The water supply of Oxfordshire, with records of sinkings and borings / by R.H. Tiddeman ... with contributions on rainfall by Hugh Robert Mill ... Pub. by order of the lords commissioners of His Majesty's Treasury.

MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE WATER SUPPLY

OF

OXFORDSHIRE,

WITH RECORDS OF SINKINGS AND BORINGS.

BY

R. H. TIDDEMAN, M.A., F.G.S.

WITH CONTRIBUTIONS ON RAINFALL BY

HUGH ROBERT MILL, D.Sc., LL.D.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HIS MAJESTY'S TREASURY.

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PREFACE.

This Memoir, which deals with the Water Supply of Oxfordshire from underground sources, has been prepared by Mr. R. H. Tiddeman since his retirement from the Staff of the Geological Survey. In addition to a large number of records of sinkings and borings and of analyses of water, it contains a valuable account of the rainfall which has been contributed by Dr. H. R. Mill.

The formations which outcrop within the limits of the County range in age from Reading Beds to Lower Lias, but some wells and borings extend down to Carboniferous Rocks. The capability of these formations, and of the superficial deposits to yield water, has been discussed by the Author in the introductory pages. The strata passed through in the wells and borings are usually recorded in the words of the well-sinker, but, wherever possible, the formations under which they should be grouped, have been added to the original accounts in a separate column.

The Author is indebted for much help to Mr. Horace B. Woodward and Dr. A. Strahan. Many records have been included from the Geological Survey Memoir on the Jurassic Rocks of Great Britain by Mr. Woodward, but for the greater number of the well-sections we have to thank the many engineers and well-sinkers whose names appear throughout the volume. To Mr. W. W. Fisher, Public Analyst for the Counties of Oxfordshire, Berkshire, and Buckinghamshire, the Author expresses his gratitude for much personal assistance as well as for help derived from his published works. For the preparation of the second and third parts of the Bibliography we have to thank Dr. H. Franklin Parsons.

In the passing of the work through the press the Author has received great assistance from Mr. E. G. W. Elliott.

J. J. H. TEALL,
Director.

Geological Survey Office,
28, *Jermyn Street, London,*
12*th April*, 1910.

(14124—17.) Wt. 13347—84. 500. 6/10. D & S.

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OF
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INTRODUCTION.

It seems appropriate, in entering on a description of the Water Supply of Oxfordshire, to quote a remark made by a great Geologist for many years connected with the University as Professor, and of world-wide renown as an authority on water-supply, the late Sir Joseph Prestwich :—"It is estimated that in these latitudes, and in a country where the surface presents the ordinary variations of permeable and impermeable strata, about one-third of the rainfall is lost by evaporation, another third flows at once from off the surface into the rivers, while the remaining third passes underground to feed and maintain the underground springs. These proportions necessarily vary according to the nature of the ground—a large quantity running off at once into the rivers wherever the strata are argillaceous or hard and compact. In river-basins so conditioned the rivers are consequently more torrential, overflowing in winter, but often dry in summer. Where on the contrary the strata consist of permeable sandy and freestone strata, or of fissured limestones, a large proportion of the rainfall passes underground and is there stored to be gradually returned to the surface in the form of perennial springs * * *

The river-delivery, therefore, represents in fact both the rainfall at once draining into them from off the surface, less the portion lost by evaporation, and part of that which, though it passes underground, is finally, through the agency of springs, discharged into the rivers."*

In the Thames river-basin, of which the area of Oxfordshire forms an important part, we have several broad belts of impermeable strata which tend to promote the "torrential" action (though this is much modified by the artificial control of the stream as a navigable river) and also abundant fissured limestones, sandstones, and surface-gravels, which use their influence towards "storage."

Rain, as it falls from the clouds, is practically pure, but in the lower regions of the atmosphere it picks up some carbonic acid, and still more on the surface of the soil from the decay of vegetable matter. Equipped with this, it is ready to dissolve carbonate of lime, which enters largely into the composition of many rocks in this district, and carbonate of magnesia. Sulphate of lime it derives from the Oxford and Kimmeridge Clays, which contain

* Prestwich. Geology, Chemical and Physical, Vol. 1, 1885, p. 155.

it in crystallised form, as selenite, usually near the surface. Salts of iron, a rather common form of impurity of waters, are also derived from the rocks, carbonate of iron in ironstone and iron-pyrites being very easily decomposed. Hence it comes that the water in running through the rocks frequently becomes charged with impurities, which to some extent are harmless, but in excess render it useless for ordinary consumption.

The proportion of salts contained in springs and in deep wells is often much larger than that in river-water. The water which traverses and penetrates the rocks is in more intimate relation with them than the water in bulk in the river and has therefore greater facilities for picking up mineral impurities. In deep wells, and borings too, doubtless the increase of temperature in depth tends to increase the solvent power. River-water, *if it can be procured from an uncontaminated area*, is therefore often preferable as a water-supply to that obtained by deep borings or from springs.

Sir Joseph Prestwich gives the following analysis of soluble salts in 100,000 parts of the Thames water at Ditton.*

Carbonate of lime	16·84
„ of magnesia	1·81
Sulphate of lime	4·37
Chloride of sodium, &c.	1·57
Silica, iron, &c.	2·61
	27·20

We may compare this with an analysis of the water taken from the Town Hall tap, Oxford, on the 23rd of July, 1907, by Mr. W. W. Fisher, Public Analyst for the County and City. The water comes by mains from the Isis or Thames at King's Weir above Godstow. The analysis is stated in grains per gallon at 17·64, which represent, when reduced to the standard of per 100,000, a total of 25·2 of total dissolved solids. Mr. Fisher states, however, that the quantities of the total dissolved solids are below the average amount. *Vide* Analysis, Oxford, p. 95.

Whilst on the matter of Thames water we may refer to the calculations which have been made, that the total amount of carbonate of lime alone removed from the Thames basin by the agency of the river amounts to 140 tons per square mile per annum.†

RELATION OF THE AREA TO DIP AND STRIKE, AND PHYSICAL FEATURES.

Oxfordshire is an irregularly defined area of 751 square miles, consisting of two large expansions with a constriction about half-way between the northern and southern limits. This isthmus between Oxford and Stanton St. John is less than seven miles across. The greatest breadth from S.W. to N.E. lies between Kelmscot and a point beyond Finmere, three miles from Buckingham, and amounts to 33 miles. The greatest length is from a point

* Geology, Chemical and Physical, Vol. 1, 1885, p. 106.

†† Prestwich, Presidential Address for 1872. *Quart. Journ. Geol. Soc.*, Vol. xxviii, p. lxvii.

near Claydon in the north, between Warwickshire and Northamptonshire, to the Thames at Caversham, near Reading, and reaches 51 miles. This direction is not far removed from that of the general dip of the rocks to the S.S.E. throughout the county. The line of greatest width, starting midway in Oxford Clay, passes across the Cornbrash only and ends in the Great Oolite Series. That is to say it approximately follows the strike.

In few parts does the county-boundary coincide with any rock-boundaries or escarpments. It has certainly one great unmistakable physical feature all along its southern and south-western side. The Upper Thames from Kelmscot viâ Oxford, Abingdon, and Reading to Henley, forms a tortuous but obvious limit. From Kelmscot to Oxford the river runs along the strike on Oxford Clay, but from thence to Reading it flows in the direction of the dip of the Upper Oolitic and Cretaceous Rocks.

The Cherwell does duty for the boundary for about nine miles only, from near Deddington northwards.

There is an approximation to following a physical and geological feature along the Oolitic escarpment from Addlestrop by Great Rollright towards Edgehill for about 14 miles along a very old road.

WATER-SUPPLY AND HUMAN HABITATION.

Boundaries may be independent of streams for miles, but towns and villages are well known to group themselves along sources of water-supply almost entirely. The sources consist of streams, springs and wells. Streams, as a rule, run across pervious and impervious rocks equally, but wells are sunk in pervious rocks or must be deep enough to go through impervious rocks to reach pervious rocks.

The facility of water-supply, in which we must include accessibility and sufficiency, has always been the prime factor in the choice of a site for human habitations. Therefore villages came to be established either on pervious rocks or on the boundaries between pervious and impermeable rocks.

The exceptions to this rule in Oxfordshire are more apparent than real. The river-gravels and plateau-gravels are widely distributed throughout the county, and are often more productive of water at a shallow depth than many of the pervious rocks. This explains the existence of towns and villages situated apparently on such unproductive formations as Oxford Clay. The sites are really on river-gravels, although these superficial deposits have not been depicted on some of the older geological maps. Oxford itself is a conspicuous example of this, and the adjacent villages of Yarnton, Cassington, and Eynsham are all built on gravel lying upon Oxford Clay. Leafield is another instance. Perched at a height of over 600 feet above the sea, on a remote outlier of Oxford Clay, it derives its water from an outlying patch of pebble-gravel resting on the clay. It is safe to say that but for that outlier of gravel Leafield village would not have been built, for the next available springs occur at lower elevations, and a village might have grown on the side but could hardly have been placed on the summit of the hill.

The following table shows in descending order the geological formations which come to the surface in Oxfordshire :—

Recent and Pleistocene.	Alluvium. Brickearth. Valley Gravel. Plateau Gravel.
Tertiary.	London Clay. Reading Beds.
Upper Cretaceous.	Upper Chalk. Middle Chalk. Chalk Marl or Lower Chalk. Upper Greensand. Gault Clay.
Lower Cretaceous.	Lower Greensand. Shotover Sands.
Upper Oolitic.	Purbeck Beds (clays). Portland Beds (limestones, sands and clay). Kimmeridge Clay.
Middle Oolitic.	Corallian Beds { Coral Rag and Oolite / Calcareous grit and sands } Pasing into Ampthill Clay. Oxford Clay and Kellaways Beds (sands and clay).
Lower Oolitic.	Cornbrash (limestone). Forest Marble (clay and limestone). Great Oolite (white limestone, oolite and marl, with Upper Estuarine Series containing sandstone). Inferior Oolite (limestone).
Liassic.	Upper Liassic (clay). Middle Liassic ("Marlstone" Series). Lower Liassic (clay and limestone).

The colour-printed Oxford map, issued in 1908, shows the distribution of the river-gravels and plateau-drift in the country around Oxford.

LIAS.

The Liassic areas in Oxfordshire lie in the northern part of the county, the principal tract being around Banbury, to the west of which it is overlain by faulted outliers of Oolitic rocks. Inlying exposures, where streams have cut down to Lias, occur east of Chipping Norton, and several strips of Lias extending from the main outcrop are exposed from the same cause. Thus Lias extends in the Cherwell valley from the Banbury area as far south as near Tackley, from Kingham along the Evenlode valley by Shipton to Charlbury, and from Windrush by the valley of that name to beyond Burford.

The Upper Lias consists mostly of clay with ferruginous concretions. At Fawler, in the Evenlode valley, it showed a thickness of only 16 feet. At Kingham it was 50 feet thick, and at Bloxham and Banbury 60 feet.*

The Mickleton boring in Gloucestershire, some 9 miles west of the county boundary, is of importance as showing the greatest thickness found in this region. The items were :—

	ft.	
Upper Lias	120	estimated.
Middle Lias	280	bored.
Lower Lias	961	bored.
	1361	

* H. B. Woodward, "Jurassic Rocks of Britain" (*Mem. Geol. Survey*), vol. iii., 1893, p. 268.

"A well at Chipping Norton (Bliss's Factory) proved 500 feet of Lias, chiefly clay belonging to the Lower Lias, and part of the Middle Lias. The sinking was abandoned, as no water was obtained."*

In the country further south Mr. Woodward records a thickness of Middle Lias of 100 feet and of Lower Lias 400 feet, in a deep boring at Burford Signet.† Yet at Wytham (in Berkshire, but close to Oxford) a boring showed Lower and Middle Lias together to be only 170 feet thick, whilst at Oxford, in Prestwich's opinion, the bores showed Oolites resting directly on the New Red Sandstone Series.‡ Mr. Woodward, however, dissented from this, and was subsequently confirmed by a boring at the City Brewery, which showed 17 feet of Lower Lias. It is obvious, nevertheless, that the Lias is much thinner here than at Burford Signet.

The Lower Lias, though containing in its lower portion many bands of limestone, is not the kind of formation in which any large quantity of water may be sought successfully. The rock-beds are so thin and so regularly interbedded with clayey shale, although they attain an aggregate thickness of 50 feet or more, that fissures cannot long remain open in them. The clay, in fact, is always ready at hand to stop a leak. Moreover, the weathering produces a clayey soil at the surface which will not readily absorb water, and the limestones are not thick enough to present at the outcrop any considerable area of pervious material for the reception and transmission of rain-water. Near their outcrop water in sufficient quantity for a cottage may be supplied, however, by the thicker Lower Lias Limestones near the base, but there are not many wells so supplied I believe in this county.

Though the upper and lower portions of the Lias are so barren the Middle Lias is usually an excellent water-bearer. From Banbury to Northampton, and onwards at intervals to Lincoln, it forms an important source, and from it most of the supply in the country about Banbury and Bloxham, Adderbury, Deddington, Hook Norton, Great and Little Tew, &c. is obtained. In the inliers about Heythrop also it yields the chief supply, but water also comes from the base of the Oolite. The same remark applies along the escarpment from Chipping Norton by Churchill, along the Evenlode Valley by Ascot to Charlbury and Fawler, and along the Windrush by Great and Little Barrington (Gloucestershire) to Taynton and Burford.

In Oxfordshire the Middle Lias consists of the "Rock bed" or "Rock," which has been or still is worked for iron-ore at Hook Norton, Fawler, and other places. It is from 6 to 12 feet thick and rests upon sand, clays, and sandstones 10 to 20 feet thick. This somewhat variable assemblage of strata constitutes the water-bearing Marlstone Series. Still lower there are clays which merge downwards into the clays of the Lower Lias. In crossing the dry hills formed by the Oolites we find them to be intersected by beautifully timbered glades, often containing ornamental lakes, which rest on the lower clays of the Middle Lias or on Lower

* *Loc. cit.*, pp. 156–7. † *Loc. cit.*, p. 158. ‡ *Loc. cit.*, p. 269.

Liassic clays, and are supplied with water from the Marlstone series of the Middle Lias and the base of the Oolites. Heythrop and Cornbury Parks are examples.

Chalybeate Springs.

As may be expected, water from these sources often contains iron. Mr. Woodward* mentions chalybeate springs from the Middle Lias at Shipton-under-Wychwood, at Lower Worton south-west of Deddington, and St. Stephen's Well on the west side of Banbury.

Sulphuretted Spring.

A spring giving off sulphuretted hydrogen derived from the decomposition of iron-pyrites occurs at Bowed or Bould, near Idbury, 1½ miles south-west from Chipping Norton Junction, on the Lower Lias.

Saline Springs from Middle Lias.

Springs of this description occur at Churchill Mill between Kingham and Churchill, near Chipping Norton, at Clifton, east of Deddington, at Deddington, and at Sutton Bog, north-east of King's Sutton Railway Station (in Northamptonshire, but close to Oxfordshire).

THE OOLITES, LOWER OOLITIC ROCKS.

The divisions are as follows :—

	Feet.
Cornbrash—Tough shelly limestone in layers, without false-bedding or oolitic structure	9 to 17
Forest Marble—Flaggy and shelly oolitic limestones, current-bedded and alternating with thick beds of clay and layers of gritty limestone	15 to 35
Great Oolite (Upper)—White limestones with marls, evenly bedded, and with scattered oolitic grains	Up to 60
Great Oolite (Lower)—False-bedded oolitic freestone, shelly limestones, clays and sandy flags (Stonesfield Slate) ...	Up to 40
Upper Estuarine Series	
Inferior Oolite	

From the point of view of wells and water-supply this set of rocks may almost be regarded as a whole. With the exception of the Forest Marble, which consists often of thin raggy limestones with thin alternations of clay, they nearly all contain beds which are possible water-horizons. Most of them consist of limestones with occasional thin marly or clayey layers. The limestones, where thick enough, carry water in their joints, and the thin clays, where continuous, hold it up and are likely to deliver it at the crop as springs, or, where broken, pass it on to the next limestone below.

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* H. B. Woodward, "Jurassic Rocks of Britain" (*Mem. Geol. Survey*), vol. iii., 1893, pp. 320–2.

Frequently this occurs indefinitely until the water arrives at the saturation-level of the country. In consequence of this, boring is often rather speculative in these beds. The Great Oolite is generally considered good for water, but disappointments sometimes occur, and occasionally, where the water is obtained by boring at some distance from the outcrop, it is too salt for use.*

The underground water, springs, and river-waters of the oolitic districts ordinarily contain from 6 to 30 grains per gallon (average about 20 grains) of mineral matter, consisting chiefly of carbonate of lime, with smaller quantities of sulphates of lime and magnesia, chloride of sodium, &c. In highly-cultivated districts the presence of nitrates of lime and soda is noticeable in the surface-waters.

The Great Oolite near Notgrove (Gloucestershire), and again that exposed between Chipping Norton and Hook Norton, proved to be of an impervious character for about one-third of its thickness at Notgrove and two-fifths at the other locality. Hence the water would be found at different levels and would be of variable quantity. The Great Oolite may be said to possess these characters from the neighbourhood of Burford and in its course to the north-east.

According to the Rev. J. Clutterbuck three distinct beds yielding water are found at Stonesfield, at about 15, 50, and 100 feet from the surface (? of the stream) respectively. None except the lowest, which rests on the Lias Clay, yields a large amount of water.† A similar case, for a knowledge of which I am indebted to the Rev. T. W. Lee, of Leafield Rectory, occurs at Leafield. Here wells have come upon small supplies above thin beds of clay, and when these were penetrated the water was lost until the sinking had reached the next retentive horizon. There also the most copious springs are those near the bottom of the valley, *i.e.*, the level of saturation. To this level any accidental fissure or dislocation will tend to discharge the yield from any higher local shelves of impervious character.

Mr. Woodward states that over much of the area north of Woodstock, near Wootton, and at Minster Lovel and Witney the uppermost beds of the Great Oolite consist mainly of limestone, to a depth of 25 feet or even 30 feet, and yield supplies of water sufficient for local purposes; and he instances springs in the valley below Wootton, Fair Rosamond's Well at Blenheim, and the Ruddy Well, N. of Stonesfield.‡

At Holywell Farm, east of Tadmarton Camp, and S.W. of Banbury, there is a "holy well" known as the Sugar Well. The spring issues from the Inferior Oolite, and yields between 200,000 and 300,000 gallons per day. An analysis by Mr. Beesley showed 14 grains of mineral matter per gallon, including 9 of carbonate of lime, together with small quantities of salts of magnesium, sodium, &c. Tadmarton Camp is in an elevated position overlooking the whole country round, and the spring referred to issues at the height of about 580 feet above O.D. It appears to come

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* *See* pp. 65, 85, 90.

† Quoted in "Jurassic Rocks of Britain" (*Mem. Geol. Survey*), vol. iv., 1894, p. 510.

‡ *Loc. cit.*, p. 510.

out of a brown marlstone, resting on clay. The whole of the top of the hill behind it is of a sandy character.

At Tite End, N. of Chipping Norton, a copious spring is thrown out at the base of the Inferior Oolite above the Upper Lias Clay.

The Upper Estuarine Series contains beds of clay black with vegetable remains, and thick sandstones which form a sort of 'silver sand' at the surface. These sandstones usually produce water in borings, but it is sometimes too saline for use, and occasionally assumes a peaty colour from the vegetable deposits.

The Forest Marble Series, when it contains thick beds of limestone, may give a limited supply near the outcrop and suffice for scattered houses, except in time of drought.*

The most prominent source about this horizon is the Cornbrash. Owing to its hard texture and the softness of the Oxford Clay which lies above it there has been a great difference in the rate of subaerial waste of the two rocks. The result is that the Cornbrash has been bared of clay for a considerable distance, and stands out as a long terrace gently sloping in the direction of the dip. Being a limestone well-jointed and bedded it forms receptive ground for rain-water, which is held up by the somewhat impervious clay in the underlying Forest Marble. It is no wonder that villages are abundant along its range.

The Cornbrash, though varying within such moderate bounds as 5 to 40 feet in thickness, extends from the Yorkshire to the Dorset Coast. But after all it is a shallow source for water on the outcrop or over its extended dip-slope, and should be treated with caution. Pollution from drainage or cesspits and farmyards is quite likely in a village, and the filling up of the old quarries with rubbish containing decaying organic matter should be most carefully avoided.

The Arncot boring, 3 or 4 miles to the S.E. of the upper boundary of the Cornbrash, goes through the whole of this series of the Lower Oolite and gives the following thicknesses beneath the Oxford Clay.

	Upper Arncot.		Church Hanborough.	
	ft.	in.	ft.	in.
Cornbrash	20	10	10	3
Forest Marble... ...	18	8	14	10
Great Oolite	56	6	76	11
Upper Estuarine Beds	40	11		
	136	11	102	0

Arncot is near the east boundary of the county at its broadest part. We have put alongside similar measurements at Church Hanborough, where also the Cornbrash was overlain by Oxford Clay, though it crops out near by. At Arncot the water was very salt, but at Church Hanborough the analysis is normal, shewing 26·04 grains of solid matter in solution per gallon according to Mr. W. W. Fisher.

THE MIDDLE OOLITIC ROCKS.

The Corallian Beds and the Oxford Clay present a fairly strong contrast, the former being made up mostly of limestone and sands, while the Oxford Clay is a stiff and thick clay. Together they

* *See* Phillips' Geology of Oxford, 1871, p. 501.

occupy a broad belt across the county, but whereas the lower member forms for the most part low ground of damp poor soils deficient in natural drainage and water-supply, the upper gives fairly elevated hills, springs and well-drained slopes suitable for corn.

The Oxford Clay emphatically forms country which is not eligible for habitation, but from the fact that it outcrops mostly in low ground much of it has been overspread by river-gravels. These have made up, in the way of well-drained sites and of water-supplies, for the natural deficiencies of the clay which they have concealed. People dwelling on bare Oxford Clay can only rely on such water as may drain from a distance or be obtained from the underlying oolites by wells or boring. Seeing that the clay ranges from 400 to 500 feet in thickness, the tapping of the oolites is not always an easy matter. Nor have the experiments made in this direction been often successful, for it may be considered the rule rather than the exception that borings in and through the Oxford Clay at any long distance from the outcrop have either yielded no water, or a water more or less saline, and the salinity has been proved by Mr. W. W. Fisher to increase in proportion to the distance from the outcrop.* Good water has been obtained near the outcrop from lower beds. The Kellaways Rock, which forms a kind of passage-bed between the Cornbrash and Oxford Clay, is scarcely a "rock" in this district, but consists of sandy beds which carry water, not of very good quality. There is usually a thickness of about 10 feet of clay between them and the Cornbrash, so that water from the Cornbrash cannot run into them, and having a small outcrop and not being highly pervious, they yield only a small supply. They sometimes make soft marshy ground.

Barrenness of Oxford Clay as a Source.

As a sample of the absence of good water from the Oxford Clay we may give the following traverse across its strike from the Oxford City boundary to Kidlington where the Cornbrash and succeeding rocks crop out from beneath it, a distance of about three miles along the highway to Banbury.

At Mr. Gee's nursery-garden beyond Sunnymede on the east, and at Cutslow Farm on the east, water issues from a gravel-terrace.

Beyond the Cemetery corner there is a small tank which derives water from a road-ditch on the Oxford side and from a field-drain on the west side, probably from gravel.

At a farm at foot of the hill further north a small well and pump have been abandoned, a pipe from the aforesaid tank well being now used.

For a level-crossing and signalman's house, water is brought by train from Oxford every day.

Cottages on the west side at the road-end to Stratfield Farm were formerly supplied by a well in front, sunk 20 to 25 feet in

* *Analyst*, February, 1904.

Oxford Clay; the water being chalybeate and smelling badly (presumably of sulphuretted hydrogen), the well has been closed, and water is fetched from Stratfield Farm.

Stratfield Farm (Mr. Hollis), further down the slope, is supplied by a well in a gravel-terrace in the orchard adjoining.

At Gosford Hill farm on the east, on the top of the hill, a well in front of the house has been filled up; whether it contained water and, if so, of what character I am unable to get particulars. This farm is now dependent on water pumped up from a well mentioned in the next item.

For some cottages in the lane to the east the supply consists of water oozing from a terrace of rainwash (perhaps underlain by gravel). Apparently this was not considered satisfactory, for a trial was bored by advice of a "diviner" a few yards west of the well. This missed the terrace and went down into Oxford Clay; the water was bad, and the trial was abandoned. The terrace-well is still used, but water for drinking is fetched from the next supply to be mentioned.

A cottage near Kidlington, at corner of the road to Islip on the east, has a shallow well (in gravel ?) which is considered good.

The barrenness of the Oxford Clay is well shown by comparison with the long outcrop of Cornbrash which runs from Islip to the north-east as far as Marsh Gibbon in Bucks, and has given sites to Islip, Water Eaton, Noke, Oddington, Charlton, Merton, Ambrosden, and Marsh Gibbon in a long nearly straight line. The wells of this district have been fully treated of by Mr. Fisher in a publication already mentioned.*

A boring at Upper Arncot, about half-way between the anticlinal exposure of Cornbrash and the projecting spur of the overlying Corallian Beds to the south-west under Brill and Muswell Mills, goes through only 156 feet of Oxford Clay before reaching the Cornbrash, and had to be sunk to a depth of 283 feet before getting to water. It passed through black sand which probably belonged to the Upper Estuarine beds below the Great Oolite. The water yielded was of salt flavour and unpleasant smell (sulphuretted hydrogen ?), but the amount was not less than 500 gallons an hour, which represents the maximum capacity of the pump used. It is interesting to note that no supply was obtained from the limestones of the Great Oolite or the other usual sources, but perhaps that may be accounted for by the fact that none of the limestones exceeded 8 feet in thickness. (*See* p. 25.)

The Corallian.

These beds consist of the following minor divisions in the Oxford District :—

Upper Calcareous Grit (local).
Coral Rag and Oolite.
Lower Calcareous Grit and Sand.

The Upper Calcareous Grit, or Calc-grit as it is usually abbreviated, is often weathered at the surface and was subjected to

* *Analyst*, February, 1904.

denudation before the overlying Kimmeridge Clay was deposited. It is sometimes almost wholly absent.

The Coral Rag is characterised by a ragged look which is to a great extent due to the abundance of corals. It is full of irregular fissures, but these are often partly filled with grey or yellow clay, so that it is not so completely pervious as it looks at first sight. Much of it is essentially a coral-rock, but it is associated with and replaced by beds of shelly and oolitic limestones.

The Lower Calc-grit comprises hard sandy limestones with worn fragments and plates of shells and other organisms, well-bedded and jointed. The sand is fairly free and incoherent, but is cemented here and there into hard calciferous sandstone, as in the neighbourhood of Shotover. It is often in quarrying "holed out" (to use a coalminer's term) in order to let down the beds above, a dangerous operation which has given rise to accidents.

It will be apparent that all these beds are practically pervious, and therefore are available for water-supply. It is also obvious that the chief springs will issue at the base of the sand where it rests upon the Oxford Clay below.

The following villages in Oxfordshire proceeding from east to west are watered from the Corallian. Piddington, though it stands on Oxford Clay, is supplied from a spring which rises from the base of the Corallian on the flank of Muswell Hill, and the water from which runs through the village. Studley stands on a western spur from Muswell Hill. Several villages both in Buckinghamshire and Oxfordshire are situated along the Corallian outcrop, and among them may be mentioned Waterperry, Waterstock, Holton, Wheatley, Forest Hill, Stanton St. John, Elsfield, Headington,* Headington Quarry,* Cowley,* Temple Cowley,* Littlemore, Sandford, Iffley.

It appears to be generally conceded that the Corallian Beds become dwarfed or lose their calcareous nature north-east of Beckley and Stanton St. John, and along a line running to the south-east. There is certainly a much larger development of clay, in the form of what is known as the Ampthill Clay, in the corresponding series east of this line, and it warrants the suggestion that the line of change is really a boundary to an old coral-reef, the higher clays being the equivalents in point of time of parts of the coral-rock. Still there are sandy beds in them which give water-bearing horizons.

THE UPPER OOLITIC.

This division consists of :—

The Purbeck Beds.
The Portland Beds.
The Kimmeridge Clay.

Of these the Kimmeridge Clay alone runs across the county. The Portland Beds occur in patches at Thame, Milton and Hazeley, and round the Shotover group of high ground, while the Purbeck

* Now supplied by the Oxford Waterworks.

beds are seen only at Shotover. The last-named are insignificant in area and probably in water-supply, and need not be further referred to.

The Kimmeridge Clay was penetrated in a boring at Cuddesdon Theological College, and proved to be 180 feet thick, but at Culham Diocesan College it was only 94 feet thick. It does not exceed 100 feet at Shotover on the western side according to J. Phillips.*

The clay contains iron-pyrites and selenite (sulphate of lime) and is likely to impart impurities, though not in harmful quantities, to rain-water flowing over its surface. To the water-seeker it is chiefly valuable as a base throwing out water from pervious beds above, or as a covering to spring-water which has found entrance to the Corallian Beds lying below it.

The Portland Beds include two divisions :—

Portland Stone.
Portland Sand.

This division, as mentioned in the Oxford Memoir,† is only applicable to parts of this district; a division into Upper and Lower is preferable, for both contain beds of sand, and in some parts the lower beds pass into a loamy clay equivalent to the Hartwell Clay.

Shotover Hill extends as a straggling outlier to Garsington and Cuddesdon. At its western end the sections show, according to that memoir (p. 51) :—

Portland Beds	Upper	Sands with hard ferruginous bands, 20 or 30 feet.	
		Whitish limestones (fossils).	
		Clays, loam and greenish sands, and rubbly glauconitic limestone ...	4 feet.
		Lydites.	
		Blue and brown clay with lydites and phosphates in base of clay and top of sands; 3 to 5 feet.	
	Lower	Yellow and greenish sands with huge spheroidal "doggers" or calciferous sandstone; 20 feet.	

The total thickness of the Portlandian at Shotover is probably about 100 feet.

In the same memoir (pp. 52, 53) Mr. H. H. Thomas shows by several observations on different parts of Shotover that the Portland Stone was originally an oolitic limestone, but that by successive changes from percolating waters,

1st. The calcareous matrix has been silicified.

2nd. That iron has subsequently surrounded the grains of oolite.

3rd. That further in some parts the grains themselves are converted into secondary quartz in a matrix of ironstone, forming in effect a ferruginous grit.

He suggests that other so-called ferruginous grits may prove to have had their origin in limestones.

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* Geology of Oxford, 1871, p. 325.

† "The Geology of the Country around Oxford" (*Mem. Geol. Survey*), 1908, p. 50.

In the above section, which is that at the Oxford highest-level water-tank, springs come out at the top of the blue and brown clay, but the chief springs issue at the base of the Portlandian, where it rests on the Kimmeridge Clay. Further east, where the Lower Portland changes to clayey sands, the water is thrown out along the base of the Upper Portland Beds, as was to be expected.

Toot Baldon rests on Portland Beds according to the latest opinions. The wells in the hamlet are all shallow, yet the supply appears to be fairly permanent. One of some clayey beds seen down the lane to the N.N.E. is probably the retentive layer, but the sections are obscure.

LOWER CRETACEOUS.

This division consists of—

Lower Greensand.
Shotover Sands.

The Iron Sands of Shotover Great Milton and Great Hazeley, to the S.E., are considered from their fauna to be fresh-water beds of the age of the Lower Greensand. At Shotover they are 50 feet in thickness. They comprise white and yellow and sometimes brown or black sands, sandstones, blue and white clay, fuller's earth, ironstone, and ochre.* The following description of these sands is by Mr. G. W. Lamplugh.†

Description.	Average thickness.
Top soil, brown sandy loam full of fragments of ironstone	1 to 3 ft.
1. Rusty sand with much tabular concretionary ironstone, forming the top of the plateau, mixed with and passing down into yellow and orange sand, no fossils seen	15 ft. seen, but may be thicker.
2. Grey or white clay, like fuller's earth, probably impersistent: causes slipping on the hill-sides ...	3 to 5 ft.
3. Very fine white or greyish sand and silt, sometimes stained buff, yellow or orange, occasionally streaked with clay; though variable, is fairly persistent as a whole	12 to 15 ft.
4. Coarser sand, white, yellow or brown, with hard purple ironstone concretions, sometimes containing casts of fresh-water shells and bits of plants: with occasional streaks or bands of grey or ochreous clay up to 1 ft. in thickness, including unfossiliferous claystone-nodules	8 to 10 ft. seen, but may be thicker.
5. Coarse speckly sand, with crumbs of white earth (? decomposed clay-pellets) and decayed ironstone concretions: resting on stained Portland Beds ...	1 to 2 ft.
Total thickness, about 50 ft.	

LOWER GREENSAND.

Undoubted marine beds of this formation occur at Culham, and at Clifton Hampden in a lane going down to the ferry.

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* Woodward, Geology of England and Wales, p. 376; Phillips, Geology of Oxford, 1871, p. 413.

† "The Geology of the Country around Oxford" (*Mem. Geol. Survey*), 1908, p. 69.

This rock generally gives a good supply of water, but on the other hand we have records of a well at Culham Diocesan College (made by Messrs. Isler, information supplied by Mr. Winship of Abingdon) which gives according to Mr. Woodward's grouping :—

	Feet.	Inches.
Lower Greensand, consisting of loamy sand, red sand, light sand and rock	22	9
Kimmeridge Clay	94	0
Corallian Beds	92	3
	209	0

The water was obtained from the Corallian Beds.

We have also three wells (*see* p. 40) from Clifton Hampden, 73, 44½, and 53½ feet in depth respectively. The two shallower gave 600 and 720 gallons an hour from the Greensand; in the deepest, water stood at 18 feet from the surface, but on pumping 60 gallons per hour it was lowered to 27 feet from surface, in what time is not stated. This supply was from the Corallian and not from the Greensand, although the well went through the latter. It is, however, obvious that these are good water-bearing beds; and we must bear in mind that Culham has not so large an area of Lower Greensand to draw upon as Clifton Hampden.

UPPER CRETACEOUS.

This includes—

Upper Cretaceous.
- Upper Chalk, at its base the Chalk Rock.
- Middle Chalk, at its base the Melbourn Rock.
- Chalk Marl or Lower Chalk, in it the Totternhoe Stone.
- Upper Greensand, in it the Malmstone.
- Gault Clay.

Mr. Jukes-Browne further divides the Lower Chalk as follows :—

Lower Chalk.
- Zone of *Holaster subglobosus.*
  - Belemnite Marl (below the Melbourn Rock).
  - White and grey chalk.
  - Totternhoe Stone.
- Zone of *Ammonites varians.*
  - Grey chalk and Chalk Marl.
  - Chloritic or Glauconitic Marl.

The Cretaceous system has been divided into a number of zones characterized by certain fossils. These are excellent guides for determining beds of the same age or somewhat similar age at a distance by skilled palæontologists, but what is most wanted for purposes of water-supply are physical features and horizons of hard and soft rock, which may be recognised along the escarpment. Fortunately such horizons are not wanting, and they have been carefully traced on the New Series Maps. The horizons referred to are those of the Chalk Rock, Melbourn Rock and Totternhoe Stone—all are characterized by their features and also by springs.

The following remarks on the Upper Greensand and Gault of this district are due chiefly to Mr. Jukes-Browne.* He gives

* Cretaceous Rocks of Britain (*Mem. Geol. Survey*), vol. i, 1900, chap. xix.

the succession between Thame and Chinnor as below (*op. cit.*, p. 276) :—

		Feet
Upper Greensand.	Soft greensand	12
	Grey marl with glauconite grains	12
	Malmstone with layers of marl	30
Gault Clay.	Marly clays	80
	Dark grey and blue clays	150
		284

The Malmstone is the chief water-bed of this group of rocks. Along the main line of outcrop through Oxfordshire a large amount of water finds its way into the Malmstone and Greensand, especially where these beds form a minor escarpment of their own in front of the Chalk Hills. In this county the result is seen in fine springs at Postcombe, Adwell, Easington, Cadwell, Berrick Salome, and other places. The Malmstone is a kind of siliceous rottenstone, either originally an impure limestone from which the calcareous portion has been mostly removed, or a limestone into which silica has been introduced in part by substitution from percolating water.

Very abundant springs from this source have been found by boring on the Berkshire side of the river at Wallingford. The waterworks well near the railway-station was made in 1884, and gave the following section :—

		Ft.	Ins.
	River sand and gravel	13	0
Chalk Marl.	Soft sandstone	3	6
	Hard sandstone	6	6
	Blue clay	2	0
	Alternating soft blue stone and blue clay ...	21	6
Upper Greensand.	Hard blue stone	7	4
	Sandy clay	1	11

At Shillingford, north of Wallingford, a boring traversed a depth of 144 of Gault, and from the height of the top of the formation near by it has been calculated that the full thickness of Lower and Upper Gault must be here about 190 feet.

The Lower Chalk.

This includes all the beds of Chalk and Marl which lie between the highest bed of Gault or Greensand and the Melbourn Rock, the divisions being as stated on p. 14. Their total thickness, according to Mr. Jukes-Browne, is about 200 feet, and is made up as follows :—*

	Feet
Soft grey marly chalk	3
Hard grey and white chalk	70 to 80
Totternhoe Stone	2 „ 4
Chalk Marl	120
Chloritic Marl	1 or 2

The Totternhoe Stone consists of hard grey and sandy chalk containing about 8 per cent. of silica and charged in places with glauconitic grains. It yields many springs.

* Cretaceous Rocks of Britain (*Mem. Geol. Survey*), vol. ii., 1903, p. 173.

The Middle Chalk.

The base of this, the Melbourn Rock, rises from the level of the Thames near Cleeve Mill, north of Goring, and forms a conspicuous feature or ridge in advance of the main scarp as far as Watlington and Lewknor. It is a hard yellow and white nodular rock and carries water. The top of the Middle Chalk rises from the Thames near Whitchurch, and passes to high levels north-eastwards till it reaches a height of 700 or 800 ft. It also appears again in low ground at 210 feet above O.D. in the valley between Henley and Stonor.

In the high road north of Nuffield, between Nettlebed and Benson, the top of the Middle Chalk is 500 feet above O.D. The distance between these two places is 5 miles, which works out to a decline of 58 feet in a mile, or about 1 in 91; certainly a smaller dip than one would expect.

The Upper Chalk.

This, of course, is very far from complete. Indeed it is doubtful if we see the true top in England, so much having been denuded before the Tertiary beds were laid down upon it.

Flints in layers are abundant in the Upper Chalk above the Chalk Rock, but they are few and inconspicuous below it.

The Chalk is one of the best water-bearing rocks we have, though the hardness of the water yielded by it constitutes a drawback. The absorbent nature of the rock and the large surface it occupies, increased as it is by deep valleys, combine to form one of the best absorption-grounds in the kingdom. Probably the water finds its way all through it down to the Chalk Marl unless it first meets the saturation-level. But certainly there are horizons, such as the Chalk Rock, where water runs and more freely than in the main body of the Chalk, and which increase the chances of success in a well sunk through them. In the mass of the Chalk, as in other rocks, much may depend on the diameter of the shaft, *i.e.*, upon the surface exposed, from which water may be drained. A small boring will often find an inadequate supply where a dug well will satisfy the demand.

In a slowly permeable rock like the Chalk it often happens that a bore will not yield enough unless it happens to meet with a joint or open fissure. We may regard such a fissure as practically widening the well, for every inch of its walls may be exuding moisture and it may extend a long way and be connected with other fissures. These fissures are probably abundant at levels approaching the saturation-plane. One well in our list shows that water was insufficient in chalk at 18 feet below the river-level. It should have come to the level of saturation before that. On further boring a good supply was obtained.

The Chalk Rock is well-known to well-sinkers as a source of water in Oxfordshire and other counties.

Clay with Flints.

Lying on the tops of the chalk-hills almost universally in this county there is a deposit of clay-with-flints. From the way in which

it lies there is much reason for supposing that it forms the insoluble residue of the chalk which has been destroyed, but it is also mixed in places with pebbles and sand, the débris of Tertiary beds, as well as the rough flints which may be supposed to have weathered out of the Chalk. Wherever exposed to view the deposit may be seen to run down in pipes or conical funnels into the Chalk below. Often it is sufficiently retentive to give a small supply of water; and in other places it is the base for ponds for farm-purposes or house-supply. Without some such means of getting water few of the villages on the hill-tops would have come into existence, for deep wells would have been too costly for the early settler.

TERTIARIES.

The London Clay.

The Reading Beds.

These occupy several patches on the tops of the Chiltern Hills. They are surviving parts of a great sheet which has formerly had a wide extension at that level before the denudation of the valleys. Though small in area in the county and not of great importance, they certainly supply in their sand and clays some facilities for water-supply which are highly appreciated in the dry area of the Chalk.

THE RAINFALL OF OXFORDSHIRE.

BY

HUGH ROBERT MILL, D.Sc., LL.D.

Director of the British Rainfall Organization.

The accompanying map of the distribution of rainfall in Oxfordshire is reduced from a map on the scale of 4 miles to an inch compiled from all known records of rainfall. The records which have been utilized were collected by the British Rainfall Organization since its foundation by the late Mr. G. J. Symons in 1860, and they have for the most part, been published year by year in the volumes of "British Rainfall."

With the exception of the valuable records at the Radcliffe Observatory and Magdalen College, Oxford, practically all the rainfall observations available have been made by private observers, and many of these would have been lost but for the existence of the Rainfall Organization. A few of the records run through the whole period, but many of them are short, and some were kept wholly during a succession of wet years and others wholly during a succession of dry years. In selecting long records to serve as standards of comparison by which the shorter records could be reduced to their equivalent for 35 years it was found advisable to group the stations so as to yield one set of ratios for the north-western and another for the south-eastern parts of the county. The ratios for these two groups, taking the average rainfall as 100, are given in Table I., together with the mean of both, which may be taken as representing the variations of rainfall from year to year for Oxfordshire as a whole. The Table has been extended beyond 1902 in order to utilize short records in recent years, but the period to which all the results are calculated is 1868–1902, and thus the figures are exactly comparable with those used for the rainfall maps which have appeared in the other Water Supply Memoirs.

It will be noticed that from 1868 to 1874 the rainfall was, as a mean, 4 per cent. below the average; from 1875 to 1886 there were twelve years of which only one fell below the average, with a mean excess of 15 per cent.; and from 1887 to 1902 there were sixteen years with a mean deficiency of 9 per cent., and in only five of these did the rainfall reach the average. The driest year of the thirty-five was 1870, with 71 per cent of the average, 1893 coming next with 75 per cent., and 1887, which was the driest year in most parts of the British Isles, came third with 77 per cent. The three driest consecutive years were 1869–1871, which showed a mean deficiency of 12 per cent.

The wettest year of the thirty-five was 1882, with an excess of 30 per cent., 1872, which was the wettest year in most parts of the British Isles, coming next with 28 per cent.; but in 1903 there was a much heavier rainfall than in any other year on record, the excess amounting to 44 per cent.

It will be noticed that from 1888 onwards to 1905 there was a regular periodicity in the variations of rainfall; one year with

rainfall above the average being followed by two years with rainfall below the average; but this relationship did not hold good before 1888.

The various records were reduced to the 35 years' average by using the ratios of the group within which they fell. Thus supposing a record of 20·0 inches to be obtained as the mean of the five years 1898–1902 in the south of Oxfordshire, the mean percentage of 1898–1902 in the South East Group of long records was found to be 85·4 per cent. of the thirty-five years average, and the amount of 20·0 inches was accordingly augmented in the ratio of 85·4 to 100, yielding 23·4 inches, which is presumably the value which would have been obtained if the record had been continuous from 1868 to 1902.

As the rainfall of one period of 35 years does not probably differ by more than about 2 per cent. from that of any other period of 35 years, the rainfall figures expressed to the nearest half inch may be accepted as representing the true average rainfall of the locality.

It is not possible in every case to be certain that the exposure and surroundings of a rain gauge many years ago were such as to ensure a perfectly trustworthy record; but any cases in which there was reason for doubt were excluded from consideration. In some instances the rain gauge was placed higher above the ground than the standard height of one foot, and in these an addition of 1 per cent. for every foot of additional height has been made to the record in order to correct it for loss in the catch of rain due to wind eddies.

There were altogether 61 records in Oxfordshire and 62 others within a short distance of the borders of the county from which trustworthy records are available and these have been utilized in drawing the accompanying map. The distribution of the stations is not altogether satisfactory; there is in particular a regrettable absence of records from a large district lying to the south-west and to the north-east of Oxford. This is the only place where there is a little doubt as to whether an isohyetal should be shown or not. The district in question is traversed by the isohyetal of 25 inches, which is shown as a broken line, as it is uncertain whether the rainfall within it falls short of 25 inches by about half an inch or exceeds that value by about half an inch. The isohyetal of 25 inches south of Oxford and those of 27·5 inches and 30 inches may be relied upon as accurately placed so far as the scale of the map admits.

The following Table shows the area within each zone of rainfall bounded by isohyetal lines at intervals of 2½ inches:—

Zone.	Square Miles.	Per Cent. of Total Area.	Mean Rainfall of Zone.
Below 25·0 inches	127·2	15·6	24·6 inches
25·0 to 27·5 „	352·5	46·3	26·5 „
27·5 „ 30·0 „	269·3	37·6	28·2 „
Above 30·0 „	3·2	·5	30·5 „
Total	752·2	100·0	

From these data the average general rainfall of Oxfordshire is determined as 26·8 inches, or to the nearest quarter inch 26·75, and applying the mean ratios from Table I., we get the following, the figures being to the nearest quarter inch :—

1868–1902 Average General Rainfall of Oxfordshire ...	26·75 inches.
1882 Maximum General Rainfall of Oxfordshire	34·75 „
1870 Minimum General Rainfall of Oxfordshire	19·00 „
1869–1871 Driest 3 years, mean General Rainfall of Oxfordshire	23·50 „

The rainfall of 1903 was considerably greater than that of 1882, and although it falls outside the period to which the averages are calculated, it should be quoted ; the general rainfall for that year was 38·50 inches.

The outline of Oxfordshire makes it difficult to give a clear description of the distribution of the rainfall without reference to the neighbouring counties, and the isohyetals are continued across the part of Northamptonshire adjoining Oxfordshire, that county having been mapped already. The heaviest rainfall is along the Cotteswold Hills and other portions of the Jurassic escarpment which runs from south-west to north-east through the extreme north of the county, and the rainfall on the line of the White Horse Downs and Chiltern Hills of the Chalk escarpment which runs from south-west to north-east through the extreme south of the county is about equally great. The gap by which the Thames passes through the Chalk escarpment has a distinctly lower rainfall and unites the rainfall below 25 inches of the lower Thames Valley with the presumably equally low rainfall of the upper Thames Valley below and above Oxford. The line of 25 inches parallel to the Thames in Berkshire is also shown, but the rest of the area of the adjoining counties has not yet been mapped for rainfall.

The total range of rainfall in the county is small, not exceeding 8 inches, but small though it is, it suffices to bring out the close relationship between rainfall and configuration. The flat lands bordering the main river and the broad valleys of the lower reaches of the larger tributaries have a rainfall which exceeds 25 inches very slightly, if at all. The higher ground on the Chilterns in the south-east and on the gentle slope towards the Cotteswolds on the west has a higher rainfall, and, speaking generally, the annual rainfall probably exceeds 27·5 inches on all land exceeding 500 feet above sea-level. There is a suggestion on the map that the north-westward side of the Chiltern Hills is subjected to less rainfall than the south-eastward side at the same altitude, but there are not sufficient data to speak with certainty on the subject.

Table II. gives the rainfall at a selection of typical stations, chosen so as to represent all parts of the county. It has been necessary to include several records from adjoining counties, in order to complete the series, but they are all representative of Oxfordshire rainfall. In order to secure a nearly uniform distribution it is also necessary to include some short records, the computation of the averages from which cannot be looked upon as so satisfactory as those from longer series.

Table III. gives the monthly averages for four stations in different parts of the district, together with the maximum and minimum rainfall for each month. It will be noted that February, 1891, was

practically without rain at all four stations, and that October in 1875 or 1891 had a rainfall approaching or exceeding 8·0 inches, the largest monthly amounts recorded.

The monthly amounts at the four stations are also reduced to percentages of the annual total, and these percentages agree so closely in all cases that their mean may be taken as showing the monthly incidence of rainfall over the county. The driest month is seen to be March with 6·1 per cent. of the annual total, and the wettest October with 10·7. The driest three months are March to May with 19·3 per cent. of the annual fall, and the wettest three months October to December with 29·8 per cent.

The winter half-year, when percolation takes place most freely, has 51·4 per cent. of the annual rainfall.

TABLE I.—OXFORDSHIRE RAINFALL. AVERAGE=100.

Year.	North-West.	South-East.	Mean.
1868	100	109	105
1869	107	105	106
1870	73	69	71
1871	91	84	87
1872	131	126	128
1873	88	88	88
1874	87	86	87
1875	132	123	127
1876	123	124	124
1877	119	118	118
1878	108	112	110
1879	118	133	126
1880	120	123	121
1881	109	111	110
1882	139	120	130
1883	109	100	104
1884	81	83	82
1885	107	104	106
1886	120	117	118
1887	76	78	77
1888	103	98	101
1889	95	90	92
1890	77	80	79
1891	110	119	114
1892	74	87	81
1893	72	78	75
1894	107	119	113
1895	93	96	94
1896	87	95	91
1897	104	98	101
1898	82	78	80
1899	87	86	87
1900	104	98	101
1901	86	85	85
1902	81	80	81
1903	138	150	144
1904	89	96	92
1905	86	84	85
1906	96	102	99
Average 1868–1902 ...	100	100	100

TABLE II.—MEAN ANNUAL RAINFALL OF OXFORDSHIRE.

Stations.	Height above Ground.	Height above Sea Level.	Period of Observation.	Number of Years.	Arithmetical Mean.	Computed Average for 35 years.	Computed Average corrected for height above ground.
	Ft. in.	Ft.			In.	In.	In.
Reading, Russell Street	2 0	154	1868—1893	26	25·63	25·1	25·4
Whitchurch	1 0	150	1881—1898	18	23·95	24·7	24·7
Henley-on-Thames, Highmore ...	1 0	500	1898—1905	8	27·18	28·5	28·5
„ „ „ Greenlands ...	1 3	116	1873—1879, 1882—1906	32	27·06	27·1	27·1
Wallingford, The Castle	1 0	175	1868—1902	35	23·61	23·6	23·6
Wallington, Pyrton Manor	1 0	321	1886—1906	21	25·63	26·7	26·7
Farringdon	1 0	333	1868—1902	35	27·31	27·3	27·3
Abingdon, Nuneham Park	3 0	280	1883, 1887—1892, 1894—1906	20	24·66	25·8	26·4
Fairford, Hatherop	1 3	412	1868—1902	35	28·92	28·9	28·9
Waterstock	3 0	206	1893—1901	9	22·99	25·0	25·5
Oxford, Radcliffe Observatory ...	0 10, 1 8	208	1868—1902	35	24·75	24·8	24·8
Witney, Ringwood Farm	5 0, 1 0	400?	1877—1888, 1904—1906	15	29·15	27·7	28·5
Great Barrington	1 6	430	1878—1880, 1884—1902, 1904—1906	25	27·26	28·9	28·9
Charlbury	1 6	442	1896—1899	4	24·45	27·2	27·2
Chipping Norton, Kingham	3 6	442	1868—1902	35	28·05	28·0	28·8
Steeple Aston, The Grange	1 0	400	1883—1906	24	25·64	27·2	27·2
Stratton Audley	2 5	381	1868—1886, 1890—1894	24	25·43	24·4	24·9
Swerford	1 0	500	1895—1906	12	27·04	28·6	28·6
Brackley	1 0	425	1891—1902	12	24·67	27·1	27·1
Banbury, Bloxham Grove	3 10	387	1877—1906	30	26·53	26·7	27·5
Sibford Ferris	1 0	590	1891—1906	16	25·26	27·0	27·0
Thorpe Mandeville	1 0	530	1884—1900	17	25·67	27·7	27·7
Farnborough (Warwickshire)	1 2	520	1885—1902	18	26·66	29·1	29·1

TABLE III.—MONTHLY RAINFALL.—OXFORDSHIRE, 1868–1902.

MONTHS.	Reading, Englefield.					Fairford, Hatherop.					Oxford.				
	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.
	In.	In.		In.		In.	In.		In.		In.	In.		In.	
January	2·40	5·62	1872	·54	1880	2·49	5·31	1872	·55	1880	1·98	4·63	1877	·50	1880
February	2·04	4·65	1883	·00	1891	2·12	5·25	1900	·02	1891	1·74	4·21	1900	·01	1891
March	1·77	4·00	1888	·24	1893	1·81	3·76	1876	·11	1893	1·42	3·41	1876	·17	1893
April	1·78	3·94	1879	·02	1893	1·81	3·08	1882	·02	1893	1·57	3·83	1882	·06	1893
May	1·75	4·12	1878	·21	1880	1·89	4·58	1878	·15	1895	1·70	4·97	1878	·16	1895
June	1·98	5·26	1879	·33	1870	2·18	5·24	1879	·33	1870	2·06	4·84	1879	·66	1879
July	2·34	5·68	1875	·23	1885	2·56	5·44	1880	·51	1869	2·47	6·42	1880	·12	1885
August	2·47	7·71	1879	·77	1875	2·76	6·78	1879	·70	1871	2·35	5·12	1878	·50	1871
September	2·43	5·96	1896	·52	1900	2·54	5·93	1871	·34	1900	2·28	5·84	1876	·38	1898
October	2·95	8·85	1891	1·00	1884	3·12	8·69	1875	·62	1888	2·68	7·56	1875	·72	1888
November	2·73	5·59	1877	·43	1871	2·84	5·69	1885	·57	1879	2·31	4·80	1894	·53	1901
December	2·55	5·69	1876	·44	1873	2·80	6·88	1876	·69	1883	2·19	5·10	1876	·43	1883
Year	27·19	38·39	1879	16·85	1870	28·92	40·25	1882	19·69	1893	24·75	33·06	1875	16·66	1902

MONTHS.	Banbury.					Mean Monthly Fall expressed as Percentage of Annual Mean.					MONTHS.
	Mean Monthly Fall.	Wettest Month.	Year.	Driest Month.	Year.	Reading, Englefield.	Fairford, Hatherop.	Oxford.	Banbury.	Average.	
	In.	In.		In.		In.	In.	In.	In.	In.	
January	2·14	4·42	1877	·46	1880	8·8	8·6	8·0	8·0	8·3	January.
February	1·91	4·80	1883	·04	1891	7·5	7·3	7·0	7·1	7·2	February.
March	1·61	4·04	1897	·21	1893	6·5	6·3	5·7	6·0	6·1	March.
April	1·73	3·97	1882	·21	1893	6·6	6·3	6·4	6·5	6·5	April.
May	1·92	5·27	1886	·21	1896	6·4	6·5	6·9	7·2	6·7	May.
June	2·08	5·45	1882	·46	1868	7·3	7·5	8·3	7·8	7·7	June.
July	2·49	5·81	1888	·08	1885	8·6	8·9	10·0	9·3	9·2	July.
August	2·47	5·33	1881	·55	1880	9·1	9·5	9·5	9·3	9·4	August.
September	2·47	5·80	1876	·43	1900	8·9	8·8	9·2	9·3	9·1	September.
October	2·78	7·80	1875	·51	1888	10·9	10·8	10·8	10·4	10·7	October.
November	2·57	5·17	1888	·67	1879	10·0	9·8	9·3	9·6	9·7	November.
December	2·54	5·75	1876	·57	1883	9·4	9·7	8·9	9·5	9·4	December.
Year	26·71	38·36	1882	19·12	1892	100·0	100·0	100·0	100·0	100·0	Year.

WELL SINKINGS, BORINGS AND SPRINGS.

These are arranged under Towns and Parishes in alphabetical order.

Adderbury.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

The following information was given by Mr. Robert Beasley, Carpenter, Royal Oak Inn.

Round the Green the wells average 50 feet, and at the east end and round the Church 15 feet to 20 feet in depth.

At the Royal Oak, about half-way down the village, the well is 30 feet. The yard of this inn shows the Terebratula-bed of the Marlstone Series as a natural pavement.

At Adderbury West the wells are from 10 to 25 feet in depth.

At Green Hill Farm, ¾ mile north of Adderbury, a boring was made and communicated by Messrs. Duke and Ockenden in November, 1905, for Mr. Henry Stone. Height above O.D. 379 feet. Water level 42 feet from surface.

		Thickness. Feet.	Depth. Feet.
Lias Marlstone and "Margaritatus" Beds	Sand and clay	8	8
	Rock	1	9
	Sand and clay	7	16
	Rock	¾	16¾
	Sand and clay	2¼	19
	Rock	2	21
	Blue clay	10	31
	Rock	½	31½
	Blue clay	16	47½
	Rock	4	51½
Lower Lias	Blue clay	50½	102

Lined with 6-inch and 4½-inch tubes to 47 feet 6 inches below surface.

Mr. Stone stated that not much water was obtained until the last blue clay was pierced, when a good supply was found.

Adwell.

Geological Map 254 (new series).

Springs rise here and are used by the inhabitants. Probably they are from the base of the Lower Greensand. A new house on the top of the hill to the north-east of the village by the Oxford Road has a well of 58 feet depth. The well is about 365 feet above O.D., and the water is probably derived from the same horizon as the springs.

Albury, Tiddington and Rycote Tower.

Ordnance Map 237 (new series); Geological Map 13 (old series).

These places, which are within a mile of each other, appear to be supplied by springs from sand (Shotover Sand?) resting on Kimmeridge Clay, the latter throwing out the water. From Rycote Tower a succession of springs at about the level of that house extends nearly to Albury, and again beyond Rycote on the south side of Rycote Pond. Rycote Pond is represented on the Old Geological Map, Sheet XIII., as being on Gault, but the line of springs suggests that it is more likely to be on Kimmeridge Clay with the Shotover Sand above the springs. The well at the Tower is quite shallow, and on one of these springs, as I was told by Mr. Frank Chapman.

Alkerton, *see* Shenington.

Ambrosden.

Ordnance Map 237 (new series) ; Geological Map 45 S.E. (old series).

The well of the old mansion, of which only ruins now remain, is said to be only 20 feet deep, but "big enough to turn a wagon round in." The well at the timberyard, south-west end of the village, is 14 feet. These wells are in the Cornbrash. At the other end of the village, one at the back of a row of cottages is 9 feet. Water seems abundant in the village and comes from an inlier of Cornbrash, surrounded by Oxford Clay.

Arncot, Upper.

Ordnance Map 237 (New Series) ; Geological Map 45 S.E. (old series).

Near Arncot Wood, close to a corn windmill and Mr. HARPER's Farm.

Boring made by Messrs. CHEELD & Co. September, 1907.

Height above O.D. about 300 feet.

The yield was about 500 gallons per hour from the sand (Estuarine). This quantity was as much as the pump could raise. It is important to note that no water was obtained from the Great Oolite.

The water had a salt flavour and an unpleasant smell (? sulphuretted hydrogen).

		Thickness.		Depth.	
		Ft.	Ins.	Ft.	Ins.
Oxford Clay, 155 ft. 9 in.	Yellow clay	20	0	20	0
	Blue clay	56	9	76	9
	Rock	0	5	77	2
	Clay	12	7	89	9
	Rock	0	9	90	6
	Clay	34	0	124	6
	Rock	0	4	124	10
	Clay	2	11	127	9
	Sandy clay (Kellaways Beds)	28	0	155	9
Cornbrash, 20 ft. 10 in.	Rock	7	6	163	3
	Clay	0	3	163	6
	Rock	12	11	176	5
	Clay	0	2	176	7
Forest Marble, 18 ft 8 in.	Rock	18	8	195	3
Great Oolite, 56 ft. 6 in.	Clay	0	6	195	9
	Rock	7	8	203	5
	Clay	0	8	204	1
	Rock	3	0	207	1
	Clay	1	0	208	1
	Rock	3	8	211	9
	Clay	1	0	212	9
	Rock	1	4	214	1
	Clay	3	8	217	9
	Rock	1	0	218	9
	Clay	1	8	220	5
	Rock	2	8	223	1
	Clay	3	10	226	11
	Rock	6	6	233	5
	Clay	0	3	233	8
	Rock	4	0	237	8
	Clay	0	9	238	5
	Rock	2	0	240	5
	Clay	0	4	240	9
	Rock	1	11	242	8
	Clay	2	1	244	9
	Rock	7	0	251	9

		Thickness. Ft.	Thickness. Ins.	Depth. Ft.	Depth. Ins.
[Estuarine Series ?]	Clay	9	8	261	5
	Rock (? Pyrites)	3	6	264	11
	Clay	0	8	265	7
	Rock	0	3	265	10
	Clay	0	6	266	4
	Rock	0	4	266	8
	Clay	3	7	270	3
	Sand	0	3	270	6
	Clay	0	4	270	10
	Black sand (water)	12	0	282	10
	Clay with thin layer of a black substance like charcoal ...	[? 9	10	292	8]

N.B.—A letter from Messrs. Cheeld & Co. gives the boring as 292 feet 8 inches, but the thicknesses given in the section amount only as above. Perhaps the figures supplied in brackets give the explanation, the extra depth being in the clay of the last item.

An analysis gave 256 grains per gallon of sodium chloride, and 144 grains of sodium sulphate.

Ascot.

Geological Map 254 (new series).

Springs rise in the grounds about the old mansion. They probably come from the gravel of Chalgrove field.

Asthall.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

Cottage, south of wood. Height above O.D. about 424 feet.

	Feet.
Well steined	10
Rock to water	20

Asthall Leigh.

Wells 10 feet to 15 feet in brash.

A farm in the village, belonging to Queen's College, Oxford, and occupied by Mr. Tims, had an old well said to be about 161 feet in depth.

At the surface, as seen in new foundations, is yellow clay with quartz and quartzite-pebbles. The same deposit is seen in the road-side in the village where the descent to Fordwells begins at about 400 feet above O.D. It is probably the same as the outlier at Leafield.

The north end of the village has a tank and pump at about 365 feet above O.D., supplied from the Fordwells source by pipe—*see* Fordwells.

Aston, *see* Steeple Aston.

Balscott.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

A small village with many springs thrown out from the Lias Marlstone by the underlying Lower Lias Clay.

In one case a spring rises immediately underneath the living room of a cottage.

Bampton.

Ordnance Map 236 (new series) ; Geological Map 13 (old series).

About ½ mile W. by S. of the Church.

Boring communicated by Mr. C. E. Hawkins, 1905. Grouping of strata by Mr. H. B. Woodward.

Height above O.D. about 222 feet.

		Thickness. Feet.	Depth. Feet.
Valley Drift, 14 ft. 6 in.	Soil	3	3
	Yellow sand	4	7
	Sand and gravel	7½	14½
Oxford Clay, 137 ft. 6 in.	Blue clay	21½	36
	Blue shale	116	152
Forest Marble, 38 ft. 6 in.	Hard blue stone	6¼	158¼
	Hard blue rock and pebbles [? fossils]	4¾	163
	Blue shale and beds of rock	13	176
	Hard blue rock	1½	177½
	Blue shale	4	181½
	Hard rock	½	182
	Blue shale	2½	184½
	Hard rock	1½	186
	Blue shale and beds of rock	4½	190½
	Hard light shale*	19½	210
	Light limestone rock	2½	212½
	Hard light shale	28½	241
	Hard light limestone	11	252
	Light blue shale	3	255
	Hard light limestone	4	259
	Light blue shale	2	261
	Hard grey limestone	3½	264½
	Light blue shale	5½	270
	Hard grey limestone	1	271
	Light blue shale	26	297
	Hard light shale	1½	298½
	Light blue shale	9½	308

[Abandoned at 308 feet, the water being saline.]

Banbury.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

Water Supply.

The following information has been furnished by Mr. W. G. Wood, Secretary of the Water Company.

The Borough is supplied by the Banbury Water Company, who obtain the water from the River Cherwell, about one mile above the town. The water is subjected to downward filtration through sand and gravel, and is then pumped through mechanical filters to supply the town. The Cherwell rises at Charwelton, Northants, about 13 miles distant, and drains a purely agricultural district lying on the Lower and Upper Lias and the Marlstone formations, and from the last named the water supply is principally obtained.

The works were established in 1856 and a special Act of Parliament was obtained in 1865. The population supplied is 13,000, and the annual consumption is 124 million gallons. The character of the water is 17° temporary and 8° permanent hardness, or almost exactly similar to that supplied from the river Thames to London.

Previous to the establishment of the Company, the town was supplied from wells of various depths, but as it is situated mostly on the Lower Lias Clay, the supply from these wells was very uncertain, whilst the risk of pollution made the quality very doubtful. A portion of the town [the higher part] is situated on the Lias Marlstone, and the breweries of the town are supplied from springs in this formation, but the supply is not very large and has to be augmented by the Company's supply. For Analysis, *see* p. 91.

* By "light shale" presumably soft white limestone or marl is meant.

Boring at G.W.R. Station. Communicated by Mr. W. W. GRIERSON.

Height above O.D. about 285 feet. Water flows over at surface but can be pumped out in about 15 minutes.

		Thickness. Feet.	Depth. Feet.
Alluvial Deposits, 16 ft.	Yellow clay	5	5
	Gravel and sand	11	16
Lower Lias Clay.	Blue clay	32	48
	Blue hard rock	1½	49½
	Blue marl	14½	64
	Blue hard rock	3¼	67¼
	Blue marl	15¼	82½
	Blue marl, rocky	3½	86
	Blue marl	12	98

The upper 16 feet was a 10-inch bore, the remainder 7-inch.

(Grimsbury), Daventry Road.

Informant, Mr. R. H. ATTON, Brick-maker.

At the brick-pits east of the Daventry Road wells were sunk for the purposes of the brick-makers. The depths were 7 ft. 6 in., 8 ft. 6 in., and, in two cases, 10 ft. These were down to the Banbury Marble ("Margaritatus beds") and the water rose to the surface when it was struck. Near the junction of the Daventry and Middleton-Cheney roads a well was recently sunk 20 feet in the same beds, and though the "marble" was struck the supply was not so abundant.

At Green Hill Farm a boring was sunk by Messrs. Duke and Ockenden to a depth of 102 feet in alternations of rock with sand and clay. The water stands at 42 feet below the surface.

Beckley.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

This old village is built on the Calcareous Grit of the Jurassic Series, with hills of Coral Rag rising to the south of it. These rest on the Oxford Clay, and throw out springs abundantly. A spring-well in the street under the road running northwards from the Church supplies most of the houses in that street. In a well in the back garden of the second house east of the Police Office, water stands at 25 feet depth. It "never runs dry and keeps always at same level." At the east end of the village a spring, probably from the same horizon, supplies plentifully a pond at the source and is used by the inhabitants of that end of the village.

Though some of the wells in the streets running northwards are not considered good, others on the south side of the east-and-west street should come from a safe and unpolluted gathering ground.

Berrick Prior & Berrick Salome.

Geological Map, Sheet 254 (new series).

Mr. J. Lane, builder, states that the wells round here are all shallow. The deepest is not more than 20 feet. They are in "Green Clay." [Gault]

Bicester.

Ordnance Map 219 (new series) ; Geological Map 45 S.E. (old series.)

Writing in 1906 Dr. Theodore Thomson remarked that "The water supply of Bicester is furnished in the main by shallow wells, usually dry-steined, sunk in the rubbly rock on which the town stands ; partly by two springs at the northern end of the town, known as the Crockwell spring and the Brockless spring respectively, and by the Bicester brook, which flows through the town and from which a few households take their domestic water supply." (Report to Local Government Board, No. 107).

In dry seasons many of the wells failed.

About this time it was sought to obtain water from a well at Trow Pool :—

	Feet
Surface soil	1
Oolite rock	7
Hard blue oolite	9
Stiff blue clay	2
Alternate beds of hard rock and clay	6

Water was obtained at a depth of 7 feet*, and continued through the oolite to the depth of 18 feet. The yield was 144,000 gallons per diem.

The supply was not utilized as the necessary land for protective purposes could not be purchased. Ultimately a boring at Gowell Farm, was made for the Town Supply.

Bicester Town Supply.

Gowell Farm, near Bicester, 1¼ miles N.W. of Market Place.

Communicated by Mr. Edgar F. Willson, Surveyor to the Urban District Council.

Height above O.D. 277 feet.

A pit, 8 feet square and 11 feet deep, was lined with brickwork and floored with concrete 1 ft. 6 in. thick. A steel tube 11 inches diam. was taken to 112 ft. 4 in. from surface, with perforation at 77 feet. No water worth mentioning was met with until 92 feet, when it rose to the surface. At 105 feet the bulk was struck, and overflowed at the rate of 6,000 gallons per hour when not pumping. The water will rise 3 feet above the surface.

		Thickness. Ft.	Thickness. Ins.	Depth. Ft	Depth. In.
	Surface soil	1	6	1	6
Forest Marble 22ft.	Grey rock (Cornbrash)	3	0	4	6
	Sandy marl	8	0	12	6
	Blue rock (Forest Marble)	3	0	15	6
	Light shale	2	6	18	0
	Limestone	2	0	20	0
	Blue clay or shale	3	6	23	6
Great Oolite 84 ft. 6 in.	White rock	7	0	30	6
	Grey shale with hard beds	12	6	43	0
	Grey rock	6	0	49	0
	Dark shale	1	0	50	0
	Rock	0	6	50	6
	Blue binds	2	0	52	6
	Blue shale	1	6	54	0
	Grey rock	3	0	57	0
	Grey shale	1	0	58	0
	Grey rock	1	0	59	0
	Variegated rock	3	6	62	6
	Grey rock...	3	0	65	6
	Dark shale	7	0	72	6
	Rock	2	0	74	6
	Blue clay	5	0	79	6
	Blue rock	2	6	82	0
	Dark shale with hard beds	3	0	85	0
	Limestone	1	6	86	6
	Limestone with shale beds	3	0	89	6
	Blue shale	1	0	90	6
	Grey sandy shale with water	2	0	92	6
	Grey rock	2	6	95	0
	Dark sandy shale	2	6	97	6
	Light sandy shale	2	0	99	6
	Grey rock	2	6	102	0
	Soft rock, water, bulk here	6	0	108	0
Estuarine Beds 4 ft. 4 in. (penetrated)	Peat	1	3	109	3
	Light sand	0	8	109	11
	Dark clay and sand	2	4	112	3
	Rock, 1 inch only into it	0	1	112	4

Analysis by Mr. W. W. Fisher in "The Salinity of Water from the Oolites" "*The Analyst*," *February, 1904*. *See* p. 92.

* *See* Analysis, p. 92.

Mr. E. Foster Tanner, Clerk to the Urban District Council, has kindly added the following particulars :—

"The deep well pump has been fixed. Motive power supplied by Crossley's 13-h.p. gas engines in duplicate, either capable of driving the pumping plant, which has the capacity for raising 8,000 gallons per hour. The water is pumped into tanks, constructed of steel, on the top of a tower, immediately adjoining the well. The tanks are in duplicate, *i.e.*, an inner and an outer tank. Their combined holding capacity is about 45,000 gallons. Height from ground to bottom of tanks, 40 feet. There is a 7-inch main from the water tower to the town, and the distribution mains in the town are respectively 6-inch, 5-inch, 4-inch, and 3-inch. The cost of the works was £7,000."

Another boring through the same beds has been put down recently by Messrs. Isler & Co. at the new Bicester Station, on the Great Western Railway. The boring started at O.D. 255 feet, and was carried down to a depth of 120 feet. At 100 feet down the top of the incoherent Northampton Sand was struck, and the water rose to and overflowed at the surface at the rate of 3,000 gallons an hour. The borehole was lined to a depth of 24 feet with tubes of 13½ inches diameter, and 8,000 gallons an hour can be pumped from it.

The section of the beds passed through bears such a close resemblance to that of the town-well that a summary only of it need be given, which is as follows :—

		Thickness. Ft.	In.	Depth. Ft.	In.
Cornbrash ...	Soil and grey limestone	8	6	8	6
Forest Marble.	Alternations of bluish clay and oolitic impure limestone	21	3	29	9
Great Oolite Limestone.	Alternating thicker bands of oolitic limestones, with subordinate partings of clay. Thickness uncertain	46	3	76	0
Estuarine Group.	Alternations of thicker clay bands and limestone	24	0	100	0
Northampton Sand.	More or less incoherent sands, the lower part "peaty" and resting on the hard bottom-bed of the oolites	17	0	117	0
	In the hard-bed	3	0	120	0

The Northampton Sand yields a great quantity of water ; it has been deeply cut into in the excavations along the new railway just south of the tunnel, and yields never less than 10,000 gallons an hour, which is carried away through the tunnel in a culvert.

Bicester House, Bicester.

Sunk, 18 feet ; bored, 27 feet.

Communicated by Mr. H. G. Fane.

		Feet.
	Well; strata unknown, probably Cornbrash ...	18
Forest Marble ?	Hard blue rock	10
	Bluish clay	5
	Hard blue rock	5
	Blackish clay	½
	Hard white rock, light bluish tinge	2
	Brownish clay	½
	White rock finer and less hard	4
		45

Graven Hill Wood, at back of Keeper's house.

Mr. John Ward (Smith) bored 100 feet, but obtained no supply of water. Surface water is used.

OXFORD HOUSE, BICESTER.

Boring for Mr. W. Baker. Date, 1889.

Made and communicated by Messrs. LE GRAND & SUTCLIFF.

		Feet.
Cornbrash and Forest Marble	Old dug well, the rest bored	21
	Green clay	4
	Hard rock	19
		44

Water-level 13 ft. 6 in. below surface.

Slade Farm, ⅝ mile N. of Bicester.

Messrs. CHEELD & Co. bored 95 feet through Great Oolite to sand. The water overflows and feeds a reservoir, and supplies the farm.

Wretchwick Farm, 1¼ miles S.E. of Bicester.

Mr. SMITH, plumber, of Sheep Street, Bicester, now deceased, bored a long way. The water he obtained was very hard.

Black Bourton.

Ordnance Map 236 (new series); Geological Map 13 (old series).

There are shallow wells in the gravel of 6 to 8 feet in depth. Higher in the village the depth is up to 12 feet.

Blackthorn.

Ordnance Map 219 (new series); Geological Map 45 S.E. (old series).

Mr. H. HEATH, of Marsh Gibbon, stated that the inhabitants of Blackthorn have to fetch water from Ambrosden.

Well and boring at Blackthorn Station, S.E. of Bicester, on the Ashendon and Aynho Railway. Information from the Engineer.

		Ft.	In.
Oxford Clay	Dug Well—		
	Clay with rock at bottom	18	0
	Boring—		
	Hard loamy sand	10	0
	Dark clay	7	6
Cornbrash	Hard rock	9	6
	Dark clay	3	6
	Hard rock	3	6
	Light-coloured clay	0	3
	Rock	2	8
Great Oolite?	Sandstone (water) and thin clay layers ...	29	4
	Clay	0	6
	Hard grey rock	5	5
		90	2

Bletchingdon.

Ordnance Map 236 (new series); Geological Map 45 S.W. (old series).

The village appears to be on a sandy plateau with wells of moderate depth. No information could be procured at the estate office. The old Geological Map represents the area as Oxford Clay.

Diamond Farm, on the road from Islip, is situated on the Oxford Clay. A well has been sunk about 20 feet, and about another 50 feet has been bored. A pump goes to the bottom of the dug well, but it is said that the water from this depth is not so good as that which is drawn from the top when the well is full. The water at the top is probably surface water.

HEATHFIELD HOUSE, about 1½ miles S.E. of Bletchingdon.

Made and communicated by Messrs. DUKE & OCKENDEN. April, 1900.

Boring for C. STRATTON, Esq. Water level, 10 feet from surface.

		Thickness. Feet.	Depth Feet.
	Shaft (old dug well), Oxford Clay ?	33	33
Oxford Clay.	Clay	25	58
	Shale	1	59
	Sandy clay and fossils	2	61
	Dark clay	10	71
Cornbrash?	Rock	3	74
	Rock and clay	7	81
	Rock and a little water	4	85
	Very hard rock	6½	91½
	Light clay	3½	95
Forest Marble?	Rock	2	97
	Clay	1	98
	Rock	3	101
	Clay	5	106
	Rock	1½	107½
	Clay	1	108½
	Layers of shale and rock	9½	118

When the rock was broken through at 81 feet, water rose to 10 feet below the surface. Later, on further boring, the rest-level appears to have settled down to 18 feet below the surface.

At 100 feet and 111 feet water fissures were penetrated.

[The last was apparently the chief supply.]

Bloxham.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

At All Saints School, the Rev. G. H. Ward, Head Master, informed me that the school wells, of which there are several, average 20 feet to 30 feet in depth. They lie under the gymnasium, the cricket-field, the school-house, and elsewhere. When one is getting dry, they use another, and so on. One is said to be a sulphur well, which, however, is not used.

Mr. William Adkins, builder, states that the wells are deeper on the higher ground and shallower in the valley, and he has no hesitation in saying that they all draw water from the same bearing beds (Middle Lias or Marlstone series).

As an example, he has given the section of the new well which has been lately made for the supply of Bloxham and Adderbury by a water company at Combeford, Bloxham, 18 feet above the stream in the triangle formed by the railway, stream, and road to Tadmarton.

		Ft.	In.
Dug well	Soil	4	6
	Shelly thin rock, formerly used for road-metal ...	3	6
	Good brown building-stone	4	6*
	Mixed brown and blue building-stone in blocks (Terebratula-zone)	3	6
	Blue marl	19	0
Bored	Do.	70	0
		105	0

Boddicot.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

At this village the wells average 25 feet in depth. They are, probably, in the Marlstone.

* The water came along this plane, and none was obtained in the boring. Continuous pumping for three weeks gave 6,000 gallons per hour. The new tank for supply is on Hobb Hill, which is over 500 feet in height above the sea.

Broadwell.

Ordnance Map 236 (new series); Geological Map 44 (old series).

Broadwell village has a few shallow wells with good water. The main part of the village, including the Vicarage and the schools, is supplied from a fish-pond situated in Broadwell Manor Farm. This large pond is fed by several springs of great volume. The water, but for some slight surface-contamination from leaves, &c., is practically pure. The springs appear to rise near the line where the Cornbrash Limestone series dip beneath the Oxford Clay, which here acts as a barrier, throwing up the surplus water which cannot run away to the dip beneath its impervious layers.

I am indebted to Mr. T. S. Kilbee, of the Estate Office, for the foregoing information concerning Broadwell village, and for the following particulars as regards Broadwell Grove Estate :—

Broadwell Grove House (Ordnance Map 235, new series) [on Forest Marble] is supplied from a spring at Signet, 1½ miles distant. The water is pumped by a water-wheel to a tank in Aston Copse, thence gravitating to the house, cottages, keeper's lodge, &c. [The spring is in the Great Oolite, and issues at about 350 feet above O.D.].

Home Farm is supplied from a deep well about 80 feet deep. For analysis, *see* p. 93.

Woodside Farm is supplied for domestic purposes from a deep well [in Great Oolite]. For analysis, *see* p. 93. Its buildings and wells are supplied from a pool by the side of the road from Broadwell Grove to Burford.

Oxleaze Farm has a deep well used for domestic purposes. For analysis, *see* p. 94. Water is also obtained from a spring three-quarters of a mile distant. The water is pumped by a water-wheel to a tank at Homestead and flows thence by gravitation.

Brightwell Baldwin.

Geological Map 254 (new series).

A well by the inn is 20 feet deep, but the water from it is not good. Another in a garden nearly opposite is about the same depth, but is said to supply very good water. Both wells are in the Upper Greensand.

Further east is a fine spring below the road, which is used for watercress beds. At the cottage beyond, a well showed 15 feet to water.

The Lower Greensand at this village is faulted against the Lower Chalk on the south-east.

Brize Norton.

Ordnance Map 236 (new series). Geological Map 45 S.W. (old series).

Well and boring at the Vicarage.

Sunk 12 feet. Bored 58 feet 6 inches. Date 1891.

Made and communicated by Messrs. Le Grand and Sutcliff.

		Thickness. Feet.	Depth. Feet.
Drift ?	Dug well	12	12
	Hard stone	6	18
Cornbrash ?	Dark clay	1½	19½
	Stone	½	20
	Light blue clay	4	24
	Hard blue shale...	3½	27½
	Hard flaggy stone (water rose to 8 feet 6 inches above surface, but a feeble supply)	10	37½
	Hard rock	2½	40
	Blue clay	18	58
	Grey sandy stone (loose oolite)	12½	70½
	A good yield rising to 4 feet 6 inches from surface. Clay touched at bottom.		

BLACK MOAT and CASWELL HOUSE, 1¼ miles E. of BRIZE NORTON.

The house is supplied by the spring shewn on the Ordnance Map as "Well" on the road from Brize Norton to Witney.

Water probably rises from Cornbrash in the fields around and supplies the moat itself.

The spring is a strong one and comes out probably along a line of fault throwing Oxford Clay against the oolite.

GLEBE FARM.

There are several wells of about 15 feet in depth. Height above O.D. about 365 feet.

KILKENNY COTTAGES.

There is a well close to quarries about 6 feet deep. Height above O.D. about 300 feet.

MALT HOUSES.

There is a well about 15 feet deep. Height above O.D. about 290 feet.
In the village further south there are wells of depths varying to 30 feet.

Broughton Poggs.

Ordnance Map 235 (new series). Geological Map 34 (old series)

There are many shallow wells with good supplies of water.

Burcot.

Geological Map 254 (new series).

Boring at Mr. M. HIGGINS, Croft House, Burcot.

Communicated by Mr. GEORGE WINSHIP, F.G.S., Abingdon.

		Thickness. Feet.	Depth. Feet.
	Made ground	2	2
Lower Greensand.	Rock	12½	14½
Kimmeridge Clay.	Clay	3½	18
	Blue clay	16	34
	Clay	101	135
	Rock	1	136
	Clay	4	140
Corallian	Rock	14	154
	Rock and clay	18	172
	Rock	1½	173½
	Sand rock	3½	177
	Hard rock	13	190

Lined with 140 feet of 4-inch tubes, top standing 2 feet 6 inches below urface.

Burford.

Ordnance Map 236 (new series); Geological Map 44 (old series).

There is a public supply of water from springs below Taynton Road at the plantation, three furlongs W.N.W. of Burford Bridge. It issues at about O.D. 343 feet. Prior to this supply, public wells were used. One, in Priory Street, was 15 feet deep, while another was in Witney Street.

The private wells showed some differences in depth. One, at the Police Station, on the "bank" or steeper part of the main street, was 100 feet deep; while another at Mr. Pettier's, three houses below, was only 40 feet deep. Sheepstown well, opposite Mr. Brown's house on the "bank," was 50 feet.

SIGNET HILL FARM, on WESTWELL ROAD.

There is a well here 60 feet deep. Clay on very hard rock. The height above O.D. is 430 feet. The water-supply is now obtained from Burford.

WHITE HILL, at junction of Witney-Cheltenham road with branch to Burford.

There is a disused well here, probably deep. Height above O.D. about 450 feet.

WHITE HILL FARM, SHILTON ROAD.

There is a well 40 feet deep. Height above O.D. 412 feet. The water supply is now obtained from Burford.

Burford Signet.

Ordnance Map 236 (new series); Geological Map 44 (old series).

The following account is quoted from "Jurassic Rocks of Britain," by H. B. Woodward, vol. iv., 1894, p. 303.

[Boring north of stream; west of the plantation to the west of Sturt Farm; and east of the bend in the road south of Signet.] 1875–77.

The elevation is 337 feet above O.D.

		Thickness. Ft.	Thickness. Ins.	Depth. Ft.	Depth. Ins.
Great Oolite. 62 ft. 6 ins.	Surface soil and rubble	9	10	—	
	Yellow and blue clay	3	9	13	7
	Blue clay with bands of yellow stone ...	13	1	26	8
	Blue clay and pebbles	2	0	28	8
	Blue clay	9	4	38	0
	White Lias	2	6	40	6
	Blue Lias	1	0	41	6
	White Lias	8	8	50	2
	Yellow freestone	6	4	56	6
	Lias	4	0	60	6
	Freestone	0	6	61	0
	Lias	1	6	62	6
Inferior Oolite ? 27 ft. 8 ins.	Limestone	27	8	90	2
Upper Lias. 81 ft. 6 ins.	Blue clay	33	4	123	6
	Do. with fossils and metal ...	25	1	148	7
	Clay without fossils	13	2	161	9
	Clay with crystals [? selenite]	9	11	171	8
Middle Lias. 98 ft. 1 in.	Soft green lias with fossils and shells, large Belemnite	3	0	174	8
	Lias with fossils	0	6	175	2
	Clay	56	10	232	0
	Clay with bed of stone				
	Clay with two bands of irony sandstone	37	9	269	9
Lower Lias. 447 ft. 4 ins.	Clay with shells. At 280 feet, *Ammonites capricornus*, *Cardium truncatum*, *Avicula*, *Pecten*, &c.	30	9	300	6
	Clay with band of shelly limestone ...	18	2	318	8
	Harder clay	30	8	349	4
	Stiff clay with metal	9	0	358	4
	Harder clay				
	Clay with shells and metal	8	5	366	9
	Clay with shells, *Cardinia attenuata* at 373	12	10	379	7
	Clay with two stone-beds	20	7	400	2
	Stone and clay with fossils, *Gryphæa*, *Hippopodium ponderosum*, *Lima pectinoides*	6	10	407	0
	Clay with pebbles [? nodules], *Cardinia ovalis*	5	7	412	7

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
Lower Lias. 447 ft. 4 ins. —*cont.*	Clay with band of septarian limestone, *Lima pectinoides*	17	2	429	9
	Very soft clay, *Pentacrinus*, &c. ...	10	1	439	10
	Clay	35	2	475	0
	Clay with occasional bands of limestone	227	4	702	4
	Jointed limestone	6	0	708	4
	Clay	2	9	711	1
	Limestone	4	0	715	1
	Shale	2	0	717	1
Rhætic Beds and New Red Sandstone Series.	Soft shale and clay	32	0	749	1
	Black shale	1	0	750	1
	Green marl	6	0	756	1
	Sandstone	1	0	757	1
	Green gritty marl	50	9	807	10
	Limestone	0	3	808	1
	Variegated marls with gypsum ...	375	11	1184	0
Coal-measures	... ...	226	0	1410	0

The details of the Burford section are given partly from a record in the Museum of Practical Geology, communicated by Lieut.-Col. F. Bolton, R.E., and partly from another MS. The fossils were identified by Mr. Etheridge. Particulars have also been published by Mr. C. E. De Rance,* and by Mr. Etheridge :† the details varying in each case. In the Warwick Museum there is a core of "Coal shale" from a depth marked 1,174 feet.

In the Geological Survey Office, amongst papers by Prof. A. H. Green, is a section of the boring down to 479 feet and two analyses of ironstone therefrom, showing respectively 10·77 per cent. and 22·75 per cent. of iron.

The beds of Great Oolite, to a depth of about 50 feet, no doubt belong to the Marly beds of the Upper Division. Prof. Hull has remarked that the total thickness of this upper portion is probably little short of 100 feet :‡ it is quite 75 feet, and the full thickness of the Great Oolite may not be less than 100 feet.

North-west of Burford Signet, the Upper Division of the Great Oolite was shown in the following section :—

			Ft.	Ins.
Great Oolite.	White Limestone.	Close-grained rubbly oolite	4	0
		White oolitic limestone ... ... / Do. more earthy ...	2	4
	Marly Beds.	Irregular bed of grey and greenish carbonaceous clay ... / Hard white and pinkish limestone slightly oolitic... ... 3 0 or	4	0
		Brown more or less shelly oolite : passing down probably into freestone 3 0 or	4	0

The lower beds are hard and are employed for building-purposes. The beds, on the whole are much fissured and tumbled, as if faulted.

The upper beds of Great Oolite, together with clays that present some of the characters of the Great Oolite Clay, and some of the fossils of the Bradford Clay, were shown, as follows, in a quarry about half-a-mile south-west of Burford Church :—

		Ft.	Ins.
	Brown clayey and stony soil	1	0
Forest Marble (= Bradford Clay ?).	Grey, greenish-grey and brown clay, with thin layers of gritty and shelly limestone : *Avicula*, *Ostrea acuminata*, *O. lingulata*, *O. gregaria*, *O. Sowerbyi*, *Rhynchonella*, *Serpula*, &c. ...	3	6
	Ferruginous marly and racy bed, with interrupted masses of hard brown shelly oolite at base ...	1	0

At Burford Signet a spring by the Ford which is used for Broadwell Grove issues at 350 feet above O.D.

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* *Rep. Brit. Assoc.* for 1878, p. 384 ; *Trans. Manchester Geol. Soc.*, vol. xiv., p. 437.

† *Pop. Science Review*, ser. 2, vol. iii. p. 290.

‡ "The Country around Cheltenham" (*Mem. Geol. Survey*), 1857, p. 64.

Caversfield.

Ordnance Map 219 (new series); Geological Map 45 S.E. (old series).

Well at The Bungalow. Informant, Mr. W. Horwood.

	Feet.
Cornbrash (?)	5
Rubble Rock	5
Clay	9
Hard Blue rock	

Water rose in a joint from the bottom and maintains a level of 13 feet from the surface.

Caversham.

Geological Map 268 (new series).

For Mr. Brown.

Dug and communicated by Mr. S. Joyce.

	Feet
Plateau Gravel	6
Chalk	102
	108

Water level at 104 feet from surface. The well has since been deepened.

Henley Road (Mr. Deacon's).

Dug and communicated by Mr. S. Joyce.

	Feet
Gravel	9
Chalk	77
	86

Water level 82 feet from top. The well has since been deepened 2 feet 6 inches.

For Mr. May.

Dug and communicated by Mr. S. Joyce.

	Feet
Plateau Gravel	10
Chalk	102
	112

Water level 108 feet from surface. The well has since been deepened.

Warren House

Dug and communicated by Mr. S. Joyce.

	Feet
Plateau gravel	2
Chalk	102
	104

Water-level 100 feet from surface.

CAVERSHAM PARK.

Made and communicated by MR. CALLAS.

Rest-level of water 150 feet from surface.

		Thickness. Feet	Depth. Feet
Reading Beds.	Gravel	12	12
	Mottled clay	24	36
	Mottled sand	6	42
	Chalk	131	173

Chadlington and Eastend.

Ordnance Map 218 (new series). Geological Map 45 S.W. (old series).

These places are mostly supplied by pipes from springs. There are also some wells of a depth of about 30 feet, *e.g.* at a row of houses opposite the church—the property of the Ecclesiastical Commissioners.

BARTER'S HILL, near CHADLINGTON.

The farm, about 2⅓ miles N.N.E. from Shipton Station, is upon a ridge of Great Oolite. The well is at 600 feet O.D. and 90 feet deep. It is an old well but "never dry."

Chalgrove.

Geological Map 254 (new series).

This is an interesting example of an early settlement on a site which was chosen on account of its supply of water. Lying in the bottom of a narrow valley the road has evidently been the original stream-course. Houses have been built on both sides. The stream has been subsequently confined to a channel on the north side, and each house has a bridge over the channel into the road. In the course of time the stream became much polluted and so wells have been made in front of and behind the houses. These are sunk in the gravel to a depth of not more than 10 feet. In wet seasons the stream reclaims the roadway.

Charlton on Otmoor.

Ordnance Map 237 (new series). Geological Map 45 S.E. (old series).

There are wells in the Cornbrash and Forest Marble. They are mostly shallow, but one in the middle of the village is about 23 feet to water but at times may be handed out with a bucket. Further on, on the south-east side of the road, is a well with pump. The well is evidently polluted by the farmyard in which it is situated. The water is the colour of porter. Several such occur and are called 'black wells.' Thirty yards from the last well is another of 9 feet which appears to contain clear water.

A public well north of the Church is said to be 14 feet deep.

Chinnor.

Ordnance Map 237 (new series). Geological Map 13 (old series).

A well was noted by Mr. A. J. Jukes-Browne, as having been sunk about ½ mile N.W. of St. Andrew's Church, to a depth of 37 feet in Upper Greensand.

The wells vary from 30 to 50 feet in depth.

At the Chainmakers' Arms, in the N.E. side of this village, a well has been sunk about 50 feet to a rock (Malmstone) with a good spring in it. At the Crown Inn (extreme S.W. corner of the village) water is found at a depth of 25 feet. On the N.W. side there are several wells of a depth of about 30 feet.

These wells are probably all supplied from the Malmstone.

Chipping Norton.

Ordnance Map 218 (new series). Geological Map 45 N.W. (old series).

The Pumping Station is at Glyme Farm, 1 mile to the S.E. of the town. Three reservoirs on the top of the hill east of the town are fed from the springs by a lift of 200 feet, and the water is distributed thence by gravitation. The Glyme Farm springs are often dry from June to December or early January, but they rise late in March.

A few years ago an extension of pipe-line was carried a mile further down the Glyme to Old Chalford. There an oil-engine pumps the water into a tank, whence it is conveyed to the Glyme Farm Reservoirs.

Dean Buildings, ½ mile S.W. of Old Chalford, are supplied by a ram which pumps water from the Glyme.

Some houses along the road to Salford above the Common, for which water used to be drawn from shallow wells in the Lias Clay, now receive the town-supply. The pipe-track was in clay all the way.

Chislehampton.

Geological Map 254 (new series) and Oxford District.

The Gault on the hills to the N.W. rests on Kimmeridge Clay as shown by Mr. J. H. Blake. He noted in 1900 that "the hill to the N.W. of Chislehampton has been proved by a boring 60 feet in depth, made this year near the top of the sloping ground opposite Church Farm, to consist of bluish-grey clay, blackish in places. It is apparently Gault overlying Kimmeridge Clay."*

The two following notes are by Mr. Blake. The first may refer to the boring already mentioned, but apparently the other is a dug well :—

West of St. Katherine's Church, by Chislehampton Lodge —

	Feet
Dug well	20
Blue and grey clay [Gault]	40

Marylands Farm [⅔ mile W. of the bridge].

Well stated to be through [Kimmeridge] Clay, 18–20 feet. Water obtained from [Corallian ?] Rock.

Two gravel-outliers on the hill to the N.W. supply two cottages at the north end of the hill-top on the Oxford Road, by means of a well 15 feet deep, with water standing at less than 4 feet from the surface. This gravel is probably the source of the water of the boring noted by Mr. Blake ; a well-designed field-drain along its outcrop might have been a more efficient method of catching the water.

A well in the garden of a cottage opposite the Inn is used for drinking-water by the inhabitants of the village. It is situated in what is probably a little river-terrace, and the depth to water is 10 feet.

Clanfield.

Ordnance Map 236 (new series) ; Geological Map 34 (old series).

The wells here are shallow and of about 8 feet in depth in the gravel.

Claydon.

Ordnance Map 201 (new series) ; Geological Map 53 S.W. (old series).

The village stands on a round hill and appears to be built on pebble-gravel containing quartz, quartzite, and other pebbles, and resting on Lower Lias Clay. The village apparently obtains its water by wells from the gravel, and there are ponds in the clay at lower levels.

* Summary of Progress for 1900, *Mem. Geol. Survey*, 1901, p. 120, and quoted by Mr. H. B. Woodward in "The Geology of the Country around Oxford" (*Mem. Geol. Survey*), 1908, p. 79.

Cleeve, *see* Goring.

Clifton Hampden.

Geological Map 254 (new series).

Section communicated by Messrs. Le Grand and Sutcliff.

Water stands at 18 feet below the surface. The drawing of 1 gallon per minute lowers the level to 27 feet from surface.

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
	Top soil	2	0	2	0
	Gravel	3	0	5	0
	Loamy blue clay	4	3	9	3
	Fine gravel, loamy	12	1	21	4
Lower Greensand.	Mixture of clay, sand and stones in bands	8	8	30	0
	Hard rock	3	6	33	6
	Mixture of clay, sand and stones in bands	11	6	45	0
Kimmeridge Clay.	Sandy blue clay...	28	0	73	0

Rockalls Farm.

Boring for Lord Aldenham. Date, 1900.

Made and communicated by Messrs. Le Grand and Sutcliff.

Height above O.D. 180 feet. Yield 720 gallons per hour. Water-level 15 feet 4 inches below surface.

		Thickness. Feet.	Depth. Feet.
	Dug well	16	16
Lower Greensand.	Hard rock	9½	25½
	Hard greensand...	10½	36
	Rock and green sandy clay	12	48
	Coarse greensand	5	53
	Blue clay	½	53½

Browns Well.

Boring for Lord Aldenham. Date, 1900.

Made and communicated by Messrs. Le Grand and Sutcliff.

Height above O.D. 170 feet. Yield 600 gallons per hour. Water-level 6 feet 11 inches below surface.

	Thickness. Feet.	Depth. Feet.
Dug well	14½	14½
Hard rock	13	27½
Hard greensand...	3	30½
Hard rock	1	31½
Greensand and rock in bands	4½	36
Loose greensand	8½	44½

Combe.

Ordnance Map 236 (new series); Geological Map 45 S.W. (old series).

There is a well 22 feet deep outside the Church.

At Paradise Cottages there is a well 16 feet deep, of which 10 feet is stoned. Another on the opposite side of the road further east is rather deeper.

At the buildings north-west of Littleworth Farm a well showed a depth of 30 feet, of which the upper 5 feet was stoned.

Cornwell.

Ordnance Map 218 (new series) ; Geological Map 44 (old series).

A good spring, above the village at about 500 feet O.D., rises below a cliff and works a hydraulic ram within a short distance. The water is probably derived from the Liassic Marlstone, but two faults are shown on the map, crossing the village from W.N.W.

Cottisford.

Ordnance Map 219 (new series) ; Geological Map 45 N.E. (old series).

On the Great Oolite.
Wells said to be good at the Manor Farm and the Rectory.
Most of the cottagers fetch water from a place called the Kennels.

Cowley.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

The well at the Industrial School was made by Mr. CASTLE, of Oxford, City Surveyor.

Depth to pumps 95 feet—12 feet of water. Information from Mr. W. W. FISHER.

[The Corporation has no information about the rocks passed through, but probably the well went from Corallian to Lower Calcareous Grit.]

Cropredy.

Ordnance Map 201 (new series) ; Geological Map, 53 S.W. (old series).

Cropredy is close to the Canal and Cherwell River, and probably derives its water from wells in the Lias Marlstone which is represented in the geological map as faulted down here. There are, however, traces of gravel-terraces hereabouts, and it is possible that gravel may supply some of the wells.

Crowell.

Geological Map 254 (new series).

At cottages at bottom of lane coming down from the hills there are three wells as follows in ascending order :—

(*a*). 10 feet deep—fills up after rain.
(*b*). 18 feet to water—good supply, never varies much in height.
(*c*). 20 feet to water—often rises to 10 feet from surface.

(*a*) and (*c*) probably receive surface-water.

In Lower Chalk and débris.

Crowmarsh Gifford.

Geological Map 254 (new series).

The wells are mostly shallow in gravel at the west end, and in Lower Chalk at the higher part of the village. The water-level averages about 15 feet in depth in summer, but rises nearly to the surface in winter.

The village is also supplied with water by the South Oxfordshire Water and Gas Co.

Cuddesdon.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

At the Theological College a well was sunk by Messrs. MERRYWEATHER. Height above O.D. 340 feet.

	Thickness.		Depth.	
	Ft.	Ins.	Ft.	Ins.
Portland beds	10	6	10	6
Kimmeridge clay	180	0	190	6
Corallian	80	0	270	6

This section is partly drawn up on the statement of the engineer, Mr. Hyde, who says that the last 80 feet was in rock, and according to another statement the Kimmeridge Clay was 180 feet thick.

The water came in at 260 feet and rose to 140 feet from the surface.

Culham.

Ordnance Map 253 (new series) ; Geological Map 13 (old series).

Boring made by Messrs. Isler, 1904, for Culham Diocesan College.

Communicated by Mr. George Winship, Borough Buildings, Abingdon.

Height above O.D. 209. 35 feet.

Rocks classified by Mr. H. B. Woodward.

Water obtained from depth of 184 feet. Water rose to 14 feet from surface. No water obtained below 191 feet. The sand below was "dead sand."

		Thickness.		Depth.	
		Ft.	Ins.	Ft.	Ins.
Valley Gravel, 16 ft. 6 in.	Made ground	14	0	14	0
	Ballast	2	6	16	6
Lower Greensand, 22 ft. 9 in.	Loamy sand...	6	0	22	6
	Red sand	4	0	26	6
	Light sand	10	6	37	0
	Rock...	2	3	39	3
Kimmeridge Clay, 94 feet.	Clay	53	0	92	3
	Blue rock	4	0	96	3
	Clay	37	0	133	3
Corallian, 92 ft. 3 in.	Blue rock	31	3	164	6
	Light grey sand	2	0	166	6
	Rock	6	6	173	0
	Sand...	2	6	175	6
	Rock	8	6	184	0
	Sand	2	0	186	0
	Rock	3	6	189	6
	Sand	1	6	191	0
	Rock	8	0	199	0
	Sand	8	0	207	0
	Rock	6	0	213	0
	Sand	1	0	214	0
	Rock	2	0	216	0
	Sand	9	6	225	6

Curbridge.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

Curbridge is partly supplied by a spring on the Brize Norton Road marked on the Ordnance Map "Well." The spring is carried to Caswell and thence to houses at south-west end of the village. Some other houses have wells.

At Mr. Foreshew's farm in the village is a well, the water in which rises to 3 feet 6 inches above the surface. Height above O.D. about 340 feet. The well is sunk for 23 feet and bored for 40 feet, and passes through grey clay to a hard grey "granite" (limestone).

The above information was given by Mr. Chas. Harris.

Cuxham.

Geological Map 254 (new series).

The wells here are shallow.

At some cottages near Cut Mill Bridge a well is 10 feet deep.

Cuxham lies upon Upper Greensand.

Deddington.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

The wells here are sunk in the Lias Marlstone. Mr. JOSEPH BUSBY, well-sinker, has given the following representative section :—

	Feet.
Rubbly rocky stuff, about	8
Clay	18
Blue rock like clay-stone, followed by blue clay	¾

Ducklington.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

The village stands on low ground formed of gravel overlying Oxford Clay. There are some shallow wells.

Eastend, *see* Chadlington.

Emmer Green.

Geological Map 268 (new series).

1. At Mr. HISHER'S.

Boring made and communicated by Mr. ALFRED CALLAS.

	Feet.
Drift—shifting ballast [gravel]...	9
Chalk with flints	39
	48

2. At Mr. PANMAN'S.

Communicated by Mr. CALLAS.

	Feet.
Drift—gravel	13
Chalk with flints	53
	66

3. ROSEHILL.

Dug and communicated by Mr. S. JOYCE.

Height above O.D. about 306 feet. Water-level 196 feet from surface.

	Feet.
Plateau Gravel	9 ?
Reading Beds	61
Chalk	130
	200

Emmington.

Ordnance Map 237 (new series) ; Geological Map 13 (old series).

Four cottages on the north side of the road, as approached from Chinnor, have a well 15 feet to water and about 9 feet thence to the bottom.

A cottage at the further end of the village has a well 3 feet to water and shallow in depth.

Eynsham.

Ordnance Map 236 (new series) ; Geological Map, Oxford District.

Well for the town-supply. Made by Mr. MORGAN for the Witney Rural District Council. Date, 1902.

Communicated by Mr. GEO. WINSHIP.

Height above O.D. 202 feet. Water-level 197 feet. Yield 4,000 gallons per hour.

	Thickness. Feet.	Depth. Feet.
Top soil and clay	2½	2½
Gravel	12½	15

The water is pumped to a tank and thence distributed to the town.

The yield, as tested by continuous pumping for 14 days and nights, averages 117,829 gallons per diem, with a minimum of 84,891 gallons per diem. The level of the water when test-pumping commenced was 4 feet 6 inches below surface, and when it ceased, 9 feet 3 inches. It remained stationary at the latter point during the last seven days of pumping although upwards of 100,000 gallons of water per day were raised. No alteration of the level of the subsoil water, as the effect of the test pumping, was discernible at five trial-holes on each side of the well and distant from 64 to 130 yards therefrom.

Fawler.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

Well on a farm belonging to the DUKE of MARLBOROUGH.

		Feet.
Lias Marlstone.	Marly white bed	20
	Clay	12
	Ironstone	14–15
	Clay	30
		77

Informant—Mr. J. POOLE, well-sinker, Stonesfield.

Fencot.

Ordnance Map 237 (new series) ; Geological Map 45 S.E. (old series).

Probably on Oxford Clay. Not well supplied with water.

Many of the cottagers get water from a well, 15 feet deep to water, S. of the big pond at S.W. angle of the village street.

There is a well at the farm, but it is supplemented by a field-drain from a pond to the west. (*See* MURCOTE.)

Filkins and Broughton Poggs.

Ordnance Map 235 (new series) ; Geological Map 34 (old series).

There are shallow wells 9 to 12 feet deep throughout the village. Water from limestone is abundant.

Fordwells.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

Strong springs issue at about 385 feet above O.D. in a covered arch south-west of the smithy and at the end of a row of cottages.

These supply a massive sarcophagus-like tank by the road.

An oil-engine near by supplies water to Mr. Yapp's house, Loughbarrow (*See* LEAFIELD) ; and another, further up the Langley Road, to Potters Hill and its homestead.

Forest Hill.

Ordnance Map 237 (new series). Geological Map, Oxford District.

Noted by Mr. H. B. Woodward.

The Manor Farm and Vicarage are said to be entirely on clay. Water is obtained by pipe from the Portland and Shotover beds of Red Hill.

A spring is given out in the road below the Church, at the junction of a downwash of Portland Beds, &c., and the Kimmeridge Clay.

There is a well at north-east corner of Hill House, Shotover Park, about 42 feet deep in Corallian.

Fringford.

Ordnance Map 219 (new series) ; Geological Map 45 N.E. (old series).

A well at the cottages on the Roman Road to Buckingham is 15 feet deep.

Fritwell.

Ordnance Map 218 (new series) ; Geological Map 45 N.E. (old series).

Boring at Inkerman Farm for Mr. Hazell. Made and communicated by Messrs. Cheeld & Co.

The boring went 120 feet through Oolites nearly all clay. The last 60 feet may have been Upper Lias. The yield was only about 18 gallons per hour at a depth of 60 feet.

The site for the boring was selected by a diviner.

Garsington.

Ordnance Map 237 (new series). Geological Map, Oxford District.

The village stands on Portland Beds overlying Kimmeridge Clay and gets water from springs coming out at, or wells dug to, the junction of the two formations.

Exeter College Farm.

	Feet
Well	12

A well near by was made to supply the Small Pox Hospital.

Glympton.

Ordnance Map 218 (new series). Geological Map 45 S.W. (old series).

The village on the east is supplied by a spring in the Park on the south side of the stream. This also waters Glympton Park.

It is probably derived from sandy beds to be seen in the lane coming from the Woodstock Road.

Goring.

Geological Maps 254 and 268 (new series).

Cleeve—South Oxfordshire Water and Gas Co.

The following particulars have been supplied by the Manager of the Company, Mr. L. J. C. Geer.

The well is situated at 187 feet O.D.
Depth of well from ground-level 70 ft. 4 in.
Rest-level 49 feet from surface.
The yield is about 70,000 gallons per diem (12 hours).
Lined for 20 ft. 4 in. with iron pipe.
" 34 ft. 6 in. with bricks.
" 15 ft. 6 in. cut in chalk.

The following places are supplied with water by the Company :—

Benson (Oxon).	Kingwood Common.
Bix.	North Stoke.
Chalk House Green.	Preston Crowmarsh.
Checkendon.	Rose Hill.
Cleeve.	Rotherfield Peppard.
Cold Harbour.	Satwell.
Crays Pond.	Sonning Common.
Crowmarsh Gifford.	Stoke Row.
Exlade Street.	Streatley (Berks).
Goring.	Tokers Green.
Greys Green.	Whitchurch Hill.
Kidmore End.	Woodcote.

The low-level reservoir at Cleeve supplies Goring and Streatley, the high-level reservoir at Woodcote at 600 feet O.D,. to which the water is pumped from the well, supplies the other higher places on the list.

[The well is situated on the Middle Chalk and probably goes down to the Melbourn Rock].

Well-sections communicated by Mr. John Higgs.

Battle Farm.

Height above O.D. 225 feet.

Water-level 80 feet from surface.

	Feet.
Chalky soil	10
Chalk	76
	86

Beech Farm.

Surface over 400 feet above O.D.

Water-level 260 feet from surface.

	Feet.
Loam and flints	12
Chalk	252
	264

Clee Mead House, ¼ mile W. of station.

Surface about 150 feet above O.D.

Water-level 58 feet 6 inches from surface.

	Feet.
Soil	4
Chalk	58
	62

One Hundred yards above the Coffee House.

Water-level 21 feet 6 inches from surface.

	Feet.
Gravel	6
Chalk	20½
	26½

Crays Pond.

Dug in 1886. Water-level at 301 feet.

Surface about 549 feet above O.D.

Rock 3½ feet thick at 300 feet from surface.

	Feet.
Gravel loam and clay	60
Chalk	271
	331

Elvendon Farm.

Surface 306 feet above O.D.

Water at 142 feet 6 inches from surface.

	Feet.
Soil and stones	4
Chalk	142
	146

Fairfield House, ¼ mile N.E. from Station.

Surface 220 feet above O.D.

Water-level 84 feet 6 inches from surface.

	Feet
Chalky soil	9
Chalk	78½
	87½

Cottage above Gatehampton Farm.

Water-level 54 feet from surface.

	Feet
Chalky soil	2
Chalk	54

Goring Farm.

Water-level 30 feet from surface.

	Feet
Gravel	6
Chalk	28
	34

Grove Farm.

Surface about 260 feet above O.D.

Water-level 85 feet from surface.

	Feet
Loam and flints	14
Chalk	76
	90

Harts Lock (? Goring Lock).

Boring by Mr. Callas for — Foster, Esq. Date 1897.

	Feet
Top soil	6
Gravel [Valley Drift]	3½
Hard Chalk without flints [Middle Chalk]	43½
	53

COTTAGES ADJOINING "SLOANE HOTEL."

Surface about 178 feet above O.D.

Water-level 38 feet from surface.

	Feet
Mixed gravel and chalk	27
Chalk	14
	41

THAMES BANK, GORING.

Made by Messrs. ISLER & Co. for F. SHOOLBRED, Esq.

Surface about 146 feet above O.D.

	Thickness. Feet.	Inches.
Gravel	0	3
Subsoil (Chalky nature)	7	0
"Blue clay"	111	9
	119	0

The last is obviously an error and so admitted by Messrs. ISLER.

WARREN FARM, GORING.

Made and communicated by Messrs. ISLER & Co.

	Feet
Dug well	121
Chalk and flints	57
	178

Lined with 4 inch-tube [from ?] 101 feet below surface.

Rest-level 114 feet from surface.

Near house on W. side of railway, a little more than $\frac{3}{8}$ of a mile S.E. of the Church.

Information obtained from the well-sinker on the spot.

Water-level 24 feet 9 inches from the surface.

	Feet
Gravel, mostly flint	12
Sand	5½
Gravelly and chalky sand with small boulders of hard red sandstone	3½
Chalk	8
	29

Grafton.

Ordnance Map 236 (new series); Geological Map 34 (old series).

There are shallow wells on alluvium.

Great Haseley.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

There is a well west of the Infants' School, 30 feet to water, through Shotover Beds into Portland Beds.

I am indebted to Mr. Parsler of this village for the following information :—A well with windmill on the east of the village supplies the Manor House. It is close to a quarry in Portland Rock and is about 60 feet deep. It went through three or four "rocks." A well in a garden at the top of the road entering the village from the north is about 50 feet deep. The rectory has one of 35 feet and another at a lower level of less depth. Mr. Parsler's well, south side of the church, is 14 feet in Portland Sand to water, the rest-level being 6 inches higher in February. Another well a little south of this was dug 24 feet and bored 14 feet further in clay ; the water was condemned. The difference in these two wells is accounted for by the fault running E. and W. which is inserted in the Oxford District Geological Map. The graves in the churchyard are in rubble 6 feet thick, resting on sand.

Great Milton.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

Lies on Portlandian Beds over Kimmeridge Clay. Frequent springs come out at junction of the two.

Mrs. Thomas furnished the following information :—

The Manor House has wells of about 15 feet depth, and a fishpond excavated down to the junction of the two formations mentioned, contains five springs. A cottage to the north of the church has a spring in its cellar.

In the dip between this and the northern part of the village a spring issues, probably also at the same junction.

Mr. Smith, builder, showed me a well just excavated :—

	Feet.
Buff sand	6
Rubble	1
Buff sand	7
Blue limestone rock	2
Sand	7
	23

The limestone contains Portlandian fossils.

A public well at the top of the Village Green was about 30 feet to water.

Mr. H. B. Woodward has given the following note :—

Well on the north side of road ⅓ mile E. of the "Three Pigeons," on the borders of Great Haseley Parish.

	Ft.	Ins.
Gravel	10	6
Blue clay (Gault)		

Great Rollright.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

At the "Unicorn" (W. side of the village) is a well 25 feet deep ; at cottages lower down the road there are wells of 20 feet.

Springs from various levels are used by the inhabitants. One called Sow Well is in good repute, though it comes out at the lowest level in the village, beneath the houses.

These wells appear to be in the Inferior Oolite.

Great Tew, *see* p. 77.

Hanborough.

Ordnance Map 236 (new series) ; Geological Map, Oxford District.

Boring made by Messrs. Merryweather & Sons at the Cottage of Major H. B. Dodgson, D.S.O. Date, 1905.

Rest-level of water 92 feet 6 inches from surface.

	Thickness.		Depth.	
	Ft.	Ins.	Ft.	Ins.
Gravel and water	6	0	6	0
Blue clay	10	0	16	0
Hard ragged rock	2	0	18	0
Loamy sand and water (the old supply) ...	4	0	22	0
Hard blue clay	12	6	34	6
Hard rock	10	3	44	9
Yellow clay	5	3	50	0
Very hard rock	0	1	50	1
Light hard clay	9	6	59	7
Rock	56	5	116	0
Hard blue clay	1	0	117	0
Rock	2	3	119	3
Hard blue clay	1	3	120	6
Rock	2	0	122	6
Black earth and clay	2	6	125	0
Rock	1	9	126	9
Clay and stones	3	0	129	9
Rock	5	3	135	0
Sand, clay and water (the new supply) ...	1	6	136	6
Soft rock	1	0	137	6
Hard rock	1	0	138	6

According to Major Dodgson the previous supply of water from the 22 ft. level was inadequate and undesirable owing to the prevailing system of house-drainage (pits) in the village. The new supply was found by Mr. W. W. Fisher to be of good quality for domestic use.

Hanwell.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

Hanwell is situated on the slope below the plain of the Lias Marlstone.

Wells of 20 to 40 feet exist in this part.

At 55 to 60 feet below the plain a good spring comes out under a farmhouse and supplies a trough-well, horse-trough, and pond.

Hardwick.

Ordnance Map 236 (new series) ; Geological Map 13 (old series).

There are wells in a gravel-terrace close to the River Windrush which average 10 feet in depth.

A public well on the Green which supplies 10 cottages is in or through gravel for 20 feet.

At the Priest's House is a well about 20 feet deep, passing through gravel 2 feet 6 inches, and clay.

Haseley, *see* Great Haseley and Little Haseley.

Henley-on-Thames.

Geological Map 254 (new series).

1. Henley-on-Thames Waterworks. 1872. Park Place. (on Berkshire side of the Thames).

	Feet.
Chalk	495½

2. Henley-on-Thames Waterworks. 1882.

Boring made and communicated by the late Mr. R. B. Paten, with further information from Mr. J. Church.

Shaft 23 feet, the rest bored. Water-level 6 feet 6 inches down. A good supply of water was obtained. The spring cannot be pumped down.

		Feet.
Earth and mould	[Soil, etc., and River Drift]	2
Clay and stones	[Soil, etc., and River Drift]	6
Gravel ...	[Soil, etc., and River Drift]	7
Chalk		225
		240

3. Messrs. Breakspear's Brewery.

Made and communicated by Messrs. Isler & Co.

Shaft 22 feet, the rest bored. Water-level 9 feet 6 inches down. Minimum supply 12,000 gallons per hour.

	Feet.
Made ground and gravel	22
Sand and gravel	4½
Gravel and chalk	4½
Chalk	129
	160

4. Friar Park.

For F. Crisp, Esq.

Made and communicated by Mr. Peck of Henley.

Boring 5-inch tube well. Tubed 20 feet. Water-level 162 feet from surface.

		Feet.
Chalk and flints	[Upper]	158
Rock [Chalk Rock]	[Upper]	8
Chalk [Middle]		84
		250

(From Mr. J. F. Blake's notes.)

5. Greys Court, 2½ miles west by north from Henley.

(From Mr. J. H. Blake's notes.)

	Feet.
Old well, in chalk to Chalk Rock	216

The well as originally made only touched the "rock." Later Mr. J. H. Blake saw men engaged in breaking up the rock and widening the bottom of the well. He was satisfied that the material was precisely similar to that in pits at Henley but more fossiliferous.

Water is drawn up in buckets by means of a large wheel with a donkey inside.

Henton.

Ordnance Map 237 (new series) ; Geological Map 7 (old series).

Two wells at the bottom of the hamlet on opposite sides of the road are about 10 feet deep, probably in Upper Greensand. Cottages on the way from Chinnor to Henton showed a well of 38 feet 6 inches depth, with water standing at 25 feet from surface.

Heyford *see* Upper Heyford and Lower Heyford.

Holton.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

South of Church Farm Moat. Date 1897.

Communicated to Mr. J. H. BLAKE by well-digger. Water-level about 10 feet from surface.

		Thickness. Ft.	In.	Depth. Ft.	In.
Corallian	Brown sandy and loamy soil	2	0	2	0
	Brown sandy oolitic loam with irregular patches and seams of grey clay	3	0	5	0
	Loam as above with more grey clay	2	0	7	0
	Rock band	0	4	7	4
	Brown and grey clay	3	0	10	4
	Hard yellowish white cherty rock called "Pendle" by the well-digger with *Pleuromya*	4	6	14	10
Oxford Clay.	Blue sandy and shaly clay with band of rock 2 feet thick, and large *Gryphæa dilatata* ...	6	0	20	10

The dip of the strata was noted by Mr. BLAKE as apparently N.E.

A well at Holton Cottage, in the dwelling, was said to be 15 feet deep. It was bricked to a depth of 5 feet, and beneath that was said to be excavated in "solid rock"—probably the cherty rock above noted.—H.B.W.

Holwell.

Ordnance Map 235 (new series) : Geological Map 44 (old series).

Holwell village is supplied from a well at the old brickworks. The surface of the well is about 440 feet above O.D., and the depth is about 90 feet. The water stands at 27 feet from the bottom and is raised to tanks by a windmill.

[The quarry and brickpit, in which the well stands, show rusty brash over white clay and freestone. The water probably comes from the Great Oolite.]

Hook Norton.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

The village lies on the Lias, Marlstone Series, which is being worked for iron. Several good springs are used for public supply. These are in the little valley which crosses the village. On the hill there is a well, N.E. of the Church, 36 feet deep, at gardens in Scotland End a well of 30 feet, and further east, at a new house, one 84 feet in depth.

Bored for Mr. GODSON, at a farm, Scotland End.

		Ft.	In.	Ft.	In.
Liassic Marlstone Series.	Sandstone rock	3	6	3	6
	Soft sandstone	3	6	7	0
	Sandstone rock	0	6	7	6
	Hard sand clay	20	6	28	0
	Sandstone rock	1	0	29	0

Tubes in hole 20 feet 6 inches (6 feet below surface).

Hopcrofts Holt *vide* Steeple Aston.

Horley.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

This village is on two distinct levels. The upper part, which contains the Church, Manor House, and Vicarage, has wells which are all 60 or 70 feet deep : the surface here is on the Marlstone plain. The wells in the lower part apparently go down to the same water-bearing bed and are not so deep. Brown slightly micaceous marls are seen at the road-side about 8 feet higher.

Hornton.

Ordnance Map 201 (new series). Geological Map 53 S.W. (old series).

The Marlstone running round the top of the valley gives springs to many houses. The gentler slope of the valley below the escarpment is on clay which however is said to supply water. Wells occur 40 to 50 feet deep which enter some rock below the clay.

Horsepath.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

The following record of a well dug in 1893 in Horsepath Parish, by the Windmill, south-west of Wheatley, was noted by Mr. J. H. BLAKE (1897) :—

		Thickness. Ft.	in.	Depth. Ft	in.
Shotover Sands.	Brown sandy soil	3	0	3	0
	White and iron-stained sand	14	9	17	9
Portland Beds.	Red sand with black pebbles (size of hazel nuts)	1	3	19	0
	Seam of yellow pipe-clay	0	3	19	3
	Nodules of ironstone	0	6	19	9
	Hard white stone	6	0	25	9
	Iron-ore	1	0	26	9
	Greensand (similar to that used for moulding purposes)	10	11	37	8
	Hard grey stone	1	6	39	2
	Greensand with hard concretionary masses of stone 1 ft. by 1½ ft. ...	10	0	49	2
	Hard rock—the upper 4 feet very hard ; the lower part softer, with concretionary masses, very fossiliferous, *Trigonia*, &c. Water ...	6	11	56	1
[Kimmeridge Clay ?]	Reddish-brown clayey loam	2	10	58	11

AT FARM, HORSEPATH.

Noted by Mr. H. B. WOODWARD. No water obtained.

		Feet.	Feet.
	Mainly red sand [downwash of Portland Sand]	18	18
[Kimmeridge Clay.]	Blue loamy plastic or soapy clay	3	21
	Blue loamy clay	19	40

Islip.

Ordnance Map 236 (new series) ; Geological Map, Oxford District.

Islip being on a faulted inlier of Cornbrash and Forest Marble, surrounded by Oxford Clay, and crossed by two or three faults, necessarily has wells of varying depths. A water-tower has lately been erected over a new well in the highest part of the village, S.E. of Railway station, near corner of roads. The section, obtained by Mr. POCOCK, was as follows :—

		Feet
	Soil	1
Cornbrash	Pendle	4
Forest Marble	Blue oolitic limestone with thin clay	28
	Blue clay	10
Great Oolite	Rock	1
		44

Water rose to 11 feet ; it was very hard.

The well at the cottages on the west side of the road entering Islip from Kidlington is 40 feet deep. Informant Mr. Norris, well-sinker, Islip.

Kelmscot.

Ordnance Map, 253 (new series) ; Geological Map 34 (old series).

At Kelmscot there is low wet ground with shallow wells

Kencot.

Ordnance Map 236 (new series); Geological Map 34 (old series).

The wells are all shallow in gravel (?) except at Dr. Pilkington's, north end of village, where there is a boring of 200 feet. The water rises nearly to surface, and is hard but good. Dr. Pilkington reports that, in spite of shallow wells and cesspits, no typhoid exists in the village.

KENCOT HILL FARM, 1 mile N. 30° W. from Kencot.

There is a well, 80 or 90 feet through clay. The rest-level is not known. The elevation is about 340 feet. Informant, Mr. Clapton.

Over Kiddington and Nether Kiddington.

Ordnance Map 218 (new series); Geological Map 45 S.W. (old series).

Kiddington Park and Nether Kiddington, which are on the left bank of the Glyme, are supplied by a spring on that side pumped by a water-wheel driven by the river.

Kiddington Rectory and Over Kiddington, on the right bank, use a spring from that side worked by a ram.

This information was given by Mr. Chamberlain, the estate agent.

The ground is represented on the map as being on the Great Oolite but there are sandy beds in the vicinity.

Kidlington.

Ordnance Map 236 (new series); Geological Map, Oxford District.

About ¼ mile S.W. of the Church.

Boring made by Messrs. C. ISLER & Co. for WELLINGTON TAYLOR, Esq., The Lodge, Thornbury Heath. Date 1897–8.

Grouping by Mr. H. B. WOODWARD.

Mr. W. W. Fisher examined several samples of water from different depths, but found them all too saline for use.

		Thickness. Ft.	ins.	Depth. Ft.	ins.
Alluvial	Dug pit	6	0	6	0
	Clay and gravel	5	0	11	0
Kellaways Clay.	Blue clay	2	0	13	0
Cornbrash	Rock	10	0	23	0
	Clay and fossils		6	23	6
	Rock	2	6	26	0
Forest Marble.	Clay	8	0	34	0
	Layers of clay and rock every 1 foot	5	0	39	0
	Rock	6	0	45	0
	Clay	1	6	46	6
Great Oolite.	Rock	36	6	83	0
	Clay	2	0	85	0
	Rock	3	0	88	0
	Blue Rock	5	6	93	6
	Clay	2	0	95	6
	Blue clay	4	0	99	6
	Stone		6	100	0
	Blue clay	5	0	105	0
	Rock	16	0	121	0
	Rock and clay	4	0	125	0
	Rock	25	0	150	0
	Hard brown clay	2	0	152	0
	Rock	23	0	175	0
	Blue rock	13	0	188	0
	Brown rock	3	0	191	0
	Brown clay and stones	6	0	197	0
	Brown clay	3	0	200	0
	Black clay	12	6	212	6
	Blue clay	14	6	227	0

		Thickness. Ft.	ins.	Depth. Ft.	ins.
Inferior Oolite.	Hard rock...	7	0	234	0
Lias and Rhætic.	Blue clay	18	0	252	0
	Blue clay and rock	9	0	261	0
	Blue clay	4	0	265	0
	Blue clay and rock	16	6	281	6
	Rock	2	6	284	0
	Blue clay	1	0	285	0
	Blue clay and rock	11	0	296	0
	Blue clay	2	0	298	0
	Clay and rock	22	0	320	0
	Rock	1	0	321	0
	Blue clay	2	0	323	0
	Brown rock	4	0	327	0
	Clay rock and clay	12	0	339	0
	Rock	4	0	343	0
	Clay and rock	6	0	349	0
	Rock	4	6	353	6
	Clay	3	6	357	0
	Rock	1	0	358	0
	Clay	11	6	369	6
	Rock		6	370	0
	Clay	9	6	379	6
	Rock	1	0	380	6
	Blue clay	14	6	395	0
	Clay and brown stone	2	0	397	0
	Blue clay	2	0	399	0
	Clay and rock	3	0	402	0
	Rock	28	0	430	0
	Hard black clay	17	0	447	0
	Rock	3	0	450	0
	Clay	1	0	451	0
	Rock	2	0	453	0
	Rock and clay	2	0	455	0
	Rock	8	0	463	0
	Rock and clay	2	6	465	6
	Clay	1	6	467	0

Kidmore End.

Geological Map 268 (new series).

DYSONS WOOD.

Boring by Mr. CALLAS, for — MACKENZIE, Esq. May, 1896.

	Feet.
4 ft. tube well	80

TOKER'S GREEN FARM.

Boring by Mr. CALLAS. April, 1893 64

KIDMORE GRANGE, ROSEHILL.

Boring by Mr. CALLAS. March, 1897.

Water-level 166 feet from surface. Boring 6-in. tube.

	Feet.
Top sand	2
Clay	16
Loam and sand	5
Running sand and water	1
Clay	1
Mottled sand	3
Chalk and flints	244
	272

"Rock" is given as occurring at depths of 248, 268, and 272 feet.

Kingham.

Ordnance Map 218 (new series); Geological Map 44 (old series).

The Green is on a flat above the rest of the village and was formerly dug for gravel (river). The houses round have shallow wells which are not now used for drinking purposes. Public wells occur, one on the south end of the Green which is 4 feet to water; another at the west end is about 18 feet deep. The rest of the village, though slightly lower, is on river-gravel and contains shallow wells. Levels of wells 375 to 405 feet O.D.

Wheeler's Farm, Kingham Hill Estate.

1 mile 1 furlong north 40° west from Churchill Church, near Chipping Norton.

Well made by Mr. Smith. Date, November, 1906.

Height above O.D. about 450 feet. The yield was abundant.

		Thickness. Feet.
	Blue clay, slightly yellow at surface	14
"The Rock Bed" Lias Marlstone.	Red ferruginous rock, blue at centre of blocks, containing a bed of conglomerate with *Serpula* and stem of *Pentacrinus*... ...	10
	A few blocks of above in yellow clay	4
		28

This section shows that the marlstone extends considerably S.E. of the patch shown on the old series one-inch map.

Kingham Hill, near Chipping Norton.

*Section of Shaft-well made and communicated by Mr. W. Taylor, of Hartshill, with headings at 100 feet just under the lowest layer of limestone.

Height above O.D. about 630 feet.

Water-level, 30 feet of water in November, 1885. Yield at the end of a very dry season, September, 1855, only about 1,000 gallons in 24 hours.

		Thickness. Feet.	Depth. Feet.
	Made ground	2	2
Probably Upper Lias on the so-called Transition Bed.	Upper Lias clay	47	49
	Greenish drab clay full of fossils ...	0¾	49¾
	Hard shaly slate-coloured clay	1	50¾
Middle Lias.	Soft red rock	3¼	54
	Hard red rock	4	58
	Very hard crystalline rock	12	70
	Grey loamy sand	9	79
	Soft red rock	15	94
	Clayey sand with cubed masses of limestone 18 to 24 inches, reddish brown outside, blue within ...	12	106
	Reddish-drab sandy clay, changing to blue at the base...	9	115
? Lower Lias	Blue clay	5	120

This last may be Middle Lias as the lower part of the zone of *A. margaritatus* is blue clay.

* This section was first published in Jurassic Rocks of Britain, vol. iii.. Lias of England and Wales (*Mem. Geol. Survey*), 1893, p. 221, by H. B. Woodward. Some changes in the version there given have been made on Mr. Woodward's authority.

Kingsey.

Ordnance Map 237 (new series) ; Geological Map 13 (old series).

The village appears to be on Gault and Greensand. A well at New Farm at the north end (Mr. Herbert Lanchbury) supplies most of the village with drinking water. It is 26 feet 6 inches deep through Gault to a rock (Greensand ?). A well at the blacksmith's is said to be a yard deeper. The supply for Thame lies half-way between Kingsey and Thame, in Portland beds.

Kirtlington.

Ordnance Map 218 (new series) ; Geological Map 45 S.W. (old series).

BOREHOLE AT MANOR FARM.

Made and communicated by Messrs. CHEELD & Co. Date, 1907.

Yield—pumped continuously for seven days and nights, 2,000 and sometimes 3,000 gallons per hour to get pump "on blast."

	Thickness.		Depth.	
	Ft.	Ins.	Ft.	Ins.
Old dug-well, all steined, no particulars ...	87	6	87	6
Blacksand	16	0	103	6
Rock	1	8	105	2
Sand	5	0	110	2
Rock	2	1	112	3
Sand	0	2	112	5
Rock	7	4	119	9
Clay	39	4	159	1
Rock	0	6	159	7
Clay	2	6	162	1
Rock	0	5	162	6
Clay	5	6	168	0

The water was analysed by Mr. W. W. Fisher, of Oxford, and proved excellent.

BOREHOLE AT KIRTLINGTON PARK.

Made and communicated by Messrs. CHEELD & Co. Date, 1909.

Boring 5 inches diam. Depth 143½ feet.

At 130 feet depth the yield was 270 gallons per hour. At 135 to 142½ feet depth "dark sand" [Estuarine Beds] was penetrated, and the yield was increased to 2,000 gallons per hour, the rest-level of the water being 27½ feet from surface.

This sand, according to Messrs. Cheeld & Co., was the same bed as that found by them under Great Oolite at Slade Farm (*see* under Bicester), at Stratton Audley Hall (Stratton Audley) and at Arncot.

The water was found by Mr. Fisher to be of good quality for drinking.

A well at Kirtlington. Informant, Mr. J. Poole, well-sinker, Stonesfield.

	Feet.
Gravel, about	6
Clay [Oxford Clay] to	30

Langford.

Ordnance Map 236 (new series) ; Geological Map 34 (old series).

Langford was formerly supplied by surface-wells in river-gravel. It is now supplied from a boring made by the Diamond Rock Boring Co. for the Ecclesiastical Commissioners at Langford Rectory Farm, near the church. The section, according to information supplied by Mr. Reading, was as follows :—

	Feet.
Clay	60
Rock	30
Very hard clay	34
	124

The water rose 27 feet above the surface, and contains iron.

Langley.

Ordnance Map 236 (new series); Geological Map 45 S.W. (old series).

Pump to shallow well at Langley—508 feet above O.D.; not a permanent spring. Springs rise in wood to the Langley "Palace." A spring rises in copse to the N.N.E. and supplies a pond about 600 feet O.D.

Launton.

Ordnance Map 219 (new series); Geological Map 45 S.E. (old series).

Boring communicated by Mr. Jones, of Winchester, to the late Mr. J. H. Blake.

Tubed to 44 feet. Yield—a feeble supply which rose to the surface.

	Thickness.		Depth.	
	Ft.	Ins.	Ft.	Ins.
Clay	28	0	28	0
Rock	11	2	39	2
Clay	2	0	41	2
Rock	4	0	45	2
Clay	1	0	46	2
Rock	3	1	49	3
Clay	1	0	50	3
Rock	2	8	52	11
Green clay (a feeble supply of water which rose to the surface)	1	3	54	2
Rock	8	2	62	4
Clay	0	6	62	10
Rock and sand	30	0	92	10
Clay	7	7	100	5
Rock	3	1	103	6
Sand	1	9	105	3
Green clay	2	8	107	11
Rock	12	10½	120	9½

Left off in "Rock" with no increased supply of water, September, 1884.

From information received from Mr. H. Heath, Marsh Gibbon, I have reason to believe that the boring was made by Mr. Ansell, and another of 80 to 100 feet was made by Mr. Amos Gregory with no better success. These were both at or near Launton on the N. side of the Islip anticline.

Leafield.

Ordnance Map 236 (new series); Geological Map 45 S.W. (old series).

Loughborough House (Mr. Yapps), 1898?

Made and communicated by Messrs. Isler & Co.

Lined with 40 feet of tube of 6-inch diameter from 2 feet above the surface. Water-level 140 feet in the bore. Supply, 440 gallons per hour.

	Thickness. Feet.	Depth. Feet.
Well sunk in clay	38	38
Boring:		
Rock	1	39
Rock and clay	3	42
Rock	2	44
Rock and clay	4	48
Rock	6½	54½
Rock and clay...	3½	58
Rock	24	82
Rock and clay...	10	92
Rock	79	171
Rock and clay	6	177
Clay	13	190

Ledwell.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

There is a public spring fenced round in the centre of a small green. A well at the east end of the village was 17 feet to water.

Leigh, *see* North Leigh.

Lewknor.

Geological Map 254 (new series).

Good springs come out on the N.W. side of the main road (? from Totternhoe Beds), and are used for watercress beds. A well at the N.E. end of the village showed a depth of about 35 feet to water.

Little Haseley.

Ordnance Map 237 (new series); Geological Map, Oxford District..

Well at cottage by belt of trees west of village. Noted by Mr. H. B. WOODWARD.

		Feet.
Shotover Beds.	Whitish clay	8
	Sand with water	

In this village the wells are about 12 feet to water. Informant, Mr. Parsler, Great Haseley.

At Upper Standhill, near this village, is a well dug to 40 feet in clay, with a boring of 3 feet in rock, Bluestone Shale. Water came in abundantly from below the latter and rose to within 8 feet of the surface.

Another well at Lower Standhill, on lower ground, gave the same section and results, except that the clay was only 15 feet thick.

Informant, Messrs. Howland and Brothers, Thame, the sinkers of the wells.

Little Rollright.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

This hamlet is fed by springs apparently from the Lias Marlstone. On the ridge of Great and Inferior Oolite to the north where there are cross-roads, the well at the cottage is 72 feet deep.

Little Tew, *see* p. 78.

Lower Heyford.

Ordnance Map 218 (new series); Geological Map 45 S.W. (old series).

LOWER HEYFORD is supplied by pipes from a spring four fields along the road from Upper Heyford. Clay is seen in the streets.

The wells in the upper part of the village are, probably, sunk in sands.

Lyneham.

Ordnance Map 218 (new series); Geological Map 44 (old series).

This small hamlet has a supply from a spring in gravel, quarter of a mile along the road to the N.W.

Mapledurham.

Geological Map 268 (new series).

1. Well at Chazey Farm, near "The Fisheries."

Communicated by Mr. S. Joyce.

Water 4 feet from surface.

	Feet
Peat	1½
Gravel	9½
	11

2. Parish Well on the Green, near "The Pack Horse."

Dug and communicated by Mr. S. Joyce.

	Feet.
Gravel and Reading Beds	40 to 50
Chalk with flints...	125
	175

March Baldon.

Geological Map 254 (new series).

Well and Boring at Baldon House for Sir John Willoughby, 1882–3.

Made and communicated to Mr. J. H. Blake by Edward Margrett (of Reading).

Brick shaft, 38 feet ; iron cylinders, 12 feet ; the rest bored.
Water level, 36 feet below surface.

			Thickness. Feet.	Depth. Feet.
Lower Greensand? and Portland Beds, 35 ft.	Yellow clay and sand	about	35	35
Kimmeridge Clay, 111 ft.	Blue clay [dark grey colour] ...	„	90	125
	Rock		1	126
	Blue clay [grey]...		20	146
Corallian	Rock with veins of clay...		20	166
	Rock with quartzose sand [numerous shell fragments in sand]		15	181
	Fine white sand		14	195
	Rock		1	196

The following fossils were identified by Mr. E. T. Newton :—From depth of 40 feet : *Ammonites plicatilis*, *A.* near to *eupalus*, *Protocardium striatulum*, *Serpula*, *Exogyra*. From a depth of 180 feet : *Pecten fibrosus*, *Exogyra nana*, *Glyphæa*, *Fish vertebra*.

The water was analysed by Mr. W. W. Fisher, *Analyst*, 1904.

Merton.

Ordnance Map 237 (new series) ; Geological Map 45 S.E. (old series).

A well at south-west end of village is sunk through brash to rock or staining, water running abundantly from south-east side. Wells are shallower at north-east end of village. These wells are on the anticline of Cornbrash, which rises up in the Oxford Clay plain.

Milcomb.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

1½ miles S.W. from Bloxham.

Draw-wells about 20 feet in rock (Lias), the upper part steined.

On left side of the road from here to Wigginton Heath is a spring at about 560 feet O.D., and others from the corresponding bed on opposite side of the Combe on the right.

Milton, *see* Great Milton.

Mixbury.

Ordnance Map 219 (new series) ; Geological Map 45 N.E. (old series).

About ½ mile N.W. of Church, on road to Evenley.

Boring made by Messrs. THOMAS DOCWRA & SON. Date, 1906.

Communicated by Messrs. HARRINGTON & LEY, 65, Bishopsgate Street Without, E.C., to Mr. Whitaker.

		Thickness. Ft.	In.	Depth. Ft.	In.
	Shaft. [through Drift and Great Oolite]	34	7	34	7
? base of Great Oolite and Estuarine Beds.	Hard rock	3	10	38	5
	Blue clay	1	6	39	11
Northampton Beds.	Hard rock	5	0	44	11
Upper Lias	Dark clay	14	1	59	0
	Clay stone	1	0	60	0
	Dark clay	54	0	114	0
	Clay stone	0	6	114	6
	Dark clay (given in the original as 33 ft. 6 in.)	[37	6]	152	0
	Clay stone	1	0	153	0
	Dark clay	6	0	159	0
	Stone	0	9	159	9
	Dark clay	1	3	161	0
	Rock*	3	6	164	6
	Dark clay	14	6	179	0
Middle Lias	Rock	3	9	182	9
	Blue clay	22	9	205	6
	Rock	1	0	206	6
	Blue clay	8	6	215	0

Mixbury has two public wells :—One at Banbury Road end is 18 feet and another near the angle of the road is 22 feet deep.

Other private wells exist. All are in Oolites.

Mollington.

Ordnance Map 201 (new series) ; Geological Map 53 S.W. (old series).

Mollington is built along the scarp of the base of the Lias Marlstone at about the 500-feet contour. The clays below throw out springs which have been utilized for the supply of the village.

Moreton.

Ordnance Map 237 (new series) ; Geological Map 13 (old series).

There is a public well with water at 20 feet depth. It is probably sunk through Gault to Lower Greensand or Shotover Sands.

Murcote.

Ordnance Map 237 (new series) ; Geological Map 45 S.E. (old series.)

This village has a much more abundant supply than Fencote, half-a-mile away, and apparently on the same flat. Wells are numerous and water is plentiful. From the information of an old drainer it appears likely that this village lies on some kind of alluvial deposit, for the subsoil was described as black loam over sand.

* This rock might belong to the Middle Lias (Marlstone), but it more probably represents the limestone-beds in the lower part of the Upper Lias. H. B. Woodward.

Nether Kiddington. *See* p. 54.

Nettlebed.

Geological Map 254 (new series).

1. Soundess Farm.

578 feet above O.D.

Well. Noted by Mr. J. H. Blake.

Clay-with-flints	360 feet.
Chalk	

2. Brick and Tile Works, N.W. of Windmill Hill.

Well. Noted by Mr. J. H. Blake.

Reading beds...	20 feet.
Chalk	

3. Well at Gold's Farm.

Communicated by Mr. S. Joyce.

Well ... ... 405 feet.

Water 345 feet from surface.

Newington.

Geological Map 254 (new series).

Mr. J. H. Blake noted in 1899 that a well and boring were made about the year 1893 through the Gault into Lower Greensand in which water was found, but too salt for use. Saline water was found also at the Brewery boring at Shillingford, about 2½ miles to the south. At a farm about a quarter of a mile north of the above boring, a well was dug more than 80 years ago, to a depth of 88½ feet; a boring is said to have been carried down to a depth of 160 feet, and to have lowered the water in the old well by about 15 feet, since when the water, which here also is salt, has remained at about the same level. This well has evidently been dug through the Gault into the Lower Greensand, and gives the thickness of the Gault in this locality.

North Leigh.

Ordnance Map 236 (new series); Geological Map, Oxford District.

1. Well near the bottom of village :—

	Feet.
Good walling stone	16
Good limestone, 2 beds { [Cornbrash?]	5
{ [Forest Marble]	3½
Clay	2
	26½

2. Well sunk at top end of village :—

Fine blue clay [Oxford Clay] 20

No water was obtained.

Informant, Mr. J. Poole, Stonesfield.

Northmoor.

Ordnance Map 236 (new series); Geological Map, Oxford District.

There are wells in gravel 8 to 10 feet deep.

Informant, Mr. Cadman.

North Newington.

Ordnance Map 201 (new series) ; Geological Map 45 (old series).

The depths of the wells in this village vary, and the facts lead one to suppose either faulting or supply from two distinct water-bearing beds of Marlstone. The wells vary from "stick wells" to the west, to one of 70 feet deep further to the east.

Information from Mr. F. HARRIS, Well-sinker and Builder, North Newington.

North Stoke.

Geological Map 254 (new series).

The village is adjacent to the river and the wells are stick-wells, about 7 feet deep, deriving their water from alluvium or gravel.

Nuffield.

Geological Map 254 (new series).

Hunter Combe, Nuffield Common. At the Golf Clubhouse is a deep boring.

Oakley.

Ordnance Map 237 (new series) ; Geological Map 13 (old series).

A well in an orchard has been sunk about 28 feet in Lower Chalk ; another shows a depth of about 20 feet to water, but no spring.

Oddington.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

A well, at corner of road behind some houses, is 12 feet to water. On the Lower Green, a few yards off, another well is 6 feet to water ; the latter is at a lower level ; both in Cornbrash.

ODDINGTON GRANGE FARM, 1 mile N.N.W. from Oddington.

Boring made by Messrs. MAYNE & SONS, Stewkley. Communicated by H. P. JONES, Esq., Land Agent, Winchester.

Shaft dug 35 feet in clay, then bored 32 feet in rock	} [Oxford Clay and Cornbrash.]

Water at 2 feet and 32 feet.

The water resembles others from the inliers of Cornbrash, &c., on Otmoor.

Authority : Notes of Mr. W. W. Fisher, F.I.C., County Analyst.

Over Kiddington. *See* p. 54.

Over Norton.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

There are wells in the village about 30 feet deep in Inferior Oolite (?) A public supply of water is obtained from springs in the park on lower ground (? Marlstone), which is pumped up above the school and thence distributed.

At the northern end of the village there is a well said to be 10 feet deep.

Over Norton House is supplied from a well 32 feet deep at Keeper's house, near the upper entrance to the park. It is pumped by a horse-gin.

Oxford.

Ordnance Map 236 (new series) ; Geological Map, Oxford District.

The following notes are by Mr. H. B. Woodward:—

The mineral water at St. Clement's, Oxford, was found in sinking an Artesian well in 1832. The well was carried through 265 feet of Oxford Clay, and to a further depth of 155 feet in rock (Lower Oolites, &c.).

Buckland remarked that when the bore-hole was first made, the water rose 3 or 4 feet above the surface in a considerable volume.* It was found on subsequent analysis to yield (per gallon) 748 grains of chloride of sodium, 357 grains of sulphate of soda, 135 of sulphate of lime, together with small quantities of chloride of magnesium and carbonate of lime, bringing the total to 1,277 grains per gallon. This water rose when the clay was passed through, from a depth of 280 feet; afterwards, when the boring was carried lower, the water was not so strongly charged with sulphuric salts.† This last fact is important.

In reference to this saline water, Prof. Prestwich has expressed the opinion that it "has its origin in the New Red Sandstone, and not in the Oolitic or Liassic Strata, as would otherwise, from the depth of the boring, be the natural inference. If the water were from the Oolitic strata we should expect to find it much purer, and its solid matter to consist chiefly of carbonate of lime; if from the Marlstone or Lias, to be more ferruginous and calcareous."‡

"*Petrifying Springs*" have been noted in a few places at St. Clement's, and at Carfax (pump) Oxford, (Valley Gravel); at Headington, near Oxford (Corallian Beds), and north of Holton Wood, near Holton (Corallian Beds).

Prestwich, in 1876, pointed out that "it is to be regretted, that, instead of a site below Oxford,—where such portion of the water which filters from the river into the reservoir may be more or less liable to contamination by any effluent refuse from the city,—a similar site above Oxford, and at a distance from habitations, had not been originally selected."

He suggested that a better supply might be obtained from "the water in the gravel beneath the alluvial deposits of the Isis, taken above Oxford, as for example, between the Seven Bridges Road and Port Meadow. This source has the advantage of proximity and quantity. It should, however, be protected from the floods by an embankment, and so placed as not to allow of the erection of houses near it."§

At the City (Hanley's) Brewery the supply of water was obtained (1898) from the gravel by means of five 3-inch Abyssinian tube wells 19 feet deep, coupled together—the united yield being 6,000 gallons per hour.

Oxford City Water Works.

For the following account of the Oxford City Waterworks, in 1907, we are indebted to Mr. W. H. White, M.Inst.C.E.:—

"The water is mainly taken from the river (Isis) at a point above King's Weir some four miles above Oxford, and flows thence by a 24-inch cast-iron main to the pumping station at Hinksey. There the water is delivered by gravitation on to the filter beds. The discharging capacity of the main at that level is about 2,000,000 gallons per day.

There is also a branch to the lake, into which it would be possible, if the need should ever arise, to deliver from 3 to 3½ million gallons of river-water.

The lake has a surface area of about 12½ acres, and contains approximately 25,000,000 gallons of water, which filters through the valley gravel bed, and is therefore very clear.

When the river-water is discoloured after floods the supply is taken from the lake, the water being pumped thence on to the filter beds for further filtration.

The filter-beds are five in number, one having been added in 1905. They each have an area of about 970 superficial yards. Four are usually worked together while the sand in the fifth is being washed.

There are two covered tanks (one added in 1905) which together contain something over 600,000 gallons of filtered water. When these and four filter-beds have filled up during the night, over 1,000,000 gallons are stored ready for the commencement of the pumping in the morning.

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* Buckland, *Proc. Geol. Soc.*, 1835, p. 204; Prestwich, 'Geological Conditions affecting the Water Supply to Houses and Towns,' Oxford, 1876, p. 29; *Geol. Mag.*, 1876, p. 237. *See* also notes attached to Geological Map of the Environs of Oxford, by Andrew D. Stacpoole, 1848.

† Daubeny, *Trans. Geol. Soc.*, ser. 2, vol. 5, p. 263.

‡ Prestwich, *Ashmolean Soc.*, 1876. Analysis by W. F. Donkin.

§ 'On the Geological Conditions affecting the Water Supply to Houses and Towns, with special reference to the modes of supplying Oxford.' 8vo., Oxford, 1876, pp. 3, 36.

The filter-beds and tanks are so arranged as to be capable of being in use altogether, or in any desired combination.

The pumping power consists of a pair of low lift 16 h.p. horizontal engines for lifting water from the lake to the filter-beds; a Worthington engine of 125 h.p.; and a compound horizontal engine of about 120 h.p. With either of the two last-named, 2,000 gallons or more per minute can be easily pumped into the city mains. There is also a 60 h.p. beam engine, which however is now never used.

From the pumping station two mains supply the city, respectively 18 inches and 16 inches in diameter, the first-named going through to a covered storage reservoir on Headington Hill, holding 1¼ million gallons.

During the day the various branch-mains take off most of the water as it is pumped, the surplus passing on into the reservoir before mentioned, which becomes full by evening, and affords the supply during the night.

The pressure in the main in the centre of the city is about 120 feet.

Most of the neighbouring villages are now supplied with water by the Corporation, and four or five years back, in order to supply Headington, it became necessary to pump a portion of the water to a further height. A small covered reservoir was therefore built on Shotover Hill, into which water is pumped from the Headington Hill Reservoir by a pair of gas-engines placed alongside it.

There is telephonic communication between the different stations I have mentioned, so that the quantity of water in store can be ascertained at any time.

At present the water consumption averages about 1,600,000 gallons per day. The number of consumers including both the city and the surrounding villages is estimated at 56,000. Thus the average daily supply per head, including the water supplied for public and trade purposes, would be about 28 gallons."

City Brewery. Messrs. Hanley & Co., 1898.

Boring made and communicated by Messrs. Le Grand and Sutcliff.

Description in square brackets by J. H. Blake, from examination of the cores at the time of the boring, with additions by H. B. Woodward from specimens brought to the Museum at Jermyn Street by Messrs. Le Grand and Sutcliff.

Surface of the ground about 209 feet above Ordnance Datum.

Water obtained from depth of about 400 feet overflowed, but proved to be highly saline.

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
[Valley Gravel, &c., 30 feet.]	Top soil [made ground, gravel, &c.] ...	7	6	7	6
	Sand and gravel [derived mostly from Oolites]	5	6	13	0
	Gravel, coarse at 21 feet [derived mostly from Oolites] ...	11	6	24	6
	Yellow clay and stones [gravel and clay]	5	6	30	0
[Oxford Clay, 210 feet.]	Blue clay	125	6	155	6
	Clay and shells, *Pteria*	1	6	157	0
	Blue clay, *Pecten*	3	0	160	0
	Blue clay and shells	18	0	178	0
	Blue clay	31	0	209	0
	Blue clay and shells	7	0	216	0
	Shelly rock	1	6	217	6
	Sandy clay, shells and mundic (pyrites), also lignite ...	5	0	222	6
	Shelly rock	2	0	224	6
	Hard clay and shells	7	0	231	6
	Hard clay, shells and mundic	6	6	238	0
	Sandy clay	1	0	239	0
	Ditto *Gryphæa dilatata* and iron pyrites	1	0	240	0
[Cornbrash, 17 feet.]	Hard shelly rock [dark bluish-grey limestone, at 241 feet] ...	17	0	257	0

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
[Forest Marble, 32¾ feet.]	Hard clay and shells	12	0	269	0
	Hard shelly rock [thin bands of dark grey oolitic shelly stone, with white grains, Echinoderm spine (*Acrosalenia*?) and sandy clay at 272 feet]	19	0	288	0
	Hard rock and bands of clay [sandy]	1	8	289	8
[Great Oolite, 88 feet.]	Hard shelly rock [grey and whitish oolitic stone at 300 feet] ...	29	0	318	8
	Bands of rock and clay with shells [sandy limestone at 327 and 332 feet, micaceous, whitish and greenish-grey]	39	4	358	0
	Rock	6	0	364	0
	Bands of rock and clay	1	6	365	6
	Rock	1	7	367	1
	Bands of rock and clay	6	1	373	2
	Hard rock [light grey oolitic limestone, freestone at 375 feet]	4	6	377	8
[Upper Estuarine Series, 28½ feet.	Bands of rock and clay [grey and black carbonaceous clay, silt or black mud, and a few thin beds of marl and rock, with shells, iron pyrites, "beef," black wood and other vegetable matter]	28	6	406	2
	[Sandy marl, greenish at 378 feet.				
	Thin bed of grey clay (fuller's earth), at 379 feet.				
	Sandy marl, greenish, at 380 feet				
	Thin bed of dark grey oolitic shelly rock and greenish and grey sandy marl at 382 feet.				
	Blackish-grey clay, slightly sandy, with shells, iron pyrites, and thin irregular bands of "beef" at 386 feet.				
	Black silty clay with shells and iron pyrites, at 390 feet.				
	Small bivalve shells, pyritous, in black clay, with many pellets or little spherical grey stones, the size of large shot, at 395 feet.				
	Black shelly clay and marl: very thin seams of brown and whitish sand, and black laminated carbonaceous shale with lignite at 396 feet.				
	Black sandy shale with concretions and wood (?piece of branch) and other vegetable matter, and iron pyrites at 398 feet.				
	Small irregular-shaped fragments and nodules of light mottled pinkish and grey hard limestone in black clay, with seams of brown sand, at 402 and 404 feet.				
	Black papery carbonaceous shale, very friable, seemingly composed of strap-like leaves, longitudinally striated, and iron-pyrites at 404½ feet.				
	Hard blackish-grey oolitic stone 4 inches thick, at 405 feet.				
	Black shaly clay and marl at 405½ feet.]				

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
[Inferior Oolite, 16¼ feet.]	Hard rock, [hard blackish-grey coarse oolitic shelly limestone, presenting a vesicular appearance, and containing lignite, at 406 feet 2 inches; passing down into light and dark grey ragged and coarse oolitic limestone-rock, with yellow, buff, and brown oolitic grains, and very shelly throughout, to 419 feet (12 feet 10 inches in thickness); the above merging in a very irregular manner into intensely hard dark-grey shelly compact limestone, almost entirely devoid of oolitic structure, 3 feet 6 inches in thickness] ...	16	4	422	6
[Lower Lias, 17 feet.]	Blue clay. [Bluish-grey and light grey micaceous clays and marl, with shells in places.... ...	17	0	439	6

Piddington.

Ordnance Map 237 (new series); Geological Map 45 S.E. (old series).

There is a piped supply from a spring out of sands on side of Muswell Hill.

Pomfret Castle. *See* Swerford.

Pyrton.

Geological Map, 254 (new series).

About 160 yards N.W. of Church.

Noted by Mr. A. J. Jukes-Browne.

Marl [Lower Chalk]	25 Feet.
Green sand [Upper Greensand]	

Rotherfield Peppard.

Geological Map 254 (new series).

The following was commenced by Messrs. Cooper & Howell, and completed by Messrs. Isler & Co.

Information communicated by Mr. W. Rowland Howell, A.R.I.B.A. Reading.

Top of well is about 372 feet above O.D.

Dug well :—	Feet.
Top-soil and loam	6
Chalk to 'rock'—small quantity of water	226
5¾ inches boring. (Water rose into the well)	80
	312

A test gave 1,800 gallons per hour. Rest-level of water varies from 220 to 226 feet below surface.

Rycote Tower. *See* Albury.

Salford.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

Salford is supplied by tanks and pipes from springs up the valley to the west of the Church.

Sandford-on-Thames.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

King's Arms (Messrs Simmonds).

Made and communicated by Messrs. Callas to Mr. J. H. Blake.
Shaft 16 feet. Rest bored. Date 1900.

		Thickness. Feet.	Depth Feet.
Valley gravel &c.	Made ground	6	6
	Dark blackish-grey clay	3	9
	Dark gravel	9	18
Corallian	Grey clay	2	20
	Rock	1½	21½
	Bluish-grey sandy loam	12½	34
	Sandstone	1	35
	Blue sandy loam	21	56
	Sandstone	1½	57½
Oxford Clay	Blue clay	15½	73

There is the following variation for the first 20 feet in a copy furnished to the Geological Survey Office :—

	Feet.
Made ground	7
Gravel	9
Bluish grey sandy loam	4

For the remainder the two versions are in agreement.

A trial-hole on the Sewage Farm about a mile east of Sandford, showed the following section[1] :—

		Ft.	In.
	Soil	2	6
[Kimmeridge Clay].	Clay	1	6
	"Oyster" Bed	1	0
[Upper Corallian].	Brown earth	1	0
	Black earth	1	2
	Marl, rubble	1	2
	Hard blue stone	1	0
	Marly clay	0	9
	Blue stone	0	6
	Marly clay	5	0

Sandford St. Martin.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

Well at the pits with pump supplies a few cottages at the north-east end of the village. The water then runs into a large tank which supplies the Park and a few houses. Another spring further east is used for Coles Farm.

A medicinal spring formerly existed in the fields to the N.E. of the Church, and was much used, but later it was enclosed in a drain by the farmer and turned into a stream.

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[1] No. 3, Fig. 7, in paper by E. S. Cobbold, *Quart. Journ. Geol. Soc.*, vol. xxxvi., 1880, p. 319. See also Prestwich, *ibid.*, p. 431 ; H. B. Woodward, *ibid.*, vol. xlii., 1886, p. 307.

Sarsden.

Ordnance Map 218 (new series) ; Geological Map 45 S.W. (old series).

The estate lies on Great, and Inferior Oolite and on Upper, Middle, and Lower Lias.

The following information is from Mr. Jas. McClay Blair, agent to Lord Ducie.

Barter's Hill Farm well at 618 O.D., depth 90 feet.

Pudlicote Lane below, has springs at 400 feet O.D.

N.E. of Barter's Hill, at Partridge Court, a spring issues at 500 feet O.D., and is carried round to two farms near Millend, Chadlington.

At the head of Sarsden is a spring at 600 feet O.D., which is pumped and supplies all down the valley. The Conduit Farm supplies Sarsden Fountain.

Sarsden House gets its supply from a spring at 500 feet O.D.

At Boulter's Barn is a well 28 feet deep.

Sarsden Lodge.

A large farm, 1½ mile S.W. from Sarsden, derives its water from a field E. of the road by field-drains. The surface-layer is a pebble-gravel containing many pebbles of quartzite and quartz, and lying at an elevation of over 400 feet.

A farm-road from the buildings to the S.W. leads to a pit at the side of the railway in yellow river gravel and sand, chiefly oolitic, but also containing flints and a few quartzite pebbles.

Shenington.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

Shenington was formerly supplied by wells in the Lias Marlstone.

Water is now pumped by windmill from springs at the base of that rock in a dingle ⅓ of a mile W.S.W. of the village to tanks adjoining a road to the N.E. of the springs and thence distributed by pipes. This was done by Oriel College, the principal landowner. The water-supply of Alkerton on the other side of the valley is more scanty although on the same rock [probably owing to the dip of the strata]. A similar contrast occurs between Wroxton and Drayton, Wroxton in this case also being to the west of Drayton and having the more abundant supply.

Alkerton Hill Farm has a well 95 feet deep.

Shillingford.

Geological Map 254 (new series).

Made and communicated by Messrs. Isler & Co. Date, 1885.*

		Thickness. Ft.	in.	Depth. Ft.	in.
	Soil, &c.	4	0	4	0
	Sand and gravel	15	0	19	0
Gault	... ...	144	0	163	0
Lower Greensand.	... ...	25	0	188	0
Kimmeridge Clay, 111 ft. 6 in.	Stiff grey clay and stones (*Septaria?*)	20	0	208	0
	Black clay, with shells and stones, and phosphatic nodules at 296 feet ...	91	6	299	6
Upper Corallian, 44 ft. 6 in.	Rock	12	9	312	3
	Stony clay and shells (yellow gritty loam)	5	8	317	11
	Rock, with some layers of clay ...	9	11	327	10
	Stony clay, with layers of rock ...	8	10	336	8
	Rock with shell-fragments (*Ostrea*) ...	7	7	344	3
Lower Corallian 35 ft. 3 in.	Sand and stone	7	4	351	7
	Alternations of hard grey rock and clay	10	4	361	11
	Dark gritty clay and shells	10	1	372	0
	Hard grey limestone	2	6	374	6
	Sand and stone, with water	5	0	379	6
Oxford Clay	Blue clay, soft and slightly mottled ...	4	6	384	0

* From a note by Mr. Jukes-Browne quoted in the Jurassic Rocks of Britain (*Mem. Geol. Surv.*), Vol. v., p. 127, 1895.

"The water obtained at the base of the Corallian rose to within 60 feet of the surface, and, although palatable it did not yield a sufficient supply. Curiously enough that obtained from the Lower Greensand above was saline, containing [of solids] 98 grains per gallon, 54 of which were chloride of sodium." For salt water, *see* also Warborough and Newington.

Boring at Shillingford Hill. Date, May, 1895.

By Mr. CALLAS, for F. SWEETLAND, Esq.

	Feet.
Chalk rubble	65
Upper Greensand	2
Gault Clay	85
	152

Tubed to 150 feet with 5-inch tube.

Shirburn.

Geological Map 254 (new series).

The Castle is surrounded by a wide moat, which is probably fed by springs. A well near the bottom of Benham Road is 17 feet deep, being 10 feet to water level. There are three wells higher up the road. One well, at the north-east end of the village, is 24 feet to water. These are all in the Lower Chalk.

MODEL FARM, north of Shirburn Castle.

Well noted by Mr. A. J. Jukes-Browne.

		Feet.
[Upper Greensand.]	Gravel	60
	Greensand	
	Malmstone	

North of Shirburn Lodge, on the top of the Chalk Escarpment.

797 feet above O.D.

Noted by Mr. J. H. Blake.

Well dug in 1862.

	Feet.
Chalk	396

From 15 to 18 feet of water. Never alters much in level, and never fails.

Shotover.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

SHOTOVER HILL COTTAGE, New Well.

According to Mr. Cruikshank, Bailiff to the late Col. Miller, the water-level practically the same as that of the other wells in Headington Quarry.

Shutford.

Ordnance Map 201 (new series) ; Geological Map 45 N.W. (old series).

The wells here are in the Lias Marlstone. Those on the east side of the village, 35 to 45 feet lower down ; on the west side, they are about 40 feet deep. Informant, Mr. Harris, Well Sinker, Shutford.

Sibford Ferris.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

Sibford Ferris is built on the junction of the Northampton Sands with the underlying Upper Lias Clay. Several fine springs are visible in the south side

of the main street. One rises in a farmyard at the back of the houses, and though fenced round from the approach of cattle, is evidently polluted. This enters a dipping-well in the road, and also supplies the swimming-bath at the Friends' School.

Sibford Gower and Burdrop.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

The above lies on the southern end of a spur of the Northampton Sands. A public well at the west end, near a pond, supplies many of the houses. Other houses have wells varying in depth, but probably mostly shallow.

Burdrop, between Sibford Gower and Ferris, has a fine spring in the hollow below the church, on the way to the latter village.

The springs are all thrown out by the underlying clay.

Signet, *see* Burford.

Somerton.

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

A plentiful spring rises (probably in the Estuarine Series) in a combe north of the uppermost farm-house on the way to Fritwell, and is piped for the supply of the village.

South Leigh.

Ordnance Map 236 (new series); Geological Map, Oxford District.

The lower houses in South Leigh are supplied by a 1-inch pipe from the gravels in or near Tarwood, at about 247 feet elevation. The upper part of the village about the church is supplied by shallow wells, in gravel, at elevations of about 280 feet, of which the following, 100 yards east of Church Farm, given by Mr. C. M. Pasmore, is a sample :—

	Feet.
Soil	2
Gravel	2
Marly gravel ... ... about	2
Grey clay [Oxford Clay], bricked for reservoir	20
	26

The gravel-terrace extends for some distance round the church. The water is said to be soft.

South Stoke.

Geological Map 254 (new series).

	Feet.
Boring (5-inch) for Mr. Tuffnell	50
Boring (5-inch) for Mr. Cook	48

In this village, which lies low at the river-side, the wells are mostly pole-wells, or shallow with pumps, and probably derive their water from the alluvium and gravel.

Spelsbury.

Ordnance Map 218 (new series); Geological Map 45 S.W. (old series).

There is a Public Memorial fountain, which was dry at the time of my visit. There is said to be a pump available at a lower level.

Stadhampton.

Geological Map 254 (new series).

N.E. of Village, S.W. of Cholsey Barn, and just west of the track leading to Sheephouse Barn.

Water rose 8½ feet.

		Feet.
Kimmeridge Clay.	Grey clay with Ammonites "biplex"	50
Corallian	Stone	1
	Bluish sandy loam	4

This section was obtained by Mr. POCOCK. What is apparently another well is given by Mr. W. W. FISHER* as follows :—"2684. Stadhampton, depth 52 feet, water-level 47 feet (with an analysis) from Lower Greensand (or Portland Beds) below Gault Clay." Both these wells are possible, as the Gault overlaps the Kimmeridge Clay in this locality.

Stanton Harcourt and Sutton.

Ordnance Map 236 (new series) ; Geological Map, Oxford District.

Information from Mr. CADMAN.

	Feet
Wells in river-gravel	10–14

At Tarwood Lodge, 1¼ mile to N.W.

Marl	8
Gravel	2
	10

Stanton St. John.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

Mr. WOODWARD notes that near the School there is a well 60 feet deep in Corallian, but that no great supply is obtained.

A little to the south of the Church there is a dipping-well by the roadside, said to be permanently supplied.

Steeple Aston.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

A well 50 yards from the road for a new house on the road from Heyford Station showed :—

	Ft.	In.
Soil	1	2
Clay with race	4	0
Sand to an ironstone (water)	17	0
	22	2

At Hopcrofts Holt, an Inn, ¾ mile to the west, a well was made 78 feet deep.

At Steeple Aston the wells are all shallow and are probably in the Estuarine Series. The village is built on the two brows of the valley above the outcrop of the Upper Lias Clay.

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* Alkaline waters from the Lower Greensand.—*The Analyst*, July, 1902.

Stoke Lyne.

Ordnance Map 219 (new series) ; Geological Map 45 N.E. (old series).

A public well at the south end of the village, opposite School, is 66 feet deep. Some at the north end on Lower Greensand are much shallower.

The inhabitants prefer for drinking purposes a spring close to the stream, N.N.E. from the Church, called the Old Oak Well. It appears to rise in the valley-flat.

Swifts House, for Sir Algernon Peyton, Bart. 1900.

Dug well 27 feet, and boring.
Water-level 38 feet from surface [which is about 384 feet O.D.].
A little water between 54 and 60 feet, and again between 75 and 90 feet.

	Thickness. Feet.	Depth. Feet.
Clay	77	77
Sand and clay	18	95
Clay	37	132

Stoke Row, near Ipsden.

Geological Map 254 (new series).

The Public Well.

Known as the Maharajah's Well.

Site 573 feet above O.D.

Depth of the well 342 feet.
Water in the bottom 24 feet.

There was not enough water at first, so the well was deepened to 346 feet ; since when there has been plenty. Time occupied in raising water by windlass and buckets about ten minutes.

The well is in Chalk, with the exception of a little gravel and Reading Beds at the top.

Stonesfield.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

The wells in Stonesfield vary greatly in depth. In the highest part they are from 25 feet to 30 feet, but in the lower ground to the north-west some are quite shallow. On this side, halfway down the street towards the Fawler road, is one of 90 feet depth, sunk in the following strata :—

	Feet.
Rock	50
White stone	20
Grey and blue marl	15
Blue rock, 3 or 4 beds	5
	90

Well at Kingswood Farm, in Stonesfield.

	Feet.
Soil	1
Shelly rubbly rock	6
Yellow rock	15
Blue marl	20
Arshall (? hard shell)...	1¼
Very hard splintery rock, with water	7¾
Clay	3
	54

Particulars of these two last wells were given by Mr. J. Poole, well-sinker, Stonesfield.

Stratton Audley.

Ordnance Map 219 (new series); Geological Map 45 N.E. (old series).

Boring at Copse Cottages, made and communicated by Messrs. CHEELD & Co. Date, March, 1903.

	Thickness. Feet.	Depth. Feet.
Dug well; no details	30	30
Boring, :—		
Not described	22	52
Stiff blue clay	6	58
Very hard and tough green and blue clay and white stuff	8	66
Very hard rock and blue clay	4	70
Thin rock and black stiff clay with crystals ...	4	74
Thin rock and green clay	3	77
Thin rock and green-blue clay	9	86
Hard rock	4	90
Grey clay	7	97
Thin rock, grey clay and sand	5	102
Very hard rock	4	106
Rock and grey clay	3	109
Hard rock with layers of blue and grey clay ...	5	114
Hard rock	6	120
Stiff clay and a little rock	15	135
Very hard rock	6	141
Stiff clay and little rock	9	150
Soft clay	16	166
Stiff clay and a little rock	11	177
Stiff blue clay	29	206
Layer of sand	1	207
Clay [Estuarine beds]	17	224
Clay and rock	5	229
Micaceous clay	11	240

The "Boring stopped in Upper Lias" (Mr. H. B. Woodward).

The water-supply was only 100 gallons per hour approximately when the boring had reached 215 feet.

At 206 feet water rose within 10 feet of surface; at 209 feet 6 inches water was lost but rose again at 212 feet, standing at 13 feet 6 inches from the surface; at 227 feet more water rose to within 12 feet of the surface.

Boring in search of coal at the village* :—

	Ft.	Ins.
Cornbrash	243	10
Forest Marble		
Great Oolite...		

Plentiful and regular supply of water obtained probably from the marlstone. —A. H. GREEN.

It is singular that this boring should correspond so nearly in depth with that of 1903 given above; but considering the date of the Banbury Memoir, 1864, there can be no doubt that we have here records of two distinct borings. Also it is clear that the water could not come from the Marlstone, as the Copse Cottage boring only touched the Upper Lias. It seems more likely that the supply was from the Estuarine Beds.

Well, 110 feet deep, at Stratton Audley, for J. B. KINGSCOTE, Esq., starts at 270 feet O.D.

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* 'The Geology of the Country around Banbury, Woodstock, &c.,' A. H. Green, (*Mem. Geol. Surv.*), 1864.

STRATTON AUDLEY HALL (J. P. HEYWOOD LONSDALE, Esq.).

Well made and communicated by Messrs. CHEELD & Co.

"100 feet through Great Oolite to a bed of dark sand [Estuarine Beds]. Water rose 23 feet above the road-level, and now overflows into a trough when not otherwise drawn upon."

Studley.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

Mr. A. Morley Davies gives the following approximate section of a well sunk at the northern end of Studley Village, in September, 1899.*

	Feet.
Soil and rubble of Arngrove Stone	3
Arngrove Stone	2
Reddish-brown sandy clay : fish-tooth, *Alectryonia*-fragments, traces of other shells	3
Argillaceous limestone ... ... less than	1
Clay, very black and stiff : *Gryphœa dilatata*, *Cardioceras cordatum*... ... ... at least	10
	19

The well is situated on the north-west side of the road to Boarstall, about 3 furlongs from Studley Post Office.

Swalcliffe.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

At the lower or eastern end of the village there are no wells or standpipes and water is fetched from the stream in the valley opposite. These cottages are on rocky ground (Marlstone). The rest of the village is chiefly supplied by standpipes from sources to the west of the village [from the Inferior Oolite?] There are a few wells ; one at the Vicarage 70 feet or 80 feet deep, and one at the Post Office. Informant, Mr. C. J. Gibson, Manor Farm. A large spring rises near Swalcliffe Manor Farm from the same rock.

Swerford.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

The east branch of the village is supplied by a spring above the houses and by the roadside. Other sources occur along the hillside on the way to the church and have been utilized. One springs below the churchyard.

POMFRET CASTLE FARM, near Swerford.

Well and Boring made by Messrs. WARNER & SONS. Date, June, 1902.

Communicated by Mr. THOMAS SINGLETON, Estate Office, Great Tew.

Height above O.D. more than 600 feet. Water level 40 feet from bottom.

Dug well, 3 ft. × 3 ft , to a depth of 45 ft.

		Thickness. Feet.	Depth. Feet.
	Limestone and marl	21	21
Upper Lias? 9 ft.4	Blue clay	24	45
	Blue clay	70	115
Middle Lias? 12 ft.	Ironstone ; *Water*	12	127

Quart. Journ. Geol. Soc., vol. lxiii., 1907, p. 40.

		Thickness. Feet.	Depth. Feet.
Lower Lias.	Blue clay	4	131
	Green sandy clay	2	133
	Ironstone	3	136
	Blue clay	22	158
	Ironstone (very hard)	2	160
	Blue clay	2	162
	Ironstone	0½	162½
	Hard grey sand	3½	166
	Blue clay	3	169
	Ironstone	2	171
	Blue clay	4	175

Swinbrook.

Ordnance Map 236 (new series); Geological Map 44 (old series).

Springs from the rock abundant on both sides of the valley, but chiefly on the west. On the west side the levels of points of issue were noted progressively from 355 O.D. to 455 feet above O.D., N.W. of South Lawn, in a distance of about 1 mile 1 furlong.

Sydenham.

Ordnance Map 237 (new series) ; Geological Map 13 (old series).

Sydenham appears to be on the Gault.

An old brick and timbered house on south side of street, opposite an inn, has a well of 12 feet 'rag,' steaned at top. The water was standing at 5 feet from the surface. A lane at the back of this leads to the Upper Farm, where the well on higher ground is said to be 50 feet deep. The vicar states that his well is about 20 feet deep, but that the water is not good.

Tackley.

Ordnance Map 218 (new series); Geological Map 45 S.W. (old series).

Made and communicated by Messrs. Z. Hills & Co. Date, 1888.

Water tapped at 46 feet rose to 40 ft. 6 in. from the surface : good supply.

		Thickness. Ft.	in.	Depth. Ft.	in.
Forest Marble (or possibly Kellaways).	Clay	4	6	4	6
	Sandstone...	4	0	8	6
	Yellow clay		6	9	0
	Rock	4	6	13	6
	Greensand with decayed wood	1	0	14	6
	Blue rock...	3	6	18	0
	Oxford clay	3	6	21	6
Great Oolite ?	Stone (building-stone of district) ...	2	3	23	9
	Hard marl	1	6	25	3
	Hard marl, with sandstone in layers ...	12	3	37	6
	Red loamy sand	2	3	39	9
	Sandstone and marl	1	9	41	6
	Sandstone	1	0	42	6
	Clay		6	43	0
	Hard marl and stone	1	6	44	6
	Clay, marl and sandstone (water) ...	3	0	47	6
	Sandstone	1	6	49	0
	Marl	1	6	50	6
	Clay	1	0	51	6
	Sandstone...	1	9	53	3
	Gravel		9	54	0

Tadmarton (Lower).

Ordnance Map 218 (new series); Geological Map 45 N.W. (old series).

Several springs come out of the south bank of the stream from a marlstone with sand above and blue clay below. One of these springs is carried across the stream and supplies a standpipe for the cottages on that side.

Tadmarton (Upper).

Ordnance Map 218 (new series); Geological Map 45 N W. (old series).

An abundant spring occurs on the north side of the high road at the east end of the village, and is used by the inhabitants of the houses up as far as the Chapel. The rest of the village has wells, one at the top of the village on the south side being 41 feet deep. Half-way up the street are shallow wells on either side. At the back of some cottages by the Chapel there is a well 30 feet deep. Informant, Mr. Stantra.

Temple Mill.

Ordnance Map 218 (new series); Geological Map 45 N W. (old series).

One mile south-west of Sibford Ferris.

A remarkably copious spring issues in the valley-bottom at this spot, and in a short distance works a flour-mill by an overshot wheel. It appears to be thrown out of the Northampton Sands, which disappear to the west beneath the Great Oolite.

Great Tew.

Ordnance Map 218 (new series); Geological Map 45 N W. (old series).

Well and boring by Messrs. Le Grand & Sutcliff at the Vicarage.

Information from Rev. J. P. Malleson.

	Strata.	Thickness. Feet.	Depth. Feet.
Upper Lias.	Dug well	31	31
	Limestone	2	33
	Blue clay and small pieces of stone... ...	61	94
Marlstone Series.	Yellow clay and sandstone	1	95
	Stone	3	98
	Red sandstone and mottled clay	13	111
	Brown marlstone and clay	15	126
	Blue Lias clay	1	127

600 feet above O.D. Date, January 1897.

Boring was resorted to through Lias Marlstone without finding water. The borers were of opinion that water had got away from the Marlstone at some part of its outcrop, the situation being not far from the escarpment.

The Village is supplied by public taps piped from springs in the Marlstone.

Park Farm, ½ mile from village on Ledwell Road.

By the cottage there is a well 32 feet deep and in the yard a well 31 feet deep, both being probably in Inferior Oolite. The depth of water in each is 3 feet.

Informant, Mr. T. Singleton, Great Tew Estate Office.

GREAT TEW ESTATE

Upper Grove Farm, Lower Grove Farm, Cottenham Farm	Supplied by springs from Lias Marlstone, on Iron Down (situate near seventh milestone from Chipping Norton, on Deddington Road).
Potato Town ...	Well in Lias Marlstone 27 feet 6 inches deep; water 9 inches to 5 feet 3 inches deep (situate near fifth milestone from Chipping Norton to Deddington.

Informant, Mr. T. SINGLETON, Great Tew Estate Office.

Little Tew.

Ordnance Map 218 (new series); Geological Map 45 N W. (old series).

The village is supplied by pipes from a spring on the road to Great Tew, probably from the Lias Marlstone.

Thame.

Ordnance Map 237 (new series); Geological Map 13 (old series).

Before the present public supply was made the town relied on private wells. These averaged, according to Mr. J. G. Robinson, Surveyor to the Urban District Council, from 30 to 40 feet in depth. The main street runs W. 30° N., and those on the north side were all in gravel (? Portland Rock), and on the south side in sand (Portland Sand). Wells are still made here for building-purposes.

In 1901 a trial boring was made by the Thame Urban District Council on the top of Horsendon Hill, near Tetsworth, 2½ miles south of Thame. The site of the boring was on the Gault, with a view of getting water from the Lower Greensand, and was purposely selected by the engineer as far as possible from the outcrop of the latter bed. The boring was carried to a depth of 302 feet, but both the Lower Greensand and Portland Beds were missing, and no water-bearing bed was met with; the appearance of the lowest samples being that of the Oxford Clay.

After sinking for a depth of 173 feet through Gault Clay a bed of hard clayey sand was met with, and another bed of sand and clay at 200 feet, and a bed of rock at 291 feet.

Mr. C. E. Hawkins, who saw the specimens, was of opinion that the Oxford Clay had been reached without meeting with the Lower Greensand, the Portland Beds, or the Corallian.

The section was as follows:—

Boring at Horsendon Hill for Thame Urban District Council.

The site is on the top, East side of cart-road from Moreton to Tetsworth.

Made and communicated by Messrs. CHEELD & Co. Date, 1901.

Height above Ordnance Datum, about 330 feet.

	Thickness. Feet.	Depth. Feet.
Surface to base of Gault	173	173
Greensand	3	176
Hard dark clay	24	200
Sand and coprolites (iron pyrites?)	5½	205½
Black sand	6	211½
Dark clay (black)	79½	291
Very hard rock	4	295
Clay, Oxford Clay	7	302

The trial was abandoned. A little water came in and filled the hole, but did not yield a gallon a minute.

In 1902 a fresh site was chosen on the Kingsey Road, one mile east of Thame. The well goes from Greensand into Portland Beds, and has been successful.

Boring at Thame for the Urban District Council Water Supply, 1 mile to E. 30° N., on Kingsey Road.

Made by Messrs. TAYLOR, SONS, & SANTO CRIMP, and communicated by the URBAN DISTRICT COUNCIL.

Yield, plentiful. Water-level, normally 5 feet from surface; after pumping 14 feet.

	Ft.	in.
Stiff soil	1	10
Green sand	7	8
Portland Rock...	1	0
Portland Sand...	39	6
[? Portland Sand]	2	0

8-inch tube to Portland Rock 4 inches below.

Boring at Thame for present Town Supply. Date, 1904 ?

Communicated by Messrs. TAYLOR, SONS, & SANTO CRIMP.

Height above Ordnance Datum, 220 feet.

Yield, 7 days' continuous pumping test gave a little over 7,000 gallons an hour. Ten hours in 24 will meet the requirements.

	Thickness. Feet.	Depth. Feet.
Surface ground [soil]	2	2
Loam, gravel and clay	6	8
Loam, gravel, clay with fossils	2	10
Stone-rubble	1½	11½
Greensand rock	¾	12¼
Rubble	¼	12½
Greensand rock	2	14½
Greensand mixed with black stones	11½	26
Fine green sand	1	27
Hard sand with small stones and pebbles	2	29
Green sand mixed with light-coloured grit	18	47
Coarse sand	2	49
Fine sand mixed with quantity of clay	2	51
Coarse sand, light colour	13	64
Clay, thickness not ascertained.		

Shaft to 20 feet; 10-inch tube thence to 64 feet, the lowest 20 feet perforated.

Mr. J. G. Robinson, the Surveyor, states that the yield is 10,000 gallons an hour from the upper part of the well, without reckoning the water supplied by the tube which commences near the bottom of the shaft. The water is pumped into a tank 70 feet above, near the Thame Station (capacity, 58,000 gallons), and thence distributed.

The supply consists of two different sources, the shaft and the borehole, and the analyses given by Mr. Fisher show the existence of two distinct waters in the same well. *See* Analyses, p. 97.

The following sections were noted by Mr. JUKES-BROWNE :—In the allotment-gardens south of Thame, a well in Portland Sand, 16 feet deep; at the Railway Station a well in Gault and Lower Greensand, 30 feet deep; at Thame Park, the Park Grange well, 60 feet deep.

THAME PARK, KEEPER'S LODGE

Boring made and communicated by Mr. EDWARD MARGRETT, F.G.S., in 1881.

	Feet.
Gault and Lower Greensand	176

The water-level in June, 1909, was 86 feet from the surface.

Borings made and communicated by Mr. JACKSON, of Thame.

October, 1901.

	Feet.
Boring No. 1, N. of Cotmore Walls.	
Sandy loam	5
Gravel	3
Stone, very hard	6½

	Thickness. Ft.	Ins.	Depth. Ft.	Ins.
Boring No. 2, NE. of Cotmore Walls.				
Tube driven (? screwed) into yellow clay	10	0	10	0
Yellow clay, sandy	3	0	13	0
Sand and clay...	4	0	17	0
Rock	2	8	19	8
Clay (sandy)	2	8	22	4
Rock	2	2	24	6
Bluish sand	7	6	32	0
Stone, very hard	2	0	34	0
Sand with water	7	0	41	0
Clay just entered	0	2	41	2

Water rose (? to surface) in tube.

"Codmore," Mr. BIRCH'S House, Thame.

Information from Messrs. CHEELD & Co.

A few feet to hard Portland Stone.

In a sandy place near by 12 lbs. of gelatine dynamite were exploded, and there has been an abundant supply of water ever since.

LUBBERSDOWN (or LOBBERSDOWN) HILL FARM, near Thame.

Well and boring at over 500 feet O.D.

		Feet.
Gault.	Dug well in clay, with a nodular bed at 10 or 12 feet down	30
	Boring	40
		70

Information from Messrs. FRANKLIN & JONES. (*See* Analysis, p. 97.)

Tiddington. *See* under Albury.

Upper Heyford.

Ordnance Map 218 (new series) ; Geological Map 45 NW. (old series).

The wells in the upper part of the village appear to derive water from the Estuarine Sands.

Above the Chapel in the main street a spring occurs, probably from the base of those beds. This has been covered over and piped for the supply of the houses below.

Warborough.

Geological Map 254 (new series).

The southern part of the village to beyond the Church is on a gravel-terrace, and the wells are shallow. At the northern end, which is on Gault, a well on the west side at Sunnymead is in the following succession :—

	Feet.
Sand	3
Clay ... ... about	30
Sand with water	3

This was made about three years ago, and the water was thick the first year and very salt. It is said to be now much better and to yield quite a good water. The water stands at about 22 feet from surface.

A boring has been made also in the orchard behind the house of Orchard Leigh, on a site suggested by a "dowser." It is 177 feet deep, and the water rises to 6 feet from the surface, but is so salt as to be useless except for washing floors or clothes. Mrs. Chalker, who had it made, states that it has been used hot in baths for rheumatism with apparent advantage.

The Orchard Leigh well is quoted in Mr. W. W. Fisher's paper, amongst "Waters from Lower Greensand (or Portland Beds) below Gault Clay," as containing the greatest amount of "solids" in the list, viz. :—546 grains per gallon, of which 314·25 consist of sodium chloride (common salt).

Waterperry.

Ordnance Map 237 (new series) ; Geological Map, Oxford District.

Noted by Mr. H. B. Woodward.

Good water is said to be obtained in the village from shallow wells. There is an irregular and thin capping of gravel and brown sand, the latter partly Corallian, and these superficial strata yield the water.

Wendlebury.

Ordnance Map 219 (new series) ; Geological Map 45 SE. (old series).

A stream runs through the village and a narrow bank of river-gravel on the N.W. side gives two or three shallow wells.

The village is often flooded, the water being 6 inches deep at times on the ground-floor of the inn.

Westwell.

Ordnance Map 235 (new series) ; Geological Map 44 (old series).

Springs come from the hillside behind some houses west of the Village Green at about 390 feet above O.D. They never fail and form one of the sources of Shill Brook.

Wheatfield.

Geological Map 254 (new series).

"Mr Hutt's Farm."

A letter written in 1886 by the late Mr. John Watson, of Shirburn Estate Office, gives some account of a well dug at Mr. Hutt's Farm. Clay was found at 10 feet from the surface, then Greensand and below it a very hard rock. The bottom of this was 40 feet from the surface. From here a boring was made to a total depth of 150 feet, but no good supply of water was obtained.

Lower Farm. 1901.

Made and communicated by Messrs. Margrett & Allsebrook.

Shaft 43 feet and boring beyond. Water-level 38 feet down.

	Thickness. Feet.
Gault Clay	197
Lower Greensand	14
	211

The water was analysed by Mr. W. W. Fisher, Oxford, and found to contain alkaline carbonates.

Wheatley

Ordnance Map 237 (new series); Geological Map, Oxford District.

Notes by Mr. H. B. Woodward.

1. Wells in village in Corallian :—

Railway Hotel, about 24 feet.

New House, between Hotel and Post Office, about 28 feet; "good spring."

East End Cottage, through clay and sand to hard rock.

Park Hill, on Oxford new road, wells 48 to 50 feet.

2. To south of brickyard, south-west of railway station and east of Littleworth, a shaft was dug as a tank 27 feet in clay, the supply coming from spring in adjacent Portland Beds.

3. A well by cottage at east end of Littleworth was 80 feet deep through Kimmeridge Clay probably into Corallian.

Whitchurch.

Geological Map 268 (new series).

Wells made and communicated by Mr. John Higgs, well-sinker.

Mr. Higgs states "there are 14 wells sunk in the valley-gravel, etc., varying from 7 feet to 20 feet in depth, with water from 2 feet 6 inches to 4 feet 6 inches from the bottom, and four wells from 28 feet to 37 feet deep with 3 feet to 5 feet of water."

Oak Inn, near.

	Feet.
Soil	6
Chalk	47
Water at 49 feet from surface.	
	53

Hillside House.

	Feet.
Soil, etc.	3
Chalk	27
Water at 27 feet from surface.	
	30

China Cottage.

	Feet.
Soil, etc.	4
Chalk	60
Water at 60 feet 6 inches from surface.	
	64

The Rectory.

Made and communicated by Mr. S. Joyce.

	Feet
Gravel, a little Chalk }	50
Water at 46 feet from surface.	

At Myrtle Cottage.

	Feet.
Soil, etc.	3½
Chalk	61½
Water at 61 feet 6 inches from surface.	
	65

Uplands House.

	Feet.
Chalk	99
Water at 94 feet from surface.	

Milverton Cottage.

	Feet.
Soil	5
Chalk	55
Water at 56 feet from surface.	
	60

Coombe Lodge.

	Feet.
Soil	2
Chalk	58
Water at 54 feet from surface.	
	60

Coombe Bottom.

	Feet.
Soil, "mould and stone"	7
Chalk, rocky near bottom	93
	100

Water at 96 feet from surface; well afterwards lowered to 106 feet.

Whitchurch Gate.

	Feet.
Clay and loam	30
Chalk	217
Water at 235 feet from surface.	
	247

Copyhold Farm.

	Feet.
Loam and flints	6
Chalk	166½
Water at 169 feet 6 inches.	
	172½

Allnutt's Hospital (Alms House, Goring Heath].

	Feet.
Gravel and clay	40
Chalk (rock 3 feet thick, at 180 feet from surface)	190
Water at 226 feet from surface.	
	230

Hyde House Farm.

	Feet.
Red loam	36
Chalk (rock 4 feet 6 inches thick, at 160 feet from surface)...	174
Water.	
	210

Blackbird's Bottom Farm.

	Feet.
Soil, mould, etc.	6
Chalk (rock 4 feet thick, at 200 feet from surface)	245
Water at 241 feet from surface.	
	251

Coombe End Farm.

Sunk and communicated by Mr. John Higgs.

	Feet.
Loam and flints	40
Chalk (rock 4 feet thick, at 240 feet from surface)	301
Water at 316 feet from surface.	
	341

Hardwick House, Whitchurch.

Well and boring made and communicated by Messrs. Le Grand & Sutcliff. Date, August, 1905.

The well is not at Hardwick House but on Goring Common above.

Height above O.D. 343 feet. Water level 218 feet from surface, but varies 3½ feet.

Yield :—No test made ; took 11½ hours to pump out well.

	Thickness. Feet.	Depth. Feet.
Dug well	230	230
Chalk and flints	3	233
Hard grey chalk	7½	240½
Softer chalk	3½	244
Hard sticky chalk (harder at 274 to 301 feet) ...	63	307
Soft sticky chalk	23	330

There are two headings in the shaft measuring 6 × 4 feet.

Walliscote Farm, Whitchurch.

Boring by Mr. Callas for J. Foster, Esq., Coombe Park. July, 1897.

	Feet.
Earth	2
Gravel	8
Coarse sand	1
Ballast and shingle	8
Sand	1
Flints	1
Chalk and flints	31
	52

Five-inch tube-well ; 25 feet 5-inch tube.

Widford.

Ordnance Map 236 (new series) ; Geological Map 44 (old series).

Manor House, Well. Springs are numerous on hillside below.

Mr. Sekker states that formerly there were seven footbridges along the hill-bottom between the road and the church-cottage, a distance of 350 yards. These springs are now covered over and drained.

The church shows remains of Roman tesselated pavement, and doubtless the springs gave a favourable site to the Roman colonists.

Wigginton.

Ordnance Map 218 (new series) ; Geological Map 45 N.W. (old series).

The village lies on a slope of Lias Marlstone and has shallow wells ranging from 2 to 18 feet in depth.

Wigginton Heath.

The Holy Well is on the N.E. side of the hill which is capped by the sandy "Heath." The spring issues at about 580 feet O.D. from a brown Marlstone, overlying clay, and is an abundant source.

Two wells of about 20 feet occur at the south side of the Heath at the cross-roads, starting in sands which are probably Estuarine. On the north side a boring was made near the Camp, but particulars are not to hand.

Williamscot.

Ordnance Map 201 (new series) ; Geological Map 53 S.W. (old series).

Most of the houses have wells which range from 10 to 20 feet in depth. Water said to be hard.

Williamscot House is supplied by pipes from a well above the farmyard at the east end of the village (Marlstone).

Witney.

Ordnance Map 236 (new series) ; Geological Map 45 S.W. (old series).

Witney has numerous wells. Of some of the earlier Mr. C. E. Hawkins reports :—

"The Cornbrash and Forest Marble were penetrated by a well at the Police Station.

The records of a second and deeper well at the Police Station, and of a well at the Eagle Brewery show that the Great Oolite in this locality consists of alternating beds of limestone and clay. A boring at the Marlborough Hotel afforded similar results, viz : alternating beds of rock and clay. This boring was carried down to 196 O.D., from which depth water rose to within 22 feet of the surface or to about 257 O.D.

The deeper boring at the Police Station was carried down to beds below the Great Oolite apparently with disastrous results, the water being brackish.

The Town Water.

A trial-well was made at Appley Barn in the valley below the workhouse in 1895-6 which went down 26 feet and although Mr. Fisher was able to report favourably on the water, the site was considered to be risky on account of the proximity of the river Windrush and flood-waters. A boring was made near Curbridge Farm, on the Burford Road, but although it was carried to 180 feet no water was found.

The previous well was then reverted to and it was decided to carry it deeper and shut out the top-waters by clay-puddle and cemented brickwork. This rests on a hard rock (see section) at 18 feet. Pumping went on continuously whilst sinking the well further to a depth of 50 feet from the surface and the yield at the end of that time was 150,000 gallons per diem, according to Mr. Winship, the engineer ; but Mr. Hawkins states that the yield was 186,000 gallons per diem after 14 days test pumping.

The water was, according to Mr. Fisher, less hard than any of the present wells in Witney. *See* analysis, p. 98. The following sections and the analysis given on p. 99 will throw further light on Witney Geology and Water Supply.

Witney Water Works, Appley Barn.

Information from GEORGE WINSHIP, ESQ., F.G.S., A.M. Inst. C.E.

280 feet above O.D.

		Thickness. Ft.	Ins.	Depth. Ft.	Ins.
Top soil		1	0	—	—
Well with clay-puddle and brickwork	Gravel and loam	4	0	4	0
	Crop rock	5	0	9	0
	Loose jointed limestone rock	6	0	15	0
	Blue clay	1	3	16	3
	Rag rock and clay		9	17	0
	(Thin) sand on rock	1	0	18	0
	Hard rock	10	5	28	5
	Clay and sand	1	3	29	8
	Hard rock	3	7	33	3
	Marl	3	4	36	7
	Clay		8	37	3
	Blue rock (Water came in very freely after getting through this bed.)	5	0	42	3
	Clay	2	2	44	5
	Sandstone		11	45	4
	Rock	1	7	46	11
	Clay (very hard)		11	47	10
	Sandstone	1	6	49	4

Yield :—At first water was pumped at the rate of 80,000 gallons per day, but when pumping was stopped on the 15th of December the yield was 150,000 gallons per day.

Note.—The sinking of well commenced at 18 feet during the last week in August, when pumping went on continuously until December 15th. The rest-level was at 13 feet from the surface.

Witney Police Station. 1892.

Well made by Messrs. LE GRAND AND SUTCLIFF.

		Feet
Top soil		4
Cornbrash		10
Forest Marble	Blue clay	8
	Forest Marble	23
	Dark clay and sand	3½
Great Oolite	Grey earthy limestone	7½
	Fine oolite	4
		60

Yield, 500 to 600 gallons per hour.

Well for Messrs. CLINCH & Co.

Made and communicated by Messrs. LE GRAND AND SUTCLIFF.

Water-level : 26 feet 6 inches below surface.

Above O.D. 284 feet. Date, November 1892.

	Thickness. Ft.	Ins.	Depth. Ft.	Ins.
Dug well	32	6	32	6
Forest Marble*	16	0	48	6
Soft grey rock [earthy limestone, shell fragments. H.B.W.]	5	0	53	6
Great oolite*	29	0	82	6
Clay		3	82	9
Great oolite	1	6	84	3
Clay	2	0	86	3
Great oolite	2	9	89	0
Blue clay	1	6	90	6
Great oolite		6	91	0
Clay	2	0	93	0
Great oolite	4	3	97	3
Clay		9	98	0

* So called by the well-sinker.

Boring for Messrs. CLINCH & Co.

Made and communicated by Messrs. LE GRAND & SUTCLIFF.

Water-level, 18 feet below surface. Yield, 480 gallons per hour.

Above O.D. 284 feet. Date, March 1893.

	Thickness. Ft.	in.	Depth. Ft.	in.
Clay and loose stones	7	0	7	0
Rock	3	0	10	0
Blue clay	3	0	13	0
Rock	2	6	15	6
Clay	3	0	18	6
Rock	3	0	21	6
Forest Marble°	22	0	43	6
Soft rock	1	0	44	6
Great oolite°	2	0	46	6
Clay	1	6	48	0
Great oolite	16	6	64	6

Boring for F. W. FORESHEW, Esq.

Made and communicated by Messrs. LE GRAND & SUTCLIFF.

Water-level, 19 feet 6 inches below surface. Yield, 420 gallons.

Date, June 1892.

	Thickness. Ft.	in.	Depth. Ft.	in.
Loose stone and marl	6	3	6	3
Rock	0	5	6	8
Loose stone and marl	3	4	10	0
Blue rock	1	7	11	7
Blue clay	9	5	21	0
Rock, hard shells and clay, Forest Marble* ...	21	0	42	0
Great oolite*	2	6	44	6
Black clay and sand	2	0	46	6
Great oolite	4	6	51	0
Deepened, March 1893.				
Great oolite	10	0	61	0
Clay		6	61	6
Great oolite	3	6	65	0
Clay		6	65	6
Great oolite	1	6	67	0

Boring for Messrs. JOHNSON (of Hereford), 1899.

Made and communicated by Messrs. DUKE & OCKENDEN.

	Feet.
Rock	12
Blue clay and rock	11
Limestone rock	3
Rock	8
Clay and rock	181
	215

No water was obtained.

Well south of Middlefield Farm, between Witney and New Yatt.

Noted by T. I. POCOCK.

	Feet.
Cornbrash	9
Forest Marble { Pale clay	12
Forest Marble { Rock	2
	23

Water was obtained at the depth of 21 feet as soon as the rock was reached.

* So called by the well-sinker.

Farm near Curbridge.

Well in white rock [Cornbrash, &c.], 30 feet.

Informant, Mr J. Poole, Stonesfield.

Close to Workhouse.

A Well of 15 feet with a good spring [in Cornbrash?].

Informant, Mr. J. Poole, Stonesfield.

Well near Witney High Coggs Cart and Waggon Works,

Top of hill, S. of Eynsham and Witney Road.

Communicated by Owner.

Oxford Clay ... ... 20 feet.

Water bad, probably ferruginous. Cattle will not drink it.

Woodcote.

Geological Map 254 (new series).

This village lies on the Chiltern Hills at an altitude of more than 500 feet above O.D., and until the Reservoir and service of the South Oxfordshire Water and Gas Company was extended there in 1904, it and neighbouring places suffered much from want of water in dry seasons, as in 1897 and 1898, the only sources of supply having been ponds and deep wells in the Chalk. Of the latter, the Medical Officer of Health gave a list in October, 1898, as follows :—

		Depth. Feet.	
Well at Woodcote House ...		400	Good constant supply (12 feet of water).
„	Checkendon Rectory	360	About 560 feet above O.D. Good constant supply.
„	Stoke Row	365	Known as the Maha Rajah's Well. Height above O.D. 573 feet. Supply good until recently ; now running low.
„	Cray's Pond... ...	399	About 545 feet above O.D. Nearly empty in October, 1898 ; has not failed before.
„	Cane End	300	About 360 feet above O.D. Empty October, 1898.
In Goring R.D. „	Path Hill	350	Good supply (8 feet of water).
„	Whitchurch Hill ...	350 ?	Good supply (4 or 5 feet of water).

Of the ponds only two contained available water in October, 1898, the principal being that called the "Canal," near the "Black Lion" Inn. An analysis of the water in 1895 will be found at p. 99.

Wootton.

Ordnance Map 218 (new series); Geological Map 45 S.W. (old series).

A public well west of the Church is about 60 feet deep. To the south, near the river, the wells are shallower.

At Sansome's Farm, ¾ mile to south-east, an old well at the door is covered up and not used. Pipes from spring, probably from the Cornbrash, near Stundy's Castle run along Akeman Street.

A well at Wootton gave the following details ; informant, Mr. J. Poole, Well-sinker, Stonesfield :—

	Feet.
Shelly rock	6
White jointed rock, in thick blocks	40
Clay	3
	49

LUDWELL FARM COTTAGES, near Wootton.

Boring by Messrs. CHEELD & Co. for Sir GEO. DASHWOOD, 1909.

52 feet in oolitic rock. Water of good quality was found at that depth, and rose to 32 feet from surface.

Wroxton.

Ordnance Map 201 (new series); Geological Map 45 N.W. (old series).

This village is on the Middle Lias, or Marlstone Series, and water springs out at the lowest levels. One of these springs supplies a hand-well and an oval pond in the village near the Abbey Park entrance-gates, but is liable to pollution probably from a farm-yard above. Many of the houses have wells, ranging in depth from 12 feet to 60 or 70 feet. One well of 100 feet depth is in a farm-yard just south of the main road to Edgehill, at the corner of the lane coming up from the said pond. The Abbey and two houses are supplied by a wheel which pumps up water from a spring in the valley near Drayton.

Yarnton.

Ordnance Map 236 (new series); Geological Map, Oxford District.

The wells are in River Gravel and mostly shallow. At Mr. Hastings' a well of 10 feet was bored deeper more than 40 years ago, and more water was obtained.

Well by Woodstock Road at angle of northern road leading to Yarnton. Informant, OLIM BROS., Stonesfield, Well Sinkers. Depth 25 feet; through Oxford Clay to sand, 2 ft. 6 in.

Water stands at 13 feet from surface.

Yelford.

Ordnance Map 236 (new series); Geological Map 13 (old series).

There are shallow wells 6 or 7 feet deep in low ground about 215 feet O.D.

ANALYSES.

For the following analyses of waters in Oxfordshire we are mainly indebted to the valuable work of Mr. W. W. Fisher, F.I.C., the Public Analyst for the Counties of Oxfordshire, Berkshire, and Buckinghamshire, who has not only analysed most of the wells in those counties but has thrown considerable light upon the singular variations of the mineral contents of the different waters. To him we are indebted for much information and advice, freely given.

The following notes on the chemical constituents of the waters derived from different rocks in Oxfordshire are gathered, by permission of the author, from Mr. W. W. Fisher's memoir "On the Salinity of Waters from the Oolites," (*Analyst*, February, 1904).

Great Oolite.—The total dissolved Mineral and Saline constituents are about 20 grains per gallon, or even less ; the Chlorides are small ; there is little or no Ammonia ; while the proportion of organic matter is extremely small. Nitrates, however, are variable in amount according to the cultivation of the land adjacent to the springs.

Waters below Oxford Clay.—The Great Oolite beds with Forest Marble and Cornbrash dip gradually in a south-east direction below the Oxford Clay, and when the waters which they contain are tapped by boring the characters of the supplies are found to alter, gathering more and more the soluble constituents of the rocks and becoming increasingly saline in character. The amount of alkaline salts is indeed so great that the waters are quite useless for domestic or industrial purposes.

The waters at Ambrosden and Marsh Gibbon are interesting from the fact that they contain some peaty matter in solution which imparts to them a brownish tinge, but they are soft and alkaline, and are in use for domestic purposes.

Oxford Clay.—These beds do not yield water in any quantity, but in trial wells excessive quantities of calcium and magnesium compounds, and especially their sulphates, render the waters unsuitable for domestic purposes. The presence of saline ammonia and somewhat large proportions of organic matter are worthy of note ; the nitrates are generally small in amount.

Corallian Oolite.—Generally the waters obtained are rather hard, and the organic impurities are small ; but the nitrates, as might be expected, vary according to the state of the surroundings of the wells.

Waters below Kimmeridge Clay.—When the Corallian beds pass in their turn below the overlying Kimmeridge Clay and can only be reached by borings, the increase of alkaline salts in the water is noticeable and the waters are frequently soft and alkaline.

Kimmeridge Clay.—The water from this formation is for the most part extremely hard owing to the large amount of calcium and magnesium salts. The study of Oolitic waters leads to the general conclusion that the uncovered beds of limestone yield calcareous waters, while the deep-seated beds, especially when covered by clay, yield saline or alkaline supplies.

After reviewing other evidence Mr. Fisher concludes that the alkalies are normal constituents of the strata from which the waters are obtained, and are, not derived, as has been hitherto assumed, from any external source. It is precisely in situations where little or no circulation has been possible that saline waters are met with.

Pollution and Purity.

The following two analyses are by Mr. W. W. Fisher, F.I.C., from the same farm at Little Haseley :—

1. A polluted well.
2. A new well unpolluted.

These are put in adjacent columns for better comparison.

(Communicated by Messrs. Franklin & Jones)

1.	2.
The sample is slightly cloudy ; odour, none.	Rather turbid deposits, a little rusty brown sediment ; odour, none.
Colour in tube, pale yellowish.	Colour in tube, yellowish.

	Grains per gallon.		Grains per gallon.
Total dissolved solid matter ...	79·0	... ...	44·
Chlorine in chlorides	6·2	... ...	3·3
Ammonia, free and saline ...	0·013	... ...	0·004
„ albuminoid	0·017	... ...	0·007
Nitrogen in nitrates	2·975	... ...	0·077
„ in nitrites	0·	... ...	0·
Oxygen required to oxidise organic matter (in 3 hours)	0·159	... ...	0·018

The total solids in solution and the chlorides and nitrates are much larger than the natural quantities.

The proportion of organic matter is very large.

The analysis indicates serious pollution of the subsoil near this well, and the water is impure and unfit for drinking and domestic use.

26th Sept., 1908.

The sample contains a moderate quantity of dissolved mineral matter. The chlorides and nitrates are normal in amount.

The proportion of organic matter is quite small.

This is an unpolluted natural water, rather hard, but of satisfactory quality and suitable for drinking and domestic purposes.

11th Feb., 1909.

Bampton.

Analysis of water from borehole at Bampton by Mr. Otto Hehner.

	Parts per 100,000.
Chlorine	771·000
Sulphuric acid	129·360
Nitric „	0·000
Free ammonia	0·364
Albuminoid ammonia	0·012
Oxygen absorbed from permanganate in 15 minutes ...	0·048
„ „ „ „ „ 4 hours ...	0·098
(Both at 80 degrees F.)	
Total solids, dried at 212 degrees F.	1531·200
Loss on ignition	52·080

Banbury.

1. St. Stephen's Well, chalybeate on west of town, a little north of the footway leading to North Newington.

Hydrochlorate of magnesia	0·21
Chloride of sodium	0·54
Sulphate of lime	1·5
Carbonate of lime	3·8
Protoxide of iron	0·024
Silica	trace
	6·074°

2. Banbury Water Company. "Tap at 21 Marlborough Road, Banbury" (the Company's office).

By Dr. Percy Frankland, F.R.S., Chemical Department, The University, Birmingham. 10th June 1908.

	Parts per 100,000
Total solid matters	30·60
Organic carbon	·138
Organic nitrogen	·028
Ammonia	trace
Nitrogen as nitrates and nitrites	·153
Total combined nitrogen	·181
Chlorine	1·75

* A. Beesley, 'History of Banbury,' 1842, p. 97.

Hardness.

Temporary	13·2
Permanent	8·6
	21·8

Remarks.—Almost clear, palatable, free from poisonous metals and nitrites.

3. Analysis by Mr. W. W. Fisher, of the Banbury Water Company's water, February, 1908, from the main. Supplied by Mr. O. J. Stockton, Town Clerk.

Description: The sample is clear and bright in appearance; odour, none. Colour in 2 ft. tube, pale yellowish.

	Grains per gallon.
Total dissolved solid matter	22·12
Chlorine in chlorides	1 4
Ammonia, free and saline	0·001
„ albuminoid	0·007
Nitrogen in nitrates	0·01
„ in nitrites	0·
Oxygen required to oxidise organic matter in 3 hours	0·046

The total dissolved constituents are an average quantity for the winter season, the chlorides and nitrates are quite normal, and the proportion of organic matter is also normal. The sample has the composition and characters of an unpolluted, natural water, and is of good quality and suitable for drinking and domestic purposes.

Bicester.

Trow Pool Well.

Source.—Well, 26 feet deep, in Great Oolite.
Yield.—144,000 gallons per diem (November, 1896).

Analysis of water by Mr. C. Midgley Taylor. October 13th, 1896.

Free ammonia	·000 } parts per
Albuminoid ammonia	·042 } million.
Oxygen absorbed by organic matter in 4 hours	... Nil.
	grains per gallon.
Total solid residue	26·7
Nitrogen as nitrates and nitrites	... 0·156
Chlorine	... 1·1
Alkalinity	.. 19 degrees.

Hardness.

Permanent	3·60 } Clark's scale.
Temporary	19·40 }
Total	23 degrees.

Bicester Water Works.

Well at Gowell Farm. Present supply, 1909.

Yield.—140,000 to 212,000 gallons per day. Water reduced by 14 days test-pumping to 70 feet from surface, but rose again to surface in two hours after cessation of pumping.

Report on analysis of water received 30th September, 1905, at end of pumping test. By Mr. W. W. Fisher, F.I.C.

Description.—The sample is slightly cloudy and contains a little sand. The residue left on evaporation is alkaline and contains a little sodium carbonate.

Odour.—None.

Appearance in two-foot tube.—Pale-yellowish.

The results of the analysis are stated in grains per gallon.

Total dissolved solid matter	26·6
Chlorine in chlorides	1·1
Ammonia, free and saline	·028
„ albuminoid	·003
Nitrogen in nitrates	·014
„ in nitrites	0
Oxygen required to oxidise organic matter (in 3 hours) ...	·007
Hardness in Clark's degree	14·5

Remarks.—The total dissolved solid constituents are normal for water from the Oolite. The chlorides are not in excess of the natural amount ; the nitrates are small, and the proportion of organic matter is extremely small. The water is of a moderate degree of hardness.

Broadwell Grove.

Analysis of Water from Well. THE ESTATE.

The following four analyses are communicated by Mr. T SLATTER KILBEE, the Estate Office :—

	Grains per gallon.
Total dissolved solid matter	48·
Chlorine in chlorides	·8
Ammonia, free and saline	·001
„ albuminoid	·005
Nitrogen in nitrates	·28
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·028

Remarks.—The total dissolved solids are somewhat larger than the average of Oolite waters ; the chlorides are normal in amount, the nitrates are moderate, while the proportion of organic matter is very small.

The water is free from pollution, and of satisfactory quality for drinking and domestic purposes, but rather hard.

Water pumped into two tanks, by means of windmill, mounted on elevated stage at well-head—thence by gravitation to village of Holwell.

Water from Well, HOME FARM, BROADWELL GROVE.

	Grains per gallon.
Total dissolved solid matter	29·12
Chlorine in chlorides	1·1
Ammonia, free and saline	·001
„ albuminoid	·002
Nitrogen in nitrates	·322
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·010

Remarks.—The quantities of dissolved mineral and saline constituents are normal, and there is no excess of chlorides or nitrates ; the proportion of organic matter is very small.

The water is free from pollution and is of good quality for drinking and domestic purposes.

Water from Well (42 feet deep in Cornbrash), WOODSIDE FARM, BROADWELL GROVE.

	Grains per gallon.
Total dissolved solid matter	21·84
Chlorine in chlorides	1·1
Ammonia, free and saline	·001
„ albuminoid	·003
Nitrogen in nitrates	·518
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·002

Remarks.—The sample contains normal and natural quantities of mineral constituents, chlorides and nitrates with only a minute trace of organic matter.

It is an unpolluted natural supply of excellent quality for drinking, or dairy and household purposes.

Water from Deep Well, Oxleaze Farm, Broadwell Grove.

	Grains per gallon
Total dissolved solid matter	21·28
Chlorine in chlorides	·9
Ammonia, free and saline	0·
„ albuminoid	·004
Nitrogen in nitrates	·350
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·011

Remarks.—The total amount of mineral constituents, and also the quantities of chlorides and nitrates are quite normal, while the proportion of organic matter is very small.

The water has the composition and characters of an unpolluted natural supply, and is of excellent quality for drinking and domestic purposes.

Culham.

Report on the Analysis of a Sample of Water from Deep Boring, Culham College.

By Mr. W. W. Fisher, F.I.C. May, 1907.

Description.—The sample is bright and clear.
Odour.—None.
Colour, &c., in 2-foot tube.—Pale-bluish.

The results of the analysis are stated in grains per gallon :—

Total dissolved solid matter	38·8
Chlorine in chlorides	2·1
Ammonia, free and saline	·036
„ albuminoid	·003
Nitrogen in nitrates	·021
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·003

Remarks.—The total mineral and saline matters in solution are almost the same as in 1904, though slightly larger in amount than in 1905. The proportion of organic matter is still remarkably small. The water is an unpolluted natural supply of good quality, and is suitable for drinking and domestic purposes.

The proportion of carbonate of soda is unchanged, and so the water remains soft and alkaline.

Eynsham.

Report on the Analysis of a Sample of Water from proposed Public Supply.

By Mr. W. W. Fisher, F.I.C.

Received 4th April, 1902. Taken from well after 14 days' pumping.

Description.—The sample is very slightly turbid.
Odour.—None.
Appearance in 2-foot tube.—Pale-bluish tint.

The results of the analysis are stated in grains per gallon:—

	Grains.
Total di solved solid matter	24·9
Chlorine in chlorides	1·1
Ammonia, free and saline	·003
„ albuminoid	·004
Nitrogen, in nitrates	·100
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·017
Total hardness	17·7

The sample contains a moderate amount of dissolved mineral constituents, and the chlorides and nitrates are normal. The proportion of organic matter in the sample is very small.

The water has the composition of an unpolluted supply from the Thames Gravel, and it is of excellent quality for drinking and domestic purposes.

Oxford.

Report on the Analysis of a Sample of Water from Tap, Town Hall, Oxford.

By Mr. W. W. Fisher. July, 1907.

Description.—The sample is clear and bright.
Odour.—None.
Colour, &c., in 2-foot tube.—Pale yellowish-green.

The results of the analysis are stated in grains per gallon :—

	Grains.
Total dissolved solid matter	17·64
Chlorine in chlorides	1·0
Ammonia, free and saline	0·
„ albuminoid	·006
Nitrogen, in nitrates	·042
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·031

Remarks.—The quantities of the totally dissolved solids, and of the chlorides and nitrates, are below the average amounts, and probably at the lowest summer level the proportion of organic matter is quite small.

The water is in excellent condition, and in every respect of good quality for drinking and domestic purposes.

Report on the Analysis of a Sample of Water [obtained at a depth of about 250 feet] from New Boring at Messrs. Hanley & Co.'s Brewery.

February, 1898.

Analysis by Mr. W. W. Fisher, F.I.C.

Description.—The sample is very turbid, containing much clay in suspension. The residue left on evaporation blackened and fused on ignition.
Odour —Unpleasant.
Taste.—Brackish.
Appearance in 2-foot tube.—
Density at 14° *C* =1·0084.

The results of the analysis are stated in grains per gallon.

	Grains.
Total dissolved solid matter	672·8
Chlorine in chlorides	173·6
Ammonia, free and saline	·101
„ albuminoid	·045
Nitrogen, in nitrates	—
„ in nitrites	—
Oxygen required to oxidise organic matter (in 3 hours) ...	·394

Remarks.—The sample contains a large proportion of sodium compounds—chiefly sulphate and chloride, with small quantities of lime and magnesia. There is a considerable amount of organic matter ; the water has a bad odour, and at first contains dissolved iron carbonate, which is deposited as rust on exposure to the air. On account of the excessive quantities of sulphate and chloride of sodium, as well as the undue amount of organic matter, I am of opinion that the water cannot be used for brewing purposes.

The total dissolved solid matters dried at 160° C. amounted to 961·2 parts per 100,000.

The following constituents were determined in the water :—

	Per 100,000.
Sulphuric acid (SO_3)	287·5
Chlorine	248·0
Lime (Ca O)	29·1
Ferric oxide (Fe_2O_3)	·7
Silica (SiO_2)	1·0

with traces of magnesia and large quantities of sodium. Calculating the equivalent proportions of soda required by the sulphuric acid and chlorine, the composition of the saline residue would be approximately thus :—

	Per 100,000.
Sulphate of soda	500·2
Sodium chloride (common salt)	407·2
Calcium carbonate	40·
Calcium (or magnesium) sulphate	12·
Iron, &c.	1·8
	961·2

The proportions of saline constituents in grains per gallon would be :—

	Grains.
Sulphate of soda	350·
Chloride of sodium	285·
Other constituents	37·
	672·

Report on a Sample of Water received May 14th, 1898.

[From gravel, 25 to 30 feet thick, overlying Oxford Clay, at City Brewery, Oxford.]

Analysis by Dr. R. Moritz, F.I.C., and Dr. G. H. Morris.

Appearance.—Bright, but yellowish in colour.
Reaction.—Slightly alkaline.
Sediment.—Extremely small.

	Parts per million.
Ammonia, free and saline	0·14
„ albuminoid	0·16
Oxygen absorbed in 3 hours	1·55
	Grains per gallon.
Total solid matter	88·48
(distinctly blackening on ignition and evolving acid fumes and organic smell)	
Consisting of—	
Volatizable matter	2·10
and non-volatizable matter	86·38

The solid matter, on a further analysis, was found to contain the following basic and acid bodies :—

	Grains per gallon.
Silica	1·54
Alumina	0·42
Oxide of iron	trace
Lime	26·97
Magnesia	2·62
Soda	4·09
Potash	7·60
Chlorine	4·69
Nitric acid	6·12
Sulphuric acid	20·75

The above basic and acid bodies would exist in the water combined together, in all probability, as under :—

	Grains per gallon.
Sodium chloride	7·73
Potassium sulphate	14·07
Calcium nitrate	9·02
Calcium sulphate	15·37
Calcium carbonate	31·68
Magnesium sulphate	7·86
Silica and alumina	1·96

This water is distinctly impure, and is on this account quite unfitted for brewing.

South Oxfordshire Water and Gas Company. *See* Woodcote.

Thame.

WATERWORKS. Kingsey Road Trial Boring.

Source—Boring, 1 mile E. of Thame, through Lower Greensand and Portland Stone into Portland Sand.

Yield, from trial-boring 4-in diameter, 33,000 gallons per 24 hours.

Report on the Analysis of a Sample of Water after pumping test.

By Mr. W. W. FISHER, F.I.C. Received 13th June, 1902.

Description.—The sample is bright in appearance.
Odour.—None.
Appearance in 2-foot tube—Pale-bluish tint.

The results of the analysis are stated in grains per gallon :—

	Grains
Total dissolved solid matter	25·2
Chlorine in chlorides	1·1
Ammonia, free and saline	·004
„ albuminoid	·004
Nitrogen in nitrates	·02
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	·005
Hardness, total	20·
„ temporary	15·

Remarks.—The total dissolved mineral and saline constituents are normal for a water of the district ; the amounts of chlorides and nitrates are small, while the proportion of organic matter is very small.

The sample is an unpolluted natural supply from the Portland Beds, of a moderately hard character, and in my opinion is a water of excellent quality, suitable for drinking and domestic purposes generally.

Sample from New well, LUBBERSDOWN HILL, THAME.

Analysis by Mr. W. W. FISHER, Feb., 1909 ; communicated by Messrs. FRANKLIN & JONES.

The sample is very slightly turbid ; odour, none.

Colour in 2-foot tube, pale yellowish.

	Grains.
Total solids	66·
Chlorine in chlorides	1·3
Ammonia, free and saline	0·001
„ albuminoid	0·011
Nitrogen in nitrates	0·476
„ in nitrites	0·
Oxygen required to oxidize organic matter (in 3 hours) ...	0·078

Remarks.—The total dissolved solid matter is somewhat above the average quantity, and the water is rather hard in consequence.

The chlorides and nitrates are normal in amount, while the proportion of organic matter is a little above the average. The water is an unpolluted supply and of satisfactory quality for domestic use.

The hardness will probably diminish as the water is drawn upon.

Report on Analyses of Samples of Water, June 22nd, 1908.

By Mr. W. W. FISHER, F.I.C.

[Communicated by the THAME URBAN DISTRICT COUNCIL.]

From (1) Borepipe at well, Pumping Station, near Thame.
„ (2) Shaft at well outside borepipe at same place,

(1) The sample is slightly cloudy and turbid ; it contains a little iron. The residue left on evaporation is slightly alkaline.

Odour.—None.
Colour in 2-foot tube.—Yellowish.

(2) The sample is slightly cloudy and turbid ; it contains a little iron.

Odour.—None.
Colour in 2-foot tube—Pale-yellowish.

The results of the analyses are stated in grains per gallon :—

	No. 1. Grains.	No. 2. Grains.
Total dissolved solid matter	27·16	36·68
Chlorine in chlorides	1·2	1·2
Ammonia, free and saline	0·012	0·011
„ albuminoid	0·003	0·004
Nitrogen in nitrates	0·02	0·02
„ in nitrites	0·	0·
Oxygen required to oxidise organic matter (in 3 hours)	0·013	0·013
Hardness, total	18·	26·
„ permanent	4·2	11·1
„ temporary	13·8	14·9

Remarks.—No. 1. The sample contains a normal quantity of dissolved solid constituents, and is almost identical in composition with the original water.

It contains a very small proportion of organic matter, and is of a moderate degree of hardness. It is a good water for drinking and domestic purposes.

No. 2. The total dissolved constituents are distinctly larger than in the water from the borepipe, and the water is eight degrees harder.

In respect of chlorides, nitrates, and a small proportion of organic matter, the water is quite satisfactory, and is an unpolluted natural supply. The increase in the permanent hardness is owing to some sulphate of lime probably dissolved from the clay which divides the upper and lower strata.

Witney.

Appley Barn.

Report on the Analysis of a Sample of Water from Well for Witney water-supply.

Received 6th February, 1896. By Mr. W. W. Fisher, F.I.C.

Description.—The sample is very slightly turbid.
Odour.—None.
Appearance in 2-foot tube.—Pale-bluish tint, good colour.

The results of the analysis are stated in grains per gallon :—

	Grains.
Total dissolved solid matter	24·36
Chlorine in chlorides	1·0
Ammonia, free and saline	·001
„ albuminoid	·006
Nitrogen in nitrates	·280
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours)	·007
Hardness, total	20·8 degrees.
„ permanent	5·8 „
„ temporary	15·0 „

Remarks.—The water contains a normal quantity of dissolved mineral matters and a very small amount of organic matter. The composition of this sample is practically the same as the sample from the borehole in December last.

The water is an unpolluted natural water of excellent quality for drinking and domestic purposes.

Although somewhat hard for washing (it is in fact less hard than any of the present wells in Witney) I do not suppose any softer supply could be obtained near the town.

Report on the Analysis of a Sample of Water from Appley Barn Well, Witney, after 14 days' continuous pumping test.

Received 11th January, 1901. By Mr. W. W. Fisher, F.I.C.

Description.—The sample is clear and bright.
Odour.—None.
Appearance in 2-foot tube.—Pale-bluish tint.

Results are stated in grains per gallon :—

	Grains
Total dissolved matter	22·96
Chlorine in chlorides	1·1
Ammonia, free and saline	·001
„ albuminoid	·001
Nitrogen in nitrates	·385
„ in nitrites	0·
Oxygen required to oxidise organic matter (in 3 hours) ...	0·

Remarks.—The total mineral solids are normal in amount for a limestone-water, as also are the chlorides. The quantity of the nitrates is moderate, while the proportion of organic matter is very small indeed. The sample has the characters of an unpolluted natural supply and is of excellent quality for drinking and domestic supply.

Woodcote.

Report on the Analysis of a Sample of Water from Reservoir, near Black Lion Inn, Woodcote, South Stoke, being the High level Reservoir of the South Oxfordshire Water and Gas Company, Limited.

By Mr. W. W. Fisher, F.I.C. 10th June, 1895.

Description.—The sample is slightly turbid.
Odour.—None.
Appearance in 2-foot tube.—Yellow tint.

The results of the analysis are stated in grains per gallon :—

	Grains.
Total dissolved solid matter	15·88
Chlorine in chlorides	1·4
Ammonia, free and saline	·015
„ albuminoid	·025
Nitrogen in nitrates	·133
„ in nitrites	0
Oxygen required to oxidise organic matter (in 3 hours) ...	·113

Remarks.—The total dissolved mineral solids with the chlorides and nitrates are normal in quantity, but the quantity of organic matter is above the natural amount for a drinking water.

I think if an opportunity could be found for cleaning out the reservoir the quality of the water would be improved.

Analysis of Sample taken from the South Oxfordshire Water and Gas Company's System at Benson, April, 1909.

By Messrs. Harland & Brown.

Colour when examined in a 2-foot tube.—Pale-blue, clear.
Suspended matter.—Nil.
Smell.—Nil.
Total hardness.—16 degrees.

	Grains per gallon.
Total dissolved solids	25·9
Chlorine 1·09, equal to chloride of sodium...	1·80
Lead, copper, iron	Nil.
Nitrogen as saline ammonia	·0011
„ as albuminoid ammonia	·0022
Nitrites	Nil.
Nitrates	·3080
Oxygen absorbed by organic matter at 27° C in ¼-hour ...	·0084
„ „ „ 4 hours...	·0196

This water is free from any indication of pollution with animal organic matter, and is quite satisfactory as a supply for drinking and domestic purposes.

Woodstock.

1. Report on the Analysis of a Sample of water from Standpipe in Old Woodstock. The water is pumped from the River Glyme.

Received 14th September, 1907. By Mr. W. W. Fisher, F.I.C.

Description.—The sample is slightly cloudy.

The results of the analysis are stated in grains per gallon :—

	Grains.
Total dissolved solid matter	22·12
Chlorine in chlorides	1·
Ammonia, free and saline	·001
„ albuminoid	·006
Nitrogen in nitrates	·02
„ in nitrites	·0
Oxygen required to oxidise organic matter (in 3 hours) ...	·040

Remarks.—The total mineral solids, and the chlorides and nitrates, are normal in amount ; the proportion of organic matter is about the average.

The sample is unpolluted river-water, and is of satisfactory quality for drinking and domestic purposes.

2. Report on an Analysis of a Sample of Water from Standpipe in Blenheim Palace, supplied from springs in the gardens.

Received 14th September, 1907. By Mr. W. W. Fisher, F.I.C.

Description.—The sample is very slightly tinted.
Odour.—None.
Colour in 2-foot tube.—Pale-yellowish.

	Grains per gallon.
Total dissolved solid matter	14·0
Chlorine in chlorides	0·85
Ammonia, free and saline	·001
„ albuminoid	·010
Nitrogen in nitrates	·014
„ in nitrites	·0
Oxygen required to oxidise organic matter (in 3 hours) ...	·038

Remarks.—The quantities of the dissolved mineral solids, and of the chlorides and nitrates are normal, and the proportion of organic matter is about the average. The water is an unpolluted natural supply of good quality, and suitable for drinking and domestic purposes.

(The latter of these two analyses is of the water supplied to the town of Woodstock as well as the Palace of Blenheim, but not to Old Woodstock.)

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7,* published 1861, Drift Edition, 1872 ; 13, published 1860 ; 34,* published 1857 ; 44,* published 1856 ; 45 S.W. and 45 N.W., published 1859 ; 45 S.E. and 45 N.E., published 1863 ; 53 S.W.,* published 1855 ; 53 S.E.,° published 1859.

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Horizontal Sections.

Sheet 71.—From Nettlebed Hill, Oxfordshire, on the south, to the Burton Bassett Hills, Worcestershire—1867.

Sheet 72, No. 2.—From Lambourne Downs, Berkshire, northwards into Oxfordshire—1867.

Sheet 81.—From White Hill, near Kingsclere in Hampshire, to Pinsley Wood near Handborough, in Oxfordshire—1870.

Sheet 82.—From Handborough, in Oxfordshire, to Milverton, near Warwick —1870.

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* Small part only in Oxfordshire.

† The memoirs on Sheets 7 (1864), 34 (1858), 44 (1857), and that on the Geology of Rutland, &c. (1875), contain brief references to Oxfordshire.

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INDEX.

RAINFALL MAP
OF
OXFORDSHIRE.

By H. R. Mill, D.Sc., LL.D.

REFERENCE.

Rainfall below 25 inches	
,, between 25·0 & 27·5 inches	
,, ,, 27·5 & 30·0 ,,	
,, above 30·0 inches	

Scale. 1 Inch = 10 Miles.

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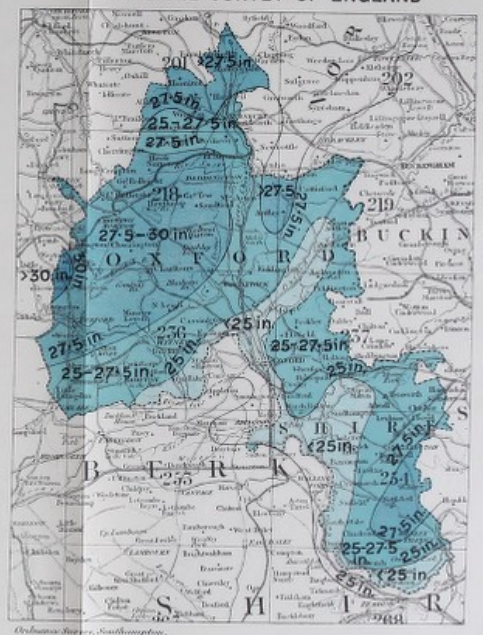

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