announced by the State in April 1985. A 400 ha pilot scheme was declared to have been a great success.

Yet there was an important agricultural problem to solve — salinity. The director's report pointed out that simply to allow Orange River water mixed with the brack water of the Great Fish to be pumped out of the river would entail huge wastage. The solution was storage in an off-channel reservoir. Sixteen m³ sec⁻¹ would be released from time to time from the Elandsdrift Weir between Cradock and Cookhouse, which would be adequate to dilute the 'mineralised base flow'. Those 'slugs' of about 6 million m³ of Gariep water would be measured at gauging weirs at Elandsdrift and at Pigott's Bridge before reaching the Hermanuskraal diversion weir. The weir, with a height of 5 m and a crest-length of 45 m, was to be built on a solid rock foundation. Above the weir, a 3 m high horseshoe-shaped tunnel would convey the water for 5055 m into a small tributary of the Ecça River and thence into the Glen Melville Dam¹⁶³.

It is gratifying to note that during the scheme's construction in 1992 Mr Francois de Kock, a landscape architect, was employed to oversee the mitigation of environmental impacts. A fishway was built at the weir to allow fish to swim upstream. The direction of the tunnel was altered in order to avoid a natural waterfall close to the exit. The canal had game-escapes inserted at 500 m intervals along its 12 km length, which would help any animals that had accidentally fallen into the canal¹⁶⁴.

The concrete dam would have a maximum height of 26 m, a crest-length of 390 m, a 100 m uncontrolled spillway, and a catchment of 55 km². The tunnel would pass water through at 12 m³ sec⁻¹ into the reservoir, which would hold 6 million m³. From there a canal

would carry water back to the irrigation settlements on the alluvial banks of the Great Fish River, while a treatment plant would purify Grahamstown's requirements before they were pumped up to a holding tank on Botha's Ridge from which the water would be reticulated by gravity into the city¹⁶⁵.

After almost a decade of above-average rainfall, the 1980's, with only two years of relief, were regarded as the worst drought in 33 years (see Appendices i, ii). In 1984 Council looked into various means of sourcing and conservation¹⁶⁶: underground supplies, recycling of wastewater, reduction of losses in the purification process, prevention of leakages, and the reduction of demand by reducing pressure. The completion of the new scheme had now become urgent, for in 1985 stringent restrictions had to be instituted, with penalties imposed on properties that consumed more than 400 litres per day.

Fortunately, 1986 produced above-average rain, which perhaps encouraged Council to investigate a number of improvements: laying a high pressure pipeline, constructing a low level reservoir, improvements to the Waainek waterworks, providing services to Lavender



Figure 23. Mr Phillip Nobomvu (superintendent) and the author at the Jan Kleynhans water purification plant below Glen Melville Dam (photo: Jim Cambray; 31 January 2008)

Valley and the Mary Waters township, extensions to the reticulation system, and the wastewater treatment works.

The Chief Engineer of the Department of Water Affairs & Forestry (DWAF), Mr FA Stoffberg, estimated that the Glen Melville scheme would cost R55 million. The Cradock



Figure 24. Mr Phillip Nobomvu points towards the heart of the Jan Kleynhans water treatment plant: the three large pumps that keep water circulating at 125 litres per second. If any one of these fails then the main pump, closest to Mr Nobomvu, will turn on (photo credit: Jim Cambray; 31 January 2008)

Heights temporary housing scheme above Cradock Dam was built for the white employees — providing 37 prefabricated structures and a community hall — and work began. In April 1986 an aerial survey and exploratory drilling were made to find the best route for the pipeline from Glen Melville to Botha's Ridge. From Botha's Ridge holding reservoir the water would gravitate into Grahamstown via storage tanks at Mayfield Farm and Tanti Location. An outlet on the right bank of the reservoir led the water back into the river and on into the concrete canal that led to the irrigation schemes. Pipes carried Grahamstown's water to the purification works and pumping station — also on the right bank — down-river from the wall, but above the floodline. The pumps would drive the water against a head of 505 m at a rate of 100 l sec⁻¹. All the design work would be completed by the end of April 1989¹⁶⁷.

Tenders were called in November 1990. The consulting engineers, SSI, recommended that Glennie Construction Co. build the reservoir at their figure of R1 402 948, while Grinakars construction company should do the purification works and housing for the supervisor and shiftmen for R3 497 385. In January 1991 agreements were negotiated with the affected farmers with regard to land expropriation, water compensation and roads and workers' compound¹⁶⁸.

Minutes of contractors' meetings record the final steps towards completion. Those on 30th January 1992 provide the following timetable: Grinakars concrete teams would leave the site as soon as possible to make way for Siemens electronics company to start work on the complex electrical installations. They estimated completing them in early March 1992. Aquazur (chemical plant) and Sulzer (pumps) would be out within six weeks. Commissioning of the purification works and pumping station would take place between 30th March and 10th April¹⁶⁹.

On the 13th February 1992, SSI's Mr MD Hall reported an argument between Grinakars and Council regarding workers' attendance (See 'Two Cities in One' below). It was a period of unrest and stay-aways. Council felt that if it could have 95% attendance during a stay-away, then so could the contractor. The latter argued that it could not be expected to have the same control over its temporary staff that Council had with a local and settled workforce. Council wanted a clause to be inserted in the contract that would confine requests for time extensions only to periods of national stay-aways. SSI doubted whether this could be done¹⁷⁰.

POLITICAL UPHEAVALS AND WATER SUPPLIES

Two cities in one

The late 1980s – 1994 was a time of political upheaval and sharp divisions between the 'Two Towns': Grahamstown on the west of Amatyana Stream and Rini, with its own municipality, on the east. The latter was an outcome of the philosophy of Separate Development and of the Group Areas Act of 1950, designed to restrict the mingling of the races. There were elections for the 'City' councillors in 1983 supported by a small minority of its citizens. It was not a popular institution on either side of the stream, being unable to provide the people with their needs at a time when cracks were developing in Apartheid policies¹⁷¹. Rini soon found itself in serious debt to its sister municipality. In January 1992

Grahamstown informed the Algoa Regional Services Council (ARSC) of this situation, which included R244 287 for water tariffs alone. The Grahamstown Town Clerk, Mr Lionel Pienaar, reported that, although most reluctant to do so, Council had no alternative but to cut off the supply of water and electricity to Rini. In response, Mr Chris Muller, the Rini Town Clerk, said that there was no need to go to such an extreme; the bills would eventually be paid, and there was at that stage a dispute over the cost price of water. He was confident that a reasonable price would be negotiated¹⁷².

Nevertheless, on the 5th February 1992 Grahamstown did cut off the services for two days, while Grahamstown and Rini leaders worked to avoid a crisis. GRACA, the Grahamstown Action Campaign, led a consumer boycott. A protest meeting at Noluthando Hall called for the immediate resignation of the Rini councillors and its Town Clerk. There would be a partial stay-away from work on Thursday. Municipal financial statements must be revealed and the bills must be paid from whatever funds were available.

The protest led to some disturbance. Stone throwers in Raglan Road, which runs through the Location, caused at least one accident: a couple had their car overturned and had to be taken to the Settlers Hospital. Schools had to be closed; damage was done to pipes and meters, and Themba TB Hospital found itself forced to use oil lamps and to seek water from Grahamstown¹⁷³.

Rini citizens had to travel into Grahamstown to find water, many pushing wheel-barrows. The Grahamstown City Engineer's Department made an effort to ease their plight by opening two water points on the boundary and sending tankers to key points. Two pictures show a long queue in Joza and two smiling recipients returning home with their buckets on their heads¹⁷⁴.

The headline 11th February 1992 in *Grocott's* begins, 'Peace Returns...' The Grahamstown Mayor, Mr Steve Birt, declared that the water problem had been eliminated. The Cape Provincial Administration (CPA) was working to reconcile all of Rini's accounts. GRACA made renewed calls for the CPA to take over the town's administration¹⁷⁵. The Two Towns experiment had clearly failed, so it was not surprising that *Grocott's* reported in July that steps were being taken to reunify them¹⁷⁶.

Costs

In the meantime, both towns would have to contribute to the Glen Melville Scheme with the support of the newly-formed Development Bank of South Africa (DBSA). SSI produced an important census of the Rini households (Table 2).

The following figures (Table 2) describe a town with overcrowded housing, most people having to fetch their water, a sewage system based largely on 'buckets', and only some interior electricity — a community needing generous support¹⁷⁷.

The new Glen Melville supply would ease the situation somewhat, providing 30 litres per person per day, though without the benefit of water-borne sewage. Even so, the cost of this supply would be enormous, despite a suggestion from the DBSA that — because of the probable relaxation of Influx Control and the lack of work in the two towns — the population increase would be in the region of 2%. As a result, the proportion of costs to Rini would drop from 60% to 30%¹⁷⁸.

Table 2: Municipal services and demographics: Rini (early 1990s)

Suburbs	Sites	People per site	Water	Sewage	Electricity and tarred roads
Fingo Village	660	200	80 connected 69 standpipes.	16 connected	
Tantyi	600	100	Standpipes.	Buckets.	
Tantyi Infill	225	6–7	65 standpipes.	Buckets	
Makanaskop	1135	10	143 standpipes.	Buckets	Supplied
Extension 1	232	6–7	Internal plumbing	Buckets	Supplied and roads tarred
Extension 5	217	6–7	Internal plumbing	Conservancy tanks	
Exts. 2,3,4	780	6–7	Connection available	Buckets	
Kings Flats	47	6–7	Internal plumbing	Water-borne	Supplied
KingsFlats	1950	6–7	Metered supply	200 high class	Supplied
Schools	13		8 supplied	4 water borne	Supplied
School buildings	2		Will have	Will have	Will have

In a July 1988 letter to the Mayor of Grahamstown, Dr B La Trobe, SSI presented a forecast of costs, in cents per unit, to the consumer, dependent on whether the towns were to receive subsidies or not, or if they together formed a Water Board and shared the costs (Table 3). SSI recommended the sharing option.

A letter to the Town Clerk of Grahamstown, Mr C Neethling, attaches the estimated costs to be faced by the Department of Water Affairs totalling R75 million: a breakdown of these costs is outlined below.

Table 3: Forecast of costs (cents per unit) of water supplies to Grahamstown and Rini (1990–2010)

Year	No subsidy		With subsidy		Water board ¹⁷⁹	
	Gtn.	Rini	Gtn.	Rini	Gtn.	Rini
1990	183	526	174	488	171	451
2000	173	262	164	248	162	233
2010	166	226	159	219	155	206

Works shared between irrigation and urban:

Diversion weir	R200 000
Tunnel	R184 000 000
Dam	R9 400 000
Flow gauges	R600 000
River crossings	R5 100 000

Irrigation only:

Ecca canal	R6 100 000
Supply mains	R9 800 000
RSA distribution	R9 800 000

Miscellaneous:

Site	R2 800 000
Servitudes	R300 000
Contingencies	R12 500 000

The letter stated that Grahamstown-Rini would have to contribute 6/42 of the shared costs, that is R5 280 000. It also mentioned that the Glen Melville scheme would be R1 719 000 cheaper than an alternative scheme at Koestersdrift (33° 07' S, 26° 30' E)¹⁸⁰. Cheaper perhaps, but the figures show that such a project was far out of reach of any town of Grahamstown's size and economic standing.

An official opening

Although the new inter-basin transfer scheme was now all but complete there remained the question of Grahamstown-Rini paying for the water that would soon be available. Negotiations were in progress with the Department of Water Affairs & Forestry (DWAf), for it appeared that its offer was considerably higher than the 33.2c per kl then being paid. Grahamstown, ever careful of its finances, proposed that for the first five years it should tap on the resource only when its own supply was short¹⁸¹.

The Glen Melville Dam was to be named for Mr James Kleinhans, the Head of the Algoa Regional Services Council. General Magnus Malan, Minister of DWAf, was to open the scheme on the 5th May 1992. The day began with a welcome from Grahamstown's mayor, Mr Steve Birt. He announced that the target date for the first arrival of water into the two cities was 1st June 1992. The present household cost, he said, was R1.76 per kilolitre for the first 10 kl, which rose to R2.188 thereafter. There could now be an increase of 7–8 %. In his speech Mr Kleinhans reported that the Algoa Regional Services Council would provide R18 million towards running costs and also a substantial discount for the less fortunate. The 10% subsidy to Rini was to continue, which meant that the householder would pay cost less 10%.

In place of the Minister, General Malan, the Deputy Minister, Mr Japie van Wyk, unveiled a commemorative plaque and opened the supply valves. Once the new tariffs had been successfully negotiated, water would be available in vast quantities. Mr Birt recalled the openings of previous schemes, when mayors had announced that water problems were then a thing of the past. He did not wish to fall into the same trap. Ironically indeed, while the celebration was taking place, the Cities were entirely waterless: there had been a burst in the main feeder line from Howison's Poort¹⁸².

The need to think ahead

The Department of Water and Environmental Affairs (DWEA; previously, DWAF) has the huge task of supplying potable water to an ever-increasing population and to the demands of industry and food production. The article 'Water Resources Development in the Eastern Cape' by van Veelen & Stoffberg (1987) touches on the topic of 'risk analysis': neither Eastern Cape towns and cities nor farmers could be absolutely assured of a continuous supply from the Gariiep Dam. DWEA warned that as demands on that source increased so would assured supply decrease. Irrigators could expect 80% assurance while urban users



Figure 25. The superintendent of the Mayfield sewage works discusses the termination of the bucket system with the author. Mr Wessels noted on 30 January 2008 that only 200 households were still serviced by this system (photo: Jim Cambray; 30 January 2008)



Figure 26. Three digesters at the Belmont Valley sewage plant (photo credit: Jim Cambray; 30 January 2008)



Figure 27. The Belmont Valley sewage plant (photo: Jim Cambray; 30 January 2008)

would be guaranteed 98% supply for the foreseeable future. The risks attached to several consecutive dry years in succession would have to be analysed. The crops best suited to withstanding dry periods and requiring least irrigation, such as lucerne, would have to be grown.

A third and very significant prospect was that of siltation, which leads to higher evaporation and reduction in capacity. It was extremely important to be able to forecast the amount of silt in flow prior to the planning of schemes — this in a semi-arid area that is notoriously subject to erosion. The problem of quality would gradually become more serious as the demands on the Gariep Dam supply increased. Flushing of mineralised streams is wasteful. The development of models depicting future possibilities had become increasingly urgent¹⁸³.

Ironically, according to an information document entitled ‘Albany Regional Water Supply Scheme’ (January 2008), the demands upon the Glen Melville scheme might have increased significantly. The intention was to supply the coastal area via a pipeline from the dam with approximately 15 million m³ per year. According to the document, Grahamstown extracted only 10 MI per day whereas the Glen Melville had a capacity to reticulate 1 370 MI per day. The James Kleinhans Water Treatment Works, it was mooted, was to be enlarged from 10MI per day to a 26 MI per day capacity. This, it was estimated, would fulfil the needs of the region down to the Ndlambe coast by the year 2020. Makana Municipality was offered the incentive to accept the scheme with the carrot of much-needed repairs to the town’s reticulation system. However, DWEA has indeed been thinking ahead, and for the present at least, has quashed the scheme in the estimation that the great Gariep River will be unable to always sustain such levels of water demand¹⁸⁴.

There have in the meantime been forward-thinking citizens of Grahamstown who have looked at local problems with concern and practical suggestions. The Kowie Catchment Campaign (KCC) was founded in December 2002 under the auspices of the Makana Environmental Forum to monitor the water quality of the Kowie River and to educate Grahamstown’s citizens on the conservation of its streams.

In 2006 a water quality crisis arose when fingerlings in the experimental ponds at the Department of Ichthyology and Fisheries Science at Rhodes University died in large numbers. Rhodes University warned against drinking tap water and large quantities of bottled water had to be imported. It was subsequently found that though the presence of ammonia and calcium carbonate had caused the death of the fishes, the water was safe for humans, although perhaps unpleasant to drink¹⁸⁵.

Angela Barberton, a leading member of the KCC committee, had noticed that people frequently stopped at ‘The Spring’ (‘Umthombo’) on the Port Alfred road to refresh themselves and collect good-quality drinking water, but in the process, also caused damage to the area. Together with her right-hand man, Barney Kepe, she built up the surrounds and the pathways, and also supplied a rubbish bin¹⁸⁶. Citizens from all walks of life were immediately attracted to the spot, armed with containers, many continuing to make regular use of it. As a result, there has been further damage to the spring and cars that gather at the roadside have proved to be a traffic hazard.

Angela Barberton and Nikki Köhly of KCC looked for citizen support and in May 2007 proposed a meeting for concerned parties. Kevin Bates of the Makana Department of Parks & Recreation and also a KCC member, initiated two meetings on their behalf: firstly with the Provincial Roads Engineer, Mr Thys Groenewald. A second meeting, on the 10th March 2008, involved the Roads Department, Makana Municipality officials, a councillor and the Rotary Club of Grahamstown who were to 'adopt' *The Spring*. Mr Groenewald was insistent that safety was a major concern, and the proposal to create a parking area west of the spring at a cost of R280 000 appears to be the first step to be taken. Other improvements have been proposed, which the Municipality and Rotary are looking into¹⁸⁷.

The Grahamstown public was invited to attend the Makana Environmental Forum's last meeting of 2008 to discuss, chiefly, two topics: the mooted Albany Regional Water Scheme and the quality of our water. To the first there were some serious objections, to the second deep concern¹⁸⁸.

Grahamstown still has to worry about water shortages and water health including the effects of inorganic chemicals, such as aluminium sulphate, upon all organisms; siltation of major sources; the transfer of potentially harmful organisms from one catchment to another; the disposal of liquid waste. The comprehension of the huge problem of water conservation by its citizens is a matter that has gained increasing attention in the press and from the community itself. It remains for words to be translated into action.

CONCLUSION

From the beginning Grahamstown has been in search of water, even though its site was chosen because of the 'water kloofs' that drained the north-facing flanks of the Rietberge ('Mountain Drive'). The growing city will continue to do so in spite of the Lower Great Fish's link to the Orange River Catchment. It will have to be ever conscious that the Gariep Dam feeds not only the Great Fish, the Sundays and the Nelson Mandela Metropolitan Area, but also large areas along its own banks and northwards into the Orange Free State. As Grahamstown grows it will be competing with areas with a much greater economic growth rate with huge, and often unsustainable, demands upon water sources.

Grahamstown will have to think ahead, and perhaps together with National and Provincial bodies, be forced to fall back on local and small-group initiatives: reduce family size; educate the young and the old; maintain smaller dams; revisit as-yet untapped schemes, such as Green Hills, Botha's River or Silverdale; re-use outflow; investigate waterless toilet systems; make domestic rainwater tanks obligatory; maintain the ancient supply infrastructure, and resist wastage.

Easier said than done! Grahamstown has always suffered from debt, and will not be able to enter into any new capital scheme without huge input from Government. Grahamstown is unable to sustain its present population, and in turn its population cannot support the City's demands without some means of supporting itself.

To the environmentalist, water retention and abstraction schemes can be a curse blocking the free movement of aquatic flora and fauna and altering and destroying habitats, often

to the benefit of undesirable alien species. Water abstraction also has serious impacts on estuaries and adjacent marine environments: major declines of freshwater inputs into such systems cause shifts in salinity gradients, with negative impacts on estuarine organisms. This is of huge concern to marine fisheries as many marine species breed in estuaries, which provide ideal 'nursery areas' for juveniles.

Yet, finally, there appears to be no alternative than to '*tap the mighty ocean*'. It is a bleak picture that faces the community and the paid councillors and officials elected or employed to lead it.

However the city has managed through almost two centuries. It has met droughts, floods, wars, depressions and confusion with the spirit and expertise of its citizens. Out of the sweat and ingenuity of thousands it has built itself, from the rusty shacks of the impoverished to the fine structures that line its tree-shaded streets. And one must not forget the leadership of the maligned commissioners of the early years and the councillors who, without payment and with limited means, oversaw the city's development. Grahamstown (as it has always been known to English speakers) or Rhini (to Xhosa speakers) or Grahamstad (to Afrikaans speakers) is the ancestral home to which many return, yet it teems with outward-seeking youth. It is worthy of preservation; its people must not allow it to become a place of desiccation and tragedy. Water is the source of its survival.

ACKNOWLEDGEMENTS

When Dr Jim Cambray, Chair of the Kowie Catchment Campaign, asked me to undertake this task I did not realize that it would be leading me to encountering so many helpful and friendly people – nor how many hours I would be sitting paging through documents, news papers, theses and books. As an amateur I thought that it would be simply a matter of reading through a few secondary sources to write a five-page school essay. Not a bit of it. Once you start it never seems to stop. But in the end, though there will be many gaps in the completed effort, the project has to be rounded off and set aside.

Among the friends who have given practical and moral assistance I must thank: Professor Keith Hunt, on whose work I so much relied, Jim Cambray and Irene de Moor our kind editors together with the anonymous reviewers who gave such sage advice. Ferdy de Moor, and Fleur Way-Jones of the Albany Museum, Denis Hughes and Lil Haigh of the Rhodes University Institute for Water Research, Nikki Köhly and Angela Barberton of the Kowie Catchment Campaign, Harri Mäki of the University of Tampere in Finland, researcher and author of 'Water, Sanitation and Health'; Andrew Theron and Christine Gross of SSI (Stewart Scott International) Consulting Engineers in Port Elizabeth, previously Stewart, Svidiroff & Oliver- SS&O), for allowing access to their archives, Staff of the Rhodes University Main and Cory Libraries, and my wife Rosemary (for her patience and encouragement).

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ENDNOTES

Note the following abbreviations:

TGJ The Grahamstown Journal; TJ = The Journal; GPM = Grocott’s Penny Mail; GDM = Grocott’s Daily Mail; GM = Grocott’s Mail; KCC = Kowie Catchment Campaign; SSI Archives = Stuart Scott International Archives

¹ Daniel J.B. McI. et al. ‘Grahamstown and its Environs’ (Albany Museum, Grahamstown)

² Butler G. ‘When Boys were Men’ (O.U.P. 1969)

³ The colloquial use of terms ‘dam’ and ‘reservoir’ is often incorrect. Strictly speaking, the term ‘Dam’ refers to the structure holding the water back, and ‘reservoir’ refers to the water body held back by the ‘dam’. Nevertheless, since the term ‘Dam’ is often used as part of a place name, this becomes part of the language and can’t be ignored even if technically incorrect. The following editorial convention has therefore been adopted: ‘Dam’ (with leading capitals) indicates part of the formal name of certain reservoirs; if written in lower case, the term refers to the dam wall structure. The term ‘reservoir’ generally refers to the bodies of water held back by the dam walls.

⁴ Hunt K.A. ‘The Story of Grahamstown’s Water Supply’. Annals of Grahamstown Historical Society, 1976

⁵ Daniel J.B. McI. et al. op. cit.

⁶ The Grahamstown Journal (TGJ) 18.02.1876

⁷ Hunt K.A. 1976. op. cit.

⁸ Hunt K.A. 1976. op. cit.

⁹ Hunt K.A. 1958. M.A. Thesis, Dept. of History Rhodes University. ‘The Development of Municipal Government in the Eastern Cape Province of the Cape of Good Hope with Special Reference to Grahamstown.’

¹⁰ Hunt K.A. 1976 op cit.

¹¹ Mostert Noël ‘Frontiers’ (Pimlico, 28 Vauxhall Bridge Rd. London SWIV 2 SA) 7

¹² Way –Jones F. ‘The Hope’s Garden Dam .’. Annals of the Grahamstown Historical Society, 2002

¹³ ‘The Amatyana Stream is locally referred to as ‘the Kowie Ditch’

¹⁴ Coetzee C. ‘Forts of the Eastern Cape 1799 – 1878’; Chapter 4. (Univ. of Fort Hare Printing Dept.)

¹⁵ Hunt K.A. 1976. op. cit.

¹⁶ ‘The Journal’ (TJ), sometimes referred to as ‘Journal’; name later changed to ‘The Grahamstown Journal’ (GJ) or ‘TGJ’; amalgamated with *Grocott’s Penny Mail* in 1920 (also see Endnote 100).

¹⁷ TGJ 16.02. 1861

¹⁸ Hunt.K.A. 1976. op.cit.

¹⁹ TGJ 16.02.1861

²⁰ Hunt K.A. 1976. op. cit.

²¹ TGJ 13 & 27. 08. 1861.

²² Gibbens M. ‘Two Decades of the Life of Grahamstown, 1862 to 1882’. M.A. Thesis, Dept of History, Rhodes University, 1982.

²³ TGJ 16 & 30.07. 1866

²⁴ TGJ 13.08.1866

²⁵ TGJ 28.10.1866

²⁶ TGJ 1.10.1866

²⁷ TGJ 8.04.1867

²⁸ Todgham C. ‘Oldenburgia Conservancy Draft Management Proposal’ p.p. 31 – 38. 2006.

²⁹ TGJ 14.01.1867

- ³⁰ TGJ 15.04.1867
³¹ Gibbens M. 1982 op.cit.
³² TGJ 21.01.1867
³³ TGJ 29.04.1867
³⁴ TGJ 4.02.1867
³⁵ TGJ 17.06.1867
³⁶ TGJ 18.03.1867
³⁷ TGJ 25.03.1867
³⁸ Doughty O. 'Early Diamond Days.' (Longmans, Green & Co Ltd. 1963)
³⁹ Daniel J.B.McI. op. cit.
⁴⁰ Crouch Dr LG 'A Short Medical History of Grahamstown' (available at Albany Museum)
⁴¹ TJ 18.08.1876
⁴² Gibbens M. 1982 op.cit. & TJ 15.03.1878
⁴³ TJ 4.10.1878
⁴⁴ TJ 30.10.1878
⁴⁵ TJ 4.10.1878
⁴⁶ Gibbens M. 1982. op.cit.
⁴⁷ Levick W.M. 'The lives of Robert & Jennie Mullins' revised by Dr MR Knowling 2004, P136.
⁴⁸ Spindler H.L. 'Grahamstown Water Supply : Drawings to accompany Mr Spindler's Report' Albany Museum Dept. of History SM5081(3). Report missing
⁴⁹ TJ 18.02.1893
⁵⁰ TJ27.06.1893
⁵¹ TJ 12. 02. 1898
⁵² TJ 3.07.1893
⁵³ TJ 10.07.1893
⁵⁴ TJ 23.09.1893
⁵⁵ TJ 5.07.1894 & TJ 26.07. 1894
⁵⁶ In South Africa the terms 'Location' and 'Township' historically referred to areas, usually on the outskirts of towns and cities, where Black and 'Coloured' people live(d).
⁵⁷ TJ 6.09.1894
⁵⁸ TJ 7.04. 1898
⁵⁹ TJ 1.10.1898
⁶⁰ TJ 8.09.1898
⁶¹ Refers to Queen Victoria's Jubilee Industrial Arts Exhibition, held in Grahamstown, 1898
⁶² TJ 12.11.1898
⁶³ Hunt K.A. 1976 op. cit.
⁶⁴ TJ 5.02.1904
⁶⁵ TJ.28.07. 1876
⁶⁶ TJ 14.04.1904
⁶⁷ TJ 16 & 30.04.1904
⁶⁸ TJ 17.05.1904
⁶⁹ TJ 17.05.1904
⁷⁰ TJ 11.06.1904
⁷¹ TJ 8.04.1905
⁷² TJ 29.07.1905
⁷³ TJ 5.08.1905

⁷⁴ TJ 29.07.1905

⁷⁵ TJ 9.12.1905

⁷⁶ TJ 23.12.1905

⁷⁷ TJ 25.01.1906

⁷⁸ TJ 18.01.1906

⁷⁹ TJ 6.03.1906

⁸⁰ TJ 10.05.1906

⁸¹ Southey N.D. 'A Period of Transition: a History of Grahamstown 1902 – 1918'. M.A. Thesis, Dept of History, Rhodes University. (Dept of History, Albany Museum).

⁸² TJ 1.06.1905

⁸³ Crouch Dr L.G. op. cit.

⁸⁴ TJ 3.06.1905

⁸⁵ GPM 31.08.1906

⁸⁶ Sellick R-M. 'A Study of Local History: Grahamstown 1883 – 1904'. M.A. Thesis, Dept of History, Rhodes University, 1993. (Dept of History, Albany Museum).

⁸⁷ Fitchat H. Municipal Year ended 30th June 1908: Minute of His Worship the Mayor, Henry Fitchat, M.L.A., J.P.' (Dept. of History, Albany Museum).

⁸⁸ Fitchat H. 1911. Report based on a paper by District Surgeon, Dr. E.G. Dru-Drury. (Dept. of History Albany Museum).

⁸⁹ TJ 5.09.1912

⁹⁰ Mäki Harri 'Water, Sanitation and Health. The Development of the Environmental Services in Four South African Cities, 1840 – 1920'. (Juvenes Print, Tampere, Finland, 2008).

⁹¹ GPM 19.07.1912

⁹² GPM 7.09.1914

⁹³ Crouch Dr L.G. op.cit.

⁹⁴ GJ 22.01. 1914

⁹⁵ TJ 21.03.1914

⁹⁶ TJ 4.09.1914

⁹⁷ TJ 28.02.1914

⁹⁸ TJ 25.06.1914

⁹⁹ Juuti P.S & Mäki H.R. 'Governance in water sector – comparing development in Kenya, Nepal, South Africa and Finland' Chapter 5. (Juvenes Print, Tampere, Finland, 2007).

¹⁰⁰ 'Grocotts Penny Mail' (GPM), renamed 'Grocott's Daily Mail' (GDM) after amalgamation with the 'Grahamstown Journal' (GJ) in 1920. In 1965 the name was again changed to 'Grocott's Mail' (GM) and is also sometimes referred to simply as 'Grocott's' (www.grocotts.co.za) (also see Endnote 16)

¹⁰¹ GPM 5.10.1914

¹⁰² GPM 2.10.1914

¹⁰³ GPM 20.11.1914

¹⁰⁴ Hunt K.A. 1976. op. cit.

¹⁰⁵ Fitchat H. Box file in the Albany Museum entitled 'Grahamstown's Voters' Roll' – Minute of His Worship the Mayor, 1st July 1916 to 26 September 1917'.

¹⁰⁶ Whiteside C.W.: 'The Minutes of His Worship the Mayor, C.W. Whiteside; two Municipal years ending 31 August 1920'. (Dept of History, Albany Museum).

¹⁰⁷ GDM 5.02.1926

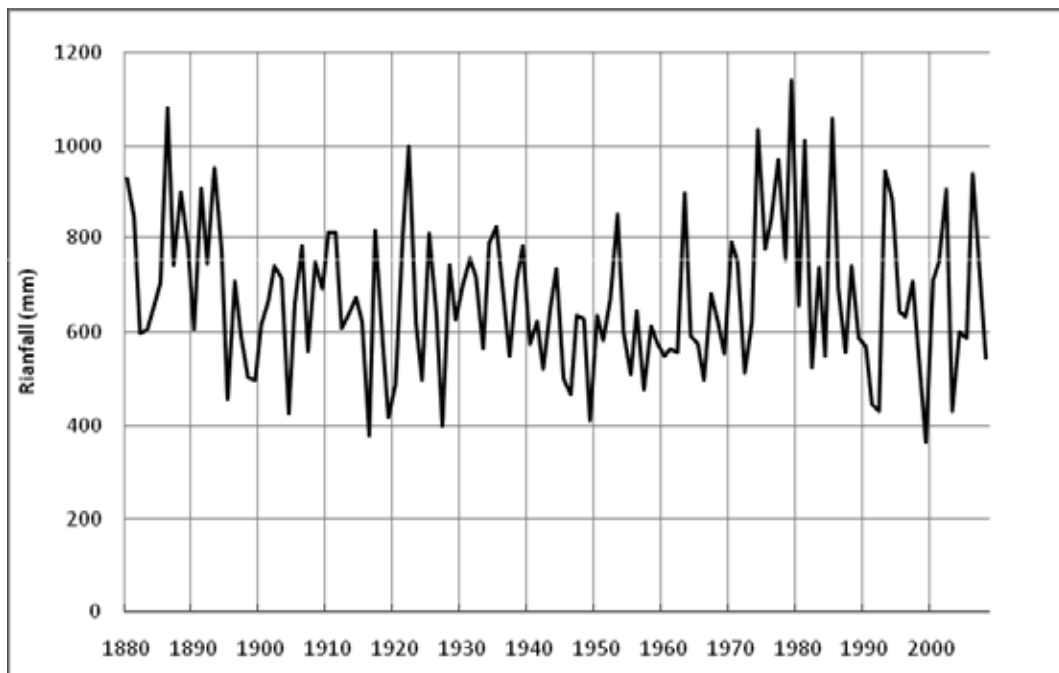
¹⁰⁸ GDM 8.04. 1926

- ¹⁰⁹ GDM 20.04.1926
¹¹⁰ GDM 26.04.1926
¹¹¹ GDM 30.04.1926
¹¹² GDM 14.05.1926
¹¹³ GDM 20.05.1926
¹¹⁴ GDM 12.02.1930
¹¹⁵ Grocott & Sherry publication: Souvenir of the Inauguration of the Howison's Poort Water Scheme, April 8th 1931'. (Dept of History, Albany Museum).
¹¹⁶ GDM 11.12.1930
¹¹⁷ GDM 25.01.1936
¹¹⁸ GDM 26.11.1936
¹¹⁹ Torlesse A.C.M. 1993. 'A History of Grahamstown, 1918 – 1945'. M.A. Thesis Dept of History, Rhodes University, 1993. (Dept of History, Albany Museum).
¹²⁰ GDM 26.10.1936
¹²¹ GDM 21.11.1936
¹²² GDM 24.11.1936
¹²³ Torlesse A.C.M. 1993. op.cit.
¹²⁴ Torlesse A.C.M. 1993. op.cit.
¹²⁵ GDM 3.10.1936
¹²⁶ Torlesse A.C.M. 1993 op.cit.
¹²⁷ Torlesse A.C.M. 1993 op.cit.
¹²⁸ GM 25.09.2007
¹²⁹ GDM 26.08.1936
¹³⁰ GDM 29.08.1936
¹³¹ GDM 7.01.1960
¹³² GDM 27.07.1956
¹³³ GDM 8, 21 & 22.08.1956
¹³⁴ GDM 4, 7, & 11. 09.1956
¹³⁵ GDM 19 & 20. 09.1956
¹³⁶ GDM 21.09.1956
¹³⁷ GDM 20.03.1960
¹³⁸ GDM 25.02.1960
¹³⁹ GDM 14 & 24.03.1960
¹⁴⁰ GDM 13.07.1960
¹⁴¹ GDM 14.07 & 2.08. 1960
¹⁴² GDM 3.09.1960
¹⁴³ GDM 8, 14 & 15.12.1960
¹⁴⁴ GDM 15.08.1960
¹⁴⁵ GDM 22 & 27.02.1962
¹⁴⁶ GDM (Ed.) 29.03.1962
¹⁴⁷ GDM (Ed.) 6.09.1962
¹⁴⁸ GDM 8 & 12.03.1963
¹⁴⁹ GDM 9.10.1962
¹⁵⁰ GDM 27.01.1981
¹⁵¹ GDM 17.04.1979
¹⁵² GDM 6.02.1981

- ¹⁵³ GDM 3.04.1981
- ¹⁵⁴ GDM 29.05.1973
- ¹⁵⁵ GDM 27 & 31.03.1981
- ¹⁵⁶ GDM 9.06.1981
- ¹⁵⁷ Badenhorst J.J. 1970. 'Survey of the Cape Midlands and Karoo Regions. Vol.1' Institute of Social & Economic Research, Rhodes University,
- ¹⁵⁸ Article from the Department of Water Affairs: 'Taming the River Giant'. sent to The Institute of Water Research, Rhodes University, by Jacqui Murray.
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- ¹⁶⁸ SSI Archives 15.11.1990
- ¹⁶⁹ SSI Archives 30. 01.1992
- ¹⁷⁰ SSI Archives 13.02.1992
- ¹⁷¹ SSI Archives 18.05.1987
- ¹⁷² GM 4.01.1992
- ¹⁷³ GM 7.02.1992
- ¹⁷⁴ GM 11.02.1992
- ¹⁷⁵ GM 11.02.1992
- ¹⁷⁶ GM July 1992
- ¹⁷⁷ SSI Archives 18.05.1987
- ¹⁷⁸ SSI Archives 10.02.1987
- ¹⁷⁹ SSI Archives July 1988
- ¹⁸⁰ SSI Archives 9.05.1988
- ¹⁸¹ GM 3.04.1992
- ¹⁸² GM 8.05.1992
- ¹⁸³ Van Veelen M. & Stoffberg F.A. op cit.
- ¹⁸⁴ Proudfoot L-A , a letter to Dr. Jim Cambray re 'The Albany Regional Water Supply Scheme' 07.01.2008.

APPENDICES

Appendix I. Annual rainfall in Grahamstown (source: Grahamstown's Weather Station records, from 1880–2003 (corrected to the nearest mm) and from 15 Park Rd, Grahamstown records (JA Cambray: from 2004–2008)



Appendix II. Annual Rainfall 1880–2008. Extracted from Grahamstown’s Weather Station Figures (corrected to the nearest mm) and from 15 Park Rd, Grahamstown records (JA Cambray: from 2004–2008.; decades’totals displayed in the far-right column

1870	71	72	73	74	75	76	77	78	79	Total
-	-	-	-	-	-	-	-	-	-	-
1880	81	82	83	84	85	86	87	88	89	
930	845	599	605	661	707	1080	744	900	780	7851
1890	91	92	93	94	95	96	97	98	99	-
605	907	748	952	774	456	709	596	503	498	6748
1900	01	02	03	04	05	06	07	08	09	-
616	667	742	717	427	662	783	561	749	694	6618
1910	11	12	13	14	15	16	17	18	19	-
812	812	608	639	675	624	379	817	588	418	6371
1920	21	22	23	24	25	26	27	28	29	-
491	807	998	621	497	810	641	401	744	626	6636
1930	31	32	33	34	35	36	37	38	39	-
701	757	718	566	788	824	675	550	714	784	7077
1940	41	42	43	44	45	46	47	48	49	-
576	624	522	653	737	501	468	638	630	412	5761
1950	51	52	53	54	55	56	57	58	59	-
636	582	673	850	602	512	646	478	615	578	6172
1960	61	62	63	64	65	66	67	68	69	-
549	565	557	896	592	576	497	682	618	555	6087
1970	71	72	73	74	75	76	77	78	79	-
790	750	513	625	1034	775	839	970	756	1140	8192
1980	81	82	83	84	85	86	87	88	89	-
658	1011	523	740	550	1059	696	556	743	588	7124
1990	91	92	93	94	95	96	97	98	99	-
569	446	431	944	881	644	635	708	549	365	6172
2000	01	02	03	04	05	06	07	08	09	-
712	753	905	432	600	589	941	722	544	-	-

Notes

Average rainfall decades 1880–1999: 673 mm p.a.

Number of years below average: 66/120

Periods below average: 1872–84; 1897–99; 1912–1920; 1926–27; 1940–1969 (with two exceptions); 1972–73; 1989–92; 2003–05.

Number of decades below average: 7/12

Number of ‘bad drought’ years (<600mm. p.a.): 39/120

Number of ‘damp’ years (>700 mm. p.a.): 46/120

Number of ‘wet’ years (>800 mm. p.a.): 24/ 120

‘Damp’ periods: 1885–1896 (with two exceptions): 1974–1981 (with one exception)

Appendix III. The population of Grahamstown: 1820 to the 2000s

Date	White	Non-White	Total
1820	200	?	200
1830s	3000	?	3000
1840s	4000	750	4750
1850s	3000	2400	5400
1860s	5400	2700	8100
1870s	5400	6900	12300
1880s	–	–	–
1890s	6200	4200	10400
1900s	7300	6600	13900
1910s	7300	6500	13800
1920s	7200	7700	14900
1930s	8200	11600	19800
1940s	9100	13900	23000
1950s	8700	15100	23 800
1960s	10 700	22000	32700
1970s	10100	31200	41300
1980s*	11000	57000	68 800
1990s*	–	–	92 900
2000s*	–	–	125 300

Notes on Population Growth

1. The information up to the 1920s is extracted from three Rhodes Masters theses:
P.E.Scott. 'Early Victorian Grahamstown: 1832–1853'.
Melanie Gibbens. 'Two Decades in the Life of a City: Grahamstown 1862–1882'.
N.D.Southey. 'A Period of Transition: a History of Grahamstown 1902–1918'.

2. 1980s–2010 These figures are taken from the anticipated population figures in the SS&O Archives 'Grahamstown 1' 16th March 1983 on application for a loan to develop the Glen Melville scheme.

The Ninham Shand estimate of 59 950 in Rhini (Grahamstown East) 1987 appears in the Rhodes University Institute for Social & Economic Research Development Studies discussed by Jane Williams and Bill Davies. Some interesting points are raised:

The estimates are derived from a number of sources, including water consumption, Ninham Shand Consulting Engineers and aerial photography.

The figures differ widely according to their sources; for example, water consumption in Rhini was measured at bulk meters in J Street and at Makana’s Kop, and the Council was billed from those readings. The meters were often vandalized, so an average had to be taken. An estimated population of 56 000 was based on these figures.

Ninham Shand’s research appears to have been more precise, providing the following information:

Fingo Village.....	22 400
Tantyi	16 200
Tantyi Infill.....	4 500
Makana’s Kop	13 600
Extension 1.....	2 400
Extension 2.....	480
Kings Flats	360
Total	59 950

3. The numbers in the table are approximations taken from a single year in each decade.

4. An interesting classification was the street-by-street listing by occupation and therefore class; for example:

I (Upper) Commandant; II (Upper Middle) Clerk to ...; III (Middling) constable; IV (Skilled manual) mason;

V (Unskilled) servant. The names in these street lists of 1842 were almost without exception British.

Appendix IV. Summary of Grahamstown’s Water Supply, 1812 to 2007.

See next page

Appendix IV. Summary of Grahamstown's Water Supply, 1812 to 2007.

Dam Reservoir	Named after	Catchment	River	Coordinates (all co-ordinates based on Google Earth searches)	Year(s) constructed	Capacity (imperial gallons or cubic metres)	Cost (British pounds or Rands)
Grey	Sir George Governor	Kowie River system	Tributary of Bloukrans River	33° 19' 26.68" S 26° 31' 39.8" E	1859–1861	15 million gallons	£ 6000+
Douglas	Lt. Governor, Sir Percy Douglas	Kowie River system	Tributary of Bloukrans River	33° 19' 14.78" S, 26° 31' 15.91" E	1866–1867	7 million gallons	App. £1038 – 4s – 1 1/4d
Hamilton	Col. R. G. Hamilton, Royal Engineers	Kowie River system	Hamilton stream, a tributary of Bloukrans River	33° 19' 00" S, 26° 30' 50.83" E	1866–1868	7 million gals	£1863
Milner	Sir Alfred Milner, High Commissioner and Governor of the Cape Colony	New Years River	Coldstream, Slaatkraal valley	33° 18' 42.70" S, 26° 25' 42.55" E	1898	45 million gals.	£35000
Jameson	Sir Leander Starr Jameson, Prime Minister of the Cape	New Years River	Coldstream, Slaatkraal valley	33° 26' 15.63" S, 26° 26' 15.63" E	1904–1905	140 million gals.	£ 6946
Howison's Poort	Farmer, Alexander Howison, who supervised construction of the Howison's Poort pass, 1832.	Kariega River	Palmiet-Berg Rivers	33° 23' 15.06" S, 26° 29' 14.66" E	1929–1931	60 million gallons	£110 000
Settlers	the 1820 Settlers	Kariega River	Palmiet-Berg Rivers	33° 24' 43.27" S, 26° 30' 35.19" E	1960–1962	880 million gallons	£156 000 /R440 000
Settlers Dam wall raised	the 1820 Settlers	Kariega River	Palmiet-Berg Rivers	33° 24' 43.27" S, 26° 30' 35.19" E	1979–1981	est. 300 million gallons	R500 000
Glen Melville	Farm No.197 in Brakrivier, Map 3326 BA	Gariep–Great Brak–Great Fish (an interbasin transfer scheme)	Gariep–Gt. Brak–Gt.Fish –Brak	33° 11' 6.76" S, 26° 39' 19.61"	Glennie Construction (dam); Grinaker (purification)	6 million cub. m with 10 'slugs' per annum @ 12 cub.m /sec.	Dam: R1 402 948, Purification: R3 497 385

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