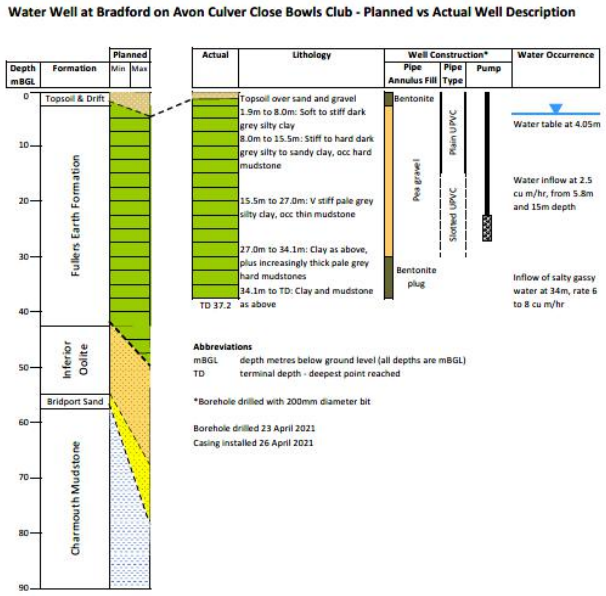
similar, although calcium and sulphate levels are much higher:

TDS	2290 mg/L
Chloride	344 mg/L
Sulphate	1080 mg/L
Calcium	385 mg/L
Sodium	218 mg/L

Another nearby example is at Melksham. In 1770 a shaft was sunk looking for coal. Instead, saline water was encountered flowing from the Forest Marble Formation at around 100 mBGL. It wasn't until 1813 that it was realised the water could have "curative" properties and a spa was constructed by local speculators. Two wells were sunk to supply Melksham Spa, in 1814 and 1815. The spa was briefly fashionable but fell out of use by 1822 and could not compete with Bath Spa or with the changing fashion in favour of sea bathing. Published water analyses (Whitaker and Edmunds, 1925) give a concentration of 552 grains per gallon of "saline matter", chiefly sodium chloride. This equates to 7,868 mg/L TDS which is saltier than the Bath or Bradford on Avon waters.



It's a pity that the deeper more saline water was not sampled in the Bradford on Avon well, or that a water temperature was not taken. Who knows – Bradford on Avon may be sitting on its own spa or thermal water source!

Both BoA Bowls Club and BoA Cricket Club are very happy with their new water supply. The total project cost was £15,000 and the club estimate that the saving is £2,000 per year. The untreated, chlorine-free water is better for the grass than mains water. Moreover, it is much greener and less wasteful to use a local water source; rather than using mains water that has been treated to drinking water standards at a high energy cost, and then just poured away onto the ground!

The Club will be closely monitoring the effects on the bowling green and the water quality over the next few seasons.

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Whitaker, W., Edmunds, F.H., 1925. The Water Supply of Wiltshire from Underground Sources. Memoirs of the Geological Survey, England and Wales, pp 20, 73, 116.

Should anyone wish to know more about this project contact Derrick Hunt, Honorary Secretary. Bradford on Avon Bowls Club via the website:

http://www.westwilts-communityweb.com/site/Bradford-on-Avon-Bowls-Club/

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Book Review
Digging Bath Stone – A Quarry and Transport History by David Pollard Published by Lightmoor Press, Lydney, Glos.,UK ISBN 9781911038 86 3. Cost £50, 512 pages.

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Anybody with an interest in English building stones, in Bath stone and the industrial history of the Bath area or who is just inquisitive about stone, old quarries and mines in general, will love this book. The use of Bath stone as a building material is well documented: first used by the Romans for their town *Aquae Sulis* here in Bath, then again during medieval times for churches and mansions, including Malmesbury Abbey (7^{th}-12^{th}C), Bath Abbey (7^{th}-16^{th}C) and Longleat House (1568). It was also then the stone of choice for John Wood the Elder and architects after him in the construction of Georgian Bath with its impressive crescents and public buildings. This book is a comprehensive account of Bath stone contained within 512 pages of text and 100s of images; many of the latter are historic B&W photographs – all fascinating to ponder over: seeing the masons at work, their various roles, their tools and devices. David Pollard began his career as a boiler maker and engineer at Swindon railway works building locomotives in the 1960s. In the early 1980s he was an industrial archaeologist with Avon County Council and his deep interest in the stone industry eventually resulted in him buying his own underground quarry at Hartham, Cors-

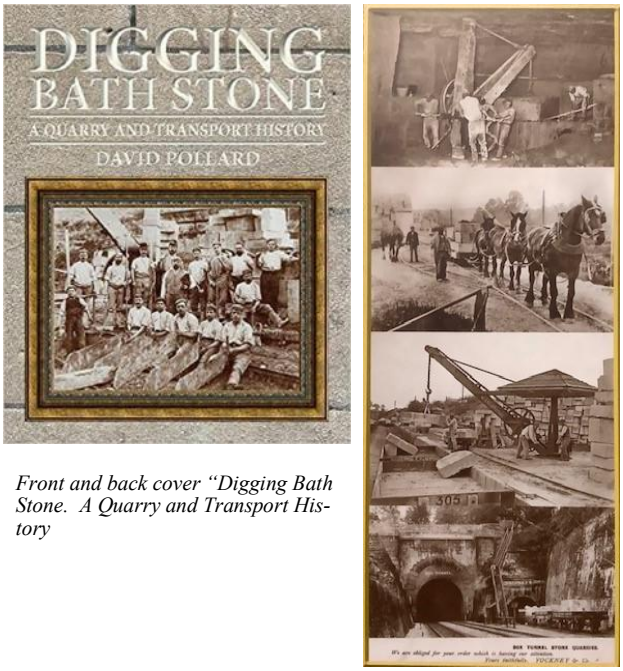
ham, which is still operating today. He collected tools, old machinery, stone samples etc. etc. with the intention of setting up a museum. I was lucky enough to join a BACAS (Bath & Counties Archaeological Society) fieldtrip in July 2016 led by David to visit his underground quarry and see his collection of artefacts. Sadly, David passed away in 2017 before his book was published. I was privileged to be able to re-visit his collection in 2019 to measure the size of his lewis bolts.

Reading David's acknowledgements in the book one appreciates the huge efforts and lengths he went to in his quest for information and detail on his Bath stone passion; he was clearly in contact with numerous people, mostly in the local area and in the stone industry, but also farther afield and in many organisations. He probably visited all the sites mentioned in the book. He also used documents from stone companies, record offices and archives, and online databases to search for information on people and relevant newspaper items. The detail in this book is staggering; he brings the topic alive with accounts of the quarrymen and their families, the incidents and hazards, the subtle differences in the stone, quarry to quarry, and the development of techniques.

David began collecting information for his book around 40 years ago when he became interested in quarry tramways and then in the quarries themselves, the methods of extraction and the people working the stone and running the companies. The book begins with some geology, explaining the origin of the stone back in the Middle Jurassic, some 167 million years ago, as mostly oolitic sediment (made of ooids) accumulating on a shallow seafloor in the subtropics, just like the Bahama Banks or the Trucial Coast of the Arabian-Persian Gulf in Abu Dhabi today. The book moves on to the people involved in the industry, following on from Ralph Allen in the mid-18th C to the quite small number of families who ran the operations in our area, with many amalgamating in 1887 to create the Bath Stone Firms Ltd which later became the Bath & Portland Stone Group. Another chapter describes how the quarries operated, with gangers and their team of quarrymen, the pickers, quarry boys and the foremen. Next follows a section on the actual digging out of the stone: the techniques of picking, jading, wedging, shaking and sawing the stone. Next comes the removal of the stone from its bed: heaving, lifting, pulling, using rollers, lewis bolts, cranes, hoists, horses, engines, and eventually the use of cutting machines, but that was mostly after 1945, although sawing machines were being invented in the late 1800s. Now stone is removed using a hydrobag: an inflatable bag made of thin gauge, mild steel sheet which is inserted into a saw cut and inflated with water under pressure causing it to expand and break the stone.

The longest chapter (8) of nearly 200 pages deals with all the quarries in the region, that is between Bath in the west, Corsham in the east and Bradford on Avon in the south; there were more than a 100. Today there are just 3 working underground quarries (Stoke Hill, Hartham and Park Lane) and one open quarry (Upper Lawns, Comb Down). Another long chapter (9) is the one dealing with haulage and transport, discussing the different methods of moving-carrying stone, by road, river, canal, sea, tramways, early railways, and then rail, followed by detailed accounts of specific 19thC tramways constructed to take the stone from quarries to canal and rail wharfs for onward transport. The construction of the Kennet and Avon canal in 1810 and then the coming of the railways in 1840 allowed much easier transport and distribution of Bath stone. Thence, it could be taken to London and other cities and be in direct competition with Portland stone which had the monopoly previously since it could be transported by sea directly from the quarries near Weymouth-Swanage. Bath stone is now recognised as an international treasure through its designation as a Global Heritage Stone Resource (a GHSR) by the International Union of Geological Sciences (IUGS). This designation "requires a stone to have been in use for at least 50 years and to be commonly recognised as a cultural icon".

This is a book to read as well as to dip into for reference, to find specific sites or aspects of the industry; it is also a book to pick up and flick through, like a coffee-table book, to marvel at the old photos of past-times and past-activities. We should be grateful to David for his lifetime of research into the winning of Bath stone and to the editor/publisher (Neil Parkhouse) and David's wife (and others) for seeing David's project through to completion.



Front and back cover "Digging Bath Stone. A Quarry and Transport History

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