Repts to
MoJ + Palestine
Survey Commission
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IRRIGATION

AND

WATER SUPPLY

BY

CYRIL Q. HENRIQUES.

IRRIGATION AND WATER SUPPLY.

My task is to note the possibilities of irrigation in Palestine. This study should include:—

1). Definite statement as to where water will be available.
2). Recommendations as to how to use it.
3). Discussion of details of quantities required, methods of distribution, etc.

Unfortunately the means and time at my disposal do not allow of carrying out the above in full. An attempt has been made to define the area in which further investigation would pay, giving reasons for it and the conclusions arrived at.

I have discussed, as far as possible, sundry projects and areas which in my opinion will be worth investigating in detail. The few authentic irrigation statistics available in Palestine are given as far as they could be collected.

For my purpose Palestine may be divided up into seven regions:—

A. The Huleh Plain.
B. The Jordan Valley proper.
C. The Coastal Plain from the northern border Ras-el-Nakurra to Acre.
D. The Emek including the whole of the Valley from the Haifa-Bay coast to Beisan.
E. The Coastal Plain from Haifa to Gaza.
F. The Hills of Galilee and Judea.
G. The Negeb or all areas south of Gaza and Beersheba.

A. Ref. Map I and Appendix I.

The *Hulch Plain* (shown hatched on the map)* is a well-defined valley to the north, east and west of which mountains rise abruptly; to the south it is shut in by a comparatively low ridge behind which the Huleh Lake is formed. The pestilential papyrus marshes, the largest known in the world, are the shallow portions of the Huleh Lake and an essential part of it; in addition all round the northeast and

*The report of Mr. Henriques refers to a number of large maps which accompanied it. They have not been reproduced because of expense. They may be seen in New York City, London, or Jerusalem.

western edges of the Plain there are numerous smaller marshes, joining on to the main lake, formed by the many springs from the foot of the hills and by shallow arms of the lake itself. This area was reported on by me during the winter of 1925-26, with a view to draining the marshes. The first premise to make is that there is water and to spare for irrigating all the 150,000 dunams (34,000 acres) of which this Plain consists. The whole of the water which feeds the Huleh Lake runs through it and out below in to the Jordan. The minimum recorded flow is 8 metres cube per second (280 C.F.S.). The maximum recorded is 115 m³/sec. (4,060 C.F.S.). Observations were taken only for two years. The calculated maximum flood discharge from the catchment area of the Jordan below the Huleh Lake is 1,400 metres cube per second (49,500 C.F.S.) as taken from Dredges variation of Ryves formula.

The Huleh Lake is the consequence of an intrusion of basalt across the Jordan Valley. Through the intrusion the Jordan has cut a deep narrow gorge, and to drain the Lake and marshes it will be necessary to enlarge the sectional area of this gorge. There is no practical alternative. (The cost of this work was roughly estimated by me at about £1,080,000 ($5,400,000) employing Jewish labour, to include deep ploughing, detailed drainage and irrigation, or excluding interest charges £740,000 ($3,700,000). No allowance for settlement charges was included.) Since the report was submitted I have had the advantage of taking the agent of Messrs. Almajia, the well known contractors, over the site. He is of the opinion that I have underestimated the cost of the work by at least 15%.

This scheme only assumes the reclamation of the Government lands, that is about 55,000 dunams (12,500 acres). A considerable area of this will be liable to inundation unless the cross section of the Jordan is blasted out to accommodate the maximum flood discharge at a quite prohibitive cost. The estimated area eventually available for settlement is about 40,000 dunams (9,100 acres) hence the cost of amelioration will be about £21.27 per dunam ($468 per acre) excluding interest and settlement charges, increasing my original estimate by 15% as above.

Now the drainage of the Government lands and the drainage of the whole Plain rests on the same main factor, i.e. increasing the cross sectional area of the Jordan. If another 100,000 dunams (22,800 acres) outside the concession area could be bought at an estimated price of £3 per dunam ($66 per acre) the cost of the drainage would be reduced to about £11.0 per dunam ($242 per acre). All authorities combine in classifying the soil of the Huleh Plain as some of the most productive in the world. Also all medical and sanitary authorities combine in condemning the climate as being as malaria-impregnated as any in the world. This could of course be eliminated by efficient drainage. The medical opinion shows that the drainage of Government lands will not make the Plain fit for Colonization, it will only drain a comparatively small area in the centre of fever-ridden swamps. Hence in my opinion it will be futile to undertake a drainage scheme until the whole Plain is under one regime.

For further information about this region attention is called to my report which was handed over to you in Palestine. This report was only a preliminary statement made out at as small a cost as possible and must not be expected to take the place of or give the information which a detailed scheme should supply. I estimate that it will cost up to £10,000 ($50,000) to make out working plans and that these should include observations taken over a period of at least five years. Most authorities consider that to gauge with theoretical accuracy the maximum flood discharge of any catchment area, a series of observations of approximately thirty years is necessary, and the engineering details depend in this case on the maximum flood discharge. I believe, however, that five years will give sufficient data from which assumptions, accurate enough for practical purposes, can be made.

B. Ref. Map II and Appendix II.

The Jordan Valley:—It is not proposed to discuss the part of the Jordan Valley which lies south of Beisan. Its inaccessibility, want of detailed information about it, and lack of time and money to collect it are the reasons. Also this area is too hot for settlement by the methods at present employed.

The area of 30,000 dunams (6,800 acres) bounded by the Jordan on the west, the Lake of Tiberias on the north, the Transjordan hills on the east and the Yarmuk River on the south, is particularly well-adapted to irrigation. There are two methods of applying water which should be investigated:—

1. From the Yarmuk River (the flow is being gauged by Mr. Rutenberg, but I have not got the information yet). There should be sufficient water with storage to irrigate the whole of this area. Of course, the practicability and cost of this scheme still awaits investigation.

2. From the Lake of Tiberias. The maximum level of the plain is less than 15 meters (49 feet) above the level of the lake a short distance from it and there is a steady slope to the south. It will be possible to pump water from the lake up to the highest point and run it in open channels down the area. There is practically unlimited water in the lake of Tiberias. The cubic capacity of the average rise and fall of the lake of one metre is given by Wilcocks as about 155 million cubic metres (125,000 acre feet).

The area between the lake and Beisan on the west of the Jordan is about 40,000 dunams (9,100 acres) of which not more than 12,000 to 15,000 dunams (3,000 to 3,500 acres) will be fit for irrigation. There are sundry springs in this area but not of any great importance.

C. Ref. Map II and Appendix II.

The Coastal plain north of Acre:—The area between the sea and the hills in this region has been divided up into sand dunes and light soil, in which calcareous sandstone is marked, and heavy soils. Experience shows that calcareous sandstone is the principal water-bearing stratum in the coastal plain of Palestine. The areas are 6,500 dunams

(1,500 acres) sand dunes, 30,000 dunams (6,800 acres) light soil including 13,000 dunams (3,000 acres) calcareous sandstone, and 58,000 dunams (13,000 acres) heavy soil. The conditions of soil and climate appear to be very similar to that of the Plain of Sharon between Haifa and Jaffa, except that here there is a slightly larger rainfall. I need not lay stress on the quality of light soils for citrus growing in Palestine. The average at Haifa for over fifteen years is 24″8, and the average at Jaffa (Tel Aviv) is 21″4.

A number of springs occur in this region, mainly from faults occurring at the foot of the hills, notably the Kabri springs. The areas along the foot of the hills are well cultivated and prosperous. Those along the coast are very out-at-elbow. The reason is probably social as the coast is well in touch with the towns of Haifa and Acre and the landlords are non-resident, while the foot of the hills is more remote and the landlords are mostly on the soil. It is not contemplated that there will be any land suitable for cultivation for sale at the foot of the hills, but most of the light soil lying near the main road to the north along the coast will be eagerly disposed of at an economic price.

D. Ref. Map II & III and Appendix II.

The Emek is a valley comprising the valley of the Kishon and Jalud rivers from the Haifa-Acre coast to where the latter meets the Jordan valley at Beisan.

The settlement of the Emek for better or worse is a fait accompli. There are now 5,100 Jewish colonists, inhabiting 32 colonies or villages. Except for the Jalud River running from Ain Harod to Beisan there is no supply of water on a scale suited to irrigating more than small local areas as an economic proposition, except along the coast. Map III attached shows in green the coastal area in which water is believed to exist throughout the year at an economic depth below the surface. Also in this area the Kurdani springs yield sufficient water to irrigate about 50,000 dunams (12,000 acres) which calls for a commanded area of some 100,000 dunams (23,000 acres). The water can be used in two directions, either north on to the Acre—Ras-el-Nakurra plain or back in the Emek. The level of the springs are about 4 metres (13 feet) above sea-level. The level at Tel-Shamam railway station 22 kilometers (about 14 miles) back in the Emek is about 39 metres (128 feet). It is worth investigating as to whether water can be pumped in stages up to a point near Tel-Shamam, and used in that area. This would be preferable to using the water in the Acre—Ras-el-Nakurra plain, as probably a sufficient local supply at an economic depth below the surface will be found. The water from the Jalud River is sufficient to irrigate about 5,000 dunams (1,100 acres) and there is a project now under construction for utilizing it.

One other possibility is worth mentioning, and that is the construction of a storage tank on the Wadi Es Sidr between the villages of Geva and Kfar Yeheskiel. This might be comparatively cheaply done by throwing a dam across the wadi if the basin will hold water. In any case it is worth investigation.

E. Ref. Map I and Appendix I.

The coastal plain from Haifa to Gaza is probably the finest citrus growing area in the world. This soil may be roughly divided in the same way as that of the plain north of Acre. Water is found in the calcareous sandstone in varying quantities according more or less to the coarseness of the grain. This area is comparatively densely populated and its features are well-known and it is not necessary from a practical point of view to call attention to them. Neither time nor money being available I have not undertaken a detailed investigation. The only perennial stream of any importance is the Audja near Petach-Tikvah, the right of irrigating from which has been conceded to the Palestine Electric Corporation (Mr. Rutenberg). The discharge is comparatively constant, and should be capable of irrigating some 160,000 dunams (36,000 acres); the Palestine Electric Corporation is reported to have a scheme in hand to irrigate by pumping 26,000 dunams (5,900 acres).

Along the coast there are several marshes of considerable size the drainage of which is under consideration by Mr. Carter, engineer to the Malaria Research Unit.

These are from South to North.

1. Wadi Rubin of which 1,200 dunams (270 acres) can be reclaimed at an amount estimated by Mr. Carter at £3,500 ($17,500); this area can be irrigated by gravity at a comparatively small extra cost.
2. Birket Ramadan (Nahr el Falik); here 5,000 dunams (1,100 acres) can be reclaimed for an amount estimated by Mr. Carter of £10,000 ($50,000) maximum; this area can also be irrigated by gravity at a comparatively small extra cost.
3. Nahr Iskanderuneh; no information available.

In addition to the above the Kabara marshes are being drained now by the P. I. C. A.; about 7,000 dunams (1,600 acres) will be reclaimed and, including the colony of Benjamina near-by, about 1,800 dunams (400 acres) irrigated by gravity.

F. Ref. Map I and Appendix I.

The hills of Galilee and Judea consist for the most part of limestone, speaking from the point of view of an engineer not of a geologist. They are badly fissured and almost throughout distinctly layered. The consequence is that nowhere that I have seen yet is there any possibility of storing rainwater on a large scale by the usual methods of damming a valley. The mighty wadis which are so distinct a feature of this region convey, to the Englishman at least, an impression that enormous volumes of water must have rolled down them for countless ages to have hollowed them out. This is probably untrue and these valleys are more the result of geological folds of the strata than the action of water. All that the rainwater has done is to have denuded the steep sides of their earthen covering and left them the howling wildernesses of which so much of the Galilean and Judean hills consist. The records of rainfall at Safad give an average of 34 inches,

at Jerusalem 25″9 and at Hebron 24″3. It is not apparent at first sight as to where all this water goes. To explain this perhaps the best analogy is that of a book resting on an inclined desk of which the limestone layers form the pages and in which a large number of holes have been drilled. A thin stream of water falling on the book would run through the holes unless some of them were stopped up; the water in this case would run out between the pages if it did not meet another hole on the way. This is more or less what happens here in nature. The rain runs through the fissures of the limestone layers down to about sea level unless it meets a bed of clay or gravel or other material which stops up the fissures and holds it like a sponge. This is the origin of most, if not all springs in these limestone hills. Unfortunately these water holding beds are very limited and are not to be reproduced artificially. It may be taken as an axiom that no springs in these hills are to be bought except at a ruinous price.

There are considerable areas in these hills of basalt formation. As far as I have been able to examine them they are too much broken to offer any hope of storage basins, but there is no reason why such should not be found.

One method of storing water in large quantities might be suggested and that is by open masonry cisterns. No such work has been undertaken in modern times so it is not possible to speak from actual experience as to actual cost for such work on a large scale. At the moment the Keren Kayemeth is building a covered cistern to contain 2,850 metres cube (100,000 cu. ft.) at a cost of about £1.25 per cubic metre ($0.18 per cu. ft.). I am of the opinion that open reservoirs on favoured sites could be built for a maximum of two-thirds of this cost. It is for the economists to say as to whether this line of investigation is worth following up.

G. THE NEGEB comprises the whole of the area of Palestine South of Beersheba and Gaza outside the Jordan Valley. Except along the coast there is not a single permanent building besides the old Turkish war time railway stations and ruined barracks. The country is tribal Bedouin land and quite undeveloped. The Bedouins plough and sow the land after the first rains and reap it in April and May, mostly with barley. The best soils only are sown and then not more than once in three years and a small proportion of them is used at all.

In my opinion there are considerable areas of land over which sufficient water for irrigation could be found at an economic depth, notably at Al Auja and Asluj. Prof. Adams, however, is of the opinion that the remoteness of markets, the exposed situation from the point of view of raids by the Bedouins, the lack of actual experience of the capabilities of the land, etc. will make settlement here much too experimental to warrant the attempt at present. It is obviously impossible to settle on a small scale as each village must be able to protect itself from attack on a large scale.

There remains the coastal area along which conditions are more settled. I must leave this absolutely out of discussion for want of funds to investigate it; there are certainly large areas in which water for irrigation will be found at an economic depth and experiment is

recommended at selected points near the railway between Khan Yunis and Gaza.

Gaza is 70 kilometers (44 miles) south of Jaffa on the coast and Khan Yunis 23 kilometers (14 miles) south of this. I have not reproduced a composite map of the Negeb of which only sheets exist.

The information given on maps I and II and their appendices has been gathered from local information and what actual investigation was possible, with the time and means available. It is not claimed that they are exhaustive and much of the information as regards water yield is seasonal. The appendices give the origin of the information and other data as far as it could be collected, which may be of interest. No information is to hand about those sources which are marked on the map but not numbered or mentioned in the appendices.

The work in the field was carried out by the undersigned together with Mr. Barakette, civil engineer, and Dr. Picard, geologist, to whom thanks are due.

It is much regretted that owing to lack of funds the completion of this report has had to be stopped; originally, it was hoped to include a map of the coastal area from Gaza to Rafa on the same lines as that from Ras-El-Nakura to Acre.

CYRIL Q. HENRIQUES.
M.I.C.E.

November 10, 1927.
Jerusalem.

December 22, 1927.

Dear Dr. Mead,

Herewith a further note on the water question in the Jordan Valley.

Mr. Strahorn has examined the valley from the Dead Sea up to the point where my map begins and is of opinion that not more than 15% is fit for irrigation and does not consider it worth while to spend more time and money on this area.

My note gives as much information as I could gather with the time and means at my disposal, re. the streams which flow past or near Beisan *vide* your letter of 14/10/127 to Mr. Strahorn. I have no soil map of this area but it may be taken that all the land commanded is fit for irrigation in some form or other after due deductions for wadis etc. have been made. Mr. Strahorn is sending in a "crude" soil map of the area.

I am,
Yours sincerely,

CYRIL Q. HENRIQUES.
M.I.C.E.

NOTE.

The area of the Jordan valley west of the river from Beisan south to the Wadi Esh Sherar is about 100,000 dunams (23,200 acres) gross area of which at least 25% must be deducted for broken ground etc. i.e., the net area available for irrigation is about 75,000 dunams (17,400 acres).

The total amount of water available as per list attached is 21,900 m³/hour (219.00 C.F.S.) but of this the following is in the area north of Beisan:

Wadi el Bireh	630
" Esh Sheh	100
" Es Soda	2,800
" Ed Duweiyah	600
Irrigation channel	1,900
	6,030 m³/hr. (60.3 C.F.S.).

Without storage this will irrigate $\frac{(21{,}900\text{-}6{,}030)}{4.5} \times 12 = 42{,}$-320 dunams (9,840 acres) assuming that a dunam requires 4.5 m³ per day and that this will be applied over 12 hours. With storage of course this can be much increased.

But it is pointed out that the water is not concentrated in one place and will therefore either be very costly to collect or will be used in small volumes over small areas, also that no observations as to quality have been taken and it is more than probable that some of these springs are salty. I therefore think that it will be unsafe to count on being able to irrigate more than half this amount, i. e. 21,240 dunams (4,940 acres).

The area of the Jordan Valley west of the river from Jisr Mujanieh to Beisan is about 42,300 dunams (9,800 acres) gross area of which at least 25% must be deducted for broken ground etc., i. e. the net area available for irrigation is about 31,700 dunams (7,370 acres).

The total water available is 6,030 m³/hr. (6,003 C.F.S.). Without storage this will irrigate 16,000 dunams (3,720 acres), much more with it.

The water here is much more concentrated than to the south of Beisan.

There is not likely to be any opportunity of storing water on a large scale in the area south of Beisan where the strata is mostly limestone; to the north there are areas of basalt where a suitable basin might be formed but this will require considerable time to investigate.

The water is in every case, except that derived for the three Wadis Bireh, Esh Sheh, and Jalud, from springs. These flow from the foot of the gravel deposits brought down by rain from the hills and the lines of the terraces forming the Jordan Valley are clearly marked by them.

(Signed). CYRIL Q. HENRIQUES.

M.I.C.E.

22/12/27.

Name	mtr³	Yield C.F.S.	Date of Observation	Origin of Information	Remarks
W. el Bireh	630	6.3	Dec., 1927	C. Q. H.	Probably mm.
W. esh Sheh	100	1.0	Dec., 1927	C. Q. H.	Probably mm.
Ain es Soda	2,800	27.0	Aug., 1927	Dr. L. P.	Fairly constant
Yed Duwaiyeh	600	6.0	Aug., 1927	C. Q. H.	
Ain ed Tineh	7	0.007	June, 1927		Prob. constant
Ain el Jemain	2,500	25.00	July, 1927	Dr. L. P.	Fairly constant
Ain er Jozak	4,000	40.00	July, 1927	Dr. L. P.	Fairly constant
Ain Umm el Flus	235	2.30	June, 1927	Dr. L. P.	Prob. constant
Ain el Meyiteh	15	0.15	June, 1927	Dr. L. P.	Prob. constant
Ain Bala	—	—	June, 1927	Dr. L. P.	Yield unknown
Tel el Menshiyeh (a)	500	5.00	June, 1927	Dr. L. P.	Prob. constant
Tawahin el Hasaniyeh					
Ain el Madua	500	5.00	July, 1927	Dr. L. P.	Fairly constant
Sheikh es Semud (a)	5	0.048	June, 1927	Dr. L. P.	Fairly constant
Ain el Dugheim	3,000	30.00	June, 1927	Dr. L. P.	Several large springs with fairly constant yield
Aim Umm Amud	70	0.69	June, 1927	Dr. L. P.	Prob. constant
Ain el Sabha	110	1.08	June, 1927	Dr. L. P.	
Ain en Nukleh	72	0.70	June, 1927	Dr. L. P.	
Kh. el Mujedda (Ayun)	350	3.40	July, 1927	Dr. L. P.	Fairly constant
Ain Nuseirah	125	1.25	June, 1927	Dr. L. P.	Prob. constant
Ain Nusrah	80	0.78	June, 1927	Dr. L. P.	Prob. constant
Ain le Majeirah	200	2.00	June, 1927	Dr. L. P.	Prob. constant
Tel es Sarem (a)	20	0.20	June, 1927	Dr. L. P.	Prob. constant
Ain es Safssfeh	90	0.88	June, 1927	Dr. L. P.	Prob. constant
Sh. Muhammed el Kabu	150	1.50	June, 1927	Dr. L. P.	Prob. constant
Ain el Mogharabeh	75	0.74	June, 1927	Dr. L. P.	Yield estimated
Ain el Khaneizir	28	0.27	June, 1927	Dr. L. P.	Prob. constant
Ain el Malhah	34	0.33	June, 1927	Dr. L. P.	Prob. constant
Ain Umm el Haiyeh	75	0.74	June, 1927	Dr. L. P.	Yield estimated
Ain Umm Sidreh	80	0.78	June, 1927	Dr. L. P.	Prob. constant
Ed Deir	200	2.00	Dec., 1927	C. Q. H.	Prob. constant
Ain el Beida	200	2.00	Dec., 1927	C. Q. H.	Prob. constant
Ain Habas	100	1.00	Dec., 1927	C. Q. H.	Prob. constant
Ain el Helweh	300	3.00	Dec., 1927	C. Q. H.	Prob. constant
Wady el Hamra	1,370	13.70	Dec., 1927	C. Q. H.	
Kanet el Wakef	970	9.70	Dec., 1927	C. Q. H.	Prob. constant
Irrig. channel	1,900	19.00	Dec., 1927	C. Q. H.	Prob. constant
Khurbat Ka'aun	100	1.00	Dec., 1927	C. Q. H.	Prob. constant
Berdeleh el Khudr	300	3.00	Dec., 1927	C. Q. H.	Prob. constant
	21,891	217.545			

APPENDIX I.

LIST OF SPRINGS AND WELLS

REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
1	Ain el Alak		466	1530	——	——	3.8	0.037	——	G.S.B.	Prob. average
2	Ain Rueihineh		——	——	——	——	95.	0.93	——	G.S.B.	Prob. average
3	Ain ed Daheb and Ain el Khalisah		——	——	——	——	400	3.9	Nov. 1925	B.&E.	Prob. minimum
4	Ain el Musa		——	——	——	——	20	0.2	Nov. 1925	B.&E.	Prob. minimum
5	Ain el Barbir		——	——	——	——	22	0.22	Nov. 1925	B.&E.	Prob. minimum
6	Ain el Balatah		——	——	——	——	1.8	0.018	Nov. 1925	B.&E.	Prob. minimum
7	Ain Jahulah		——	——	——	——	380	3.7	Nov. 1925	B.&E.	Prob. minimum
8	Ayun Betsemun	Huleh	——	——	——	——	11	0.11	Nov. 1925	B.&E.	Two springs with prob. min. yield
9	Ayun el Mellahahn		——	——	——	——	2350	23	Nov. 1925	B.&E.	Four springs with prob. min. yield
10	Ain Almaniyeh		——	——	——	——	11	0.11	Nov. 1925	B.&E.	Prob. minimum
11	Ain Tamrun		——	——	——	——	119	1.17	——	P.W.D.	Average yield
12	Ras en Neba		——	——	——	——	320	3.14	——	P.W.D.	Average yield
13	Wadi Wakkas		——	——	——	——	16	0.16	Aug. 1927	P.I.C.A.	Perennial stream with prob. minimum yield
14	Ferem	Safed	——	——	——	——	10	0.098	Aug. 1927	P.I.C.A.	Prob. minimum
15	Ain ez Zeitun		701	2500	——	——	2	0.02	——	P.W.D.	Three springs with prob. average yield
16	Rameh		——	——	——	——	0.99	0.0097	June 1921	P.W.D.	Spring at foot of hillside about ½ km. from village
17	Mejd el Kerum (well)		——	——	15.0	49	——	——	——	P.W.D.	——
18	Wadi Amud		——	——	——	——	190	1.86	——	G.S.B.	Perennial stream with prob. average yield
19	Ain Rubudiyeh		——	——	——	——	380	3.72	——	G.S.B.	Average
20	Migdal	Tiberias	——	——	——	——	190	1.86	——	G.S.B.	Average
21	Ain Surar		——	——	——	——	140	1.39	——	G.S.B.	Average
21A	Ain Hattin		——	——	——	——	95	0.93	——	G.S.B.	Average
22	Ain Menhamia		——	——	——	——	2.4	0.024	Aug. 1926	P.I.C.A.	Prob. minimum
23	Ain Abu Sidre		——	——	——	——	1.15	0.011	Aug. 1926	P.I.C.A.	Prob. minimum
24	Ain Shefa Amr (well)		——	——	15.0	49	2	0.02	——	P.W.D.	Estimated average
25	Bir Beiyin		——	——	——	——	1.25	0.012	——	P.W.D.	Maximum
							0.31	0.003	——	P.W.D.	Minimum
26	Ain Kefr Kenna		——	——	——	——	9.5	0.095	——	G.S.B.	Average
27	Ain Beit Gan		——	——	——	——	0.8	0.0078	May 1926	P.I.C.A.	——
							0.3	0.0029	Aug. 1926	P.I.C.A.	——
28	Ain Houry		——	——	——	——	1.6	0.0157	May 1926	P.I.C.A.	——
							1.4	0.0137	Aug. 1926	P.I.C.A.	

APPENDIX I.

LIST OF SPRINGS AND WELLS

REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
29	Ain Boustan	Nazareth	——	——	——	——	1.6	0.0157	May 1926	P.I.C.A.	——
							1.4	0.0137	Aug. 1926	P.I.C.A.	——
30	Ain Atoahe		——	——	——	——	1.25	0.0123	May 1926	P.I.C.A.	——
							0.8	0.0078	Aug. 1926	P.I.C.A.	——
31	Er Reineh		——	——	——	——	9.5	0.093	——	G.S.B.	Average
31A	Ain Mahil		——	——	——	——	47	0.46	——	G.S.B.	Average
32	Ain el Jizan		——	——	——	——	19	0.19	——	G.S.B.	Average
33	Saronah		——	——	——	——	28	0.27	——	G.S.B.	Average
34	Ain el Mady		——	——	——	——	19	0.19	——	G.S.B.	Average
35	Mary's Well		——	——	——	——	9.5	0.093	——	G.S.B.	Spring inside town of Nazareth. Average yield
36	Mesha (well)		——	——	——	——	0.9	0.009	May 1926	P.I.C.A.	——
							0.3	0.003	Aug. 1928	P.I.C.A.	
37	Yemma Large Spring		——	——	——	——	2	0.02	Aug. 1928	P.I.C.A.	Prob. minmum
38	Yemma Small Spring		——	——	——	——	0.85	0.0083	Aug. 1928	P.I.C.A.	Prob. minimum
39	Ain Mizrab		——	——	——	——	2.3	0.023	Aug. 1928	P.I.C.A.	Prob. minimum
40	Ain Siah		35	279	——	——	4.7	0.046	——	P.H.D.	Location on Mt. Carmel unknown. Prob. average
41	Ain Shellaleh		210	688	——	——	12.5	0.12	——	P.H.D.	Prob. average
42	El Mahrakah (well)	Mount	335	1100	——	——	——	——	——	G.S.B.	——
43	Unmez Zeinat (well)	Carmel	122	400	——	——	——	——	——	G.S.B.	——
44	Ijzim well		91	300	——	——	——	——	——	G.S.B.	——
45	Ummel el Palm (well)		427	1400	——	——	——	——	——	G.S.B.	——
46	Ainin (well)		335	1100	——	——	——	——	——	G.S.B.	——
47	Ararah (well)		198	650	——	——	——	——	——	G.S.B.	——
48	Ain Silet ed Dahr		440	450	——	——	0.83	0.0081	Dec. 1921	P.W.D.	Upper Spring
49	Ain Silet ed Dahr		425	400	——	——	0.74	0.0073	Dec. 1921	P.W.D.	Lower spring
50	Ain el Farah		152	500	——	——	1500	13	——	G.S.B.	Average
51	Ain ed Daluk		183	600	——	——	190	1.9	——	G.S.B.	Average
52	Ain Harun	Nalbus	534	1700	——	——	16.7	0.16	Aug. 1922	P.W.D.	Prob. minimum
53	Ainel Beida		183	600	——	——	1900	19	——	G.S.B.	Average
54	Wadi Farah		——	——	——	——	2800	27	——	G.S.B.	Perennial stream yield is average
55	Ain el Kusab		488	1600	——	——	19	0.19	——	G.S.B.	Average
56	Ain Karyoun		550	1800	——	——	34	0.33	——	G.S.B.	——
57	Ain el Assal		550	1600	——	——	9	0.088	——	G.S.B.	Springs located in City of Nablus Yield is average
58	Ras el Ain		580	1900	——	——	24	0.23	——	G.S.B.	——
59	Ain Hassa		550	1800	——	——			——	G.S.B.	——

APPENDIX I.
LIST OF SPRINGS AND WELLS
REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
60	Ain Askar	Nablus	518	1700	—	—	28	0.27	—	G.S.B.	Average
61	Ain Dufna		518	1700	—	—	19	0.19	—	G.S.B.	Average
62	Ain el Arak		518	1700	—	—	9.5	0.093	—	G.S.B.	Average
63	Ain es Sur		518	1700	—	—	19	0.19	—	G.S.B.	Average
64	Ain eah Sherkiyeh		550	1800	—	—	19	0.19	—	G.S.B.	Average
65	Ain Khan Lubban		—	—	—	—	1.33	0.013	—	P.W.D.	Minimum
66	Ain Turmus Aya		—	—	—	—	2.18	0.021	—	P.W.D.	Prob. maximum
							0.22	0.0022	—	P.W.D.	Prob. minimum
67	Ain Kh. Khofriyeh		542	1780	—	—	3.78	0.037	—	P.W.D.	Maximum
68	Ain el Mughazil		—	—	—	—	0.57	0.0056	—	P.W.D.	Prob. average
69	Ain Ras el Waad		—	—	—	—	19	0.19	—	P.W.D.	Prob. average
70	Ain Dilb		565	1830	—	—	0.75	0.0074	—	P.W.D.	Minimum
							1.15	0.011			Maximum
71	Ain Kanich		533	1750	—	—	2.8	0.027	—	P.W.D.	Prob. average
72	Ain Abu Kerjem		792	2800	—	—	0.03	0.0003	—	P.W.D.	Prob. average
73	Ain et Tireh		—	—	—	—	3.8	0.037	—	G.S.B.	Prob average
74	Ain Muabah		818	2880	—	—	0.50	0.0049	—	P.W.D.	Average
							0.10	0.001	Sept. 1924	G.S.B.	Prob. minimum
75	Ain Arik	Ramallah	671	2200	—	—	57	0.56	—	P.W.D.	Average
76	Bireh Fountain		—	—	—	—	0.45	0.0044	April 1923	P.W.D.	Average
77	Ain Fawah		—	—	—	—	95	0.95	—	G.S.B.	Maximum decreasing to nil in summer
78	Ain Farah		274	900	—	—	47	0.46	—	G.S.B.	Maximum
79	Ain Kelt		—	—	—	—	230	2.25	—	G.S.B.	Maximum
							190	1.86	—	G.S.B.	Minimum
80	Ain Sitt Miriam	Jerusalem	710	2300	—	—	47	0.46	—	G.S.B.	Maximum
							9.5	0.095	—	G.S.B.	Minimum
81	Ain Karim		640	2100	—	—	47	0.46	—	G.S.B.	Maximum
							38	0.37	—	P.W.D.	Average
82	Ain Hanniyeh		853	2800	—	—	9.5	0.093	—	P.W.D.	Average
83	Ain Bittir		671	2200	—	—	47	0.46	—	P W D	Average
84	Ain Urtas		674	2215	—	—	38	0.37	—	G.S.B.	Maximum
							15	0.15	—	G.S.B.	Minimum
85	Ain Saleh	Jerusalem	792	2600	—	—	38	0.37	—	J.W.S.	Maximum decreasing to nil in summer
86	Ain Nehallin		732	2400	—	—	19	0.19	—	P.W.D.	Maximum with large decrease in summer
87	Ain Biar		853	2600	—	—	330	3.73	—	J.W.S.	Maximum decreasing in summer to nil

APPENDIX I.
LIST OF SPRINGS AND WELLS
REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
88	Ain el Aujah		—	—	—	—	1900	19	—	G.S.B.	Maximum
89	Ain ed Duk		—	—	—	—	1900	15	—	G.S.B.	Maximum
90	Ain es Sultan	Jericho	185	600	—	—	1300	13	—	G.S.B.	Maximum
							950	9.3	—	G.S.B.	Minimum
91	Ain el Feahkhah		—	—	—	—	4700	48	—	G.S.B.	Maximum
92	Ain Arrub		792	2500	—	—	380	3.73	—	J.W.S.	Maximum decreasing to nil in summer
93	Bir en Musarai		—	—	—	—	0.41	0.004	Feb. 1926	P.H.D.	
							0.12	0.0012	May 1926	P.H.D.	—
94	Ain Arab		—	—	—	—	0.41	0.004	Feb. 1926	P.H.D.	—
							0.12	0.0018	May 1926	P.H.D.	—
95	Ain Kash Kaleh	Hebron	—	—	—	—	0.44	0.0043	Jan. 1926	P.H.D.	—
							0.73	0.0072	Feb. 1926	P.H.D.	—
96	Ain el Kana		—	—	—	—	0.34	0.0033	Feb. 1926	P.H.D.	—
		Hebron					0.09	0.0009	March 1926	P.H.D.	—
97	Ain Nimreh		—	—	—	—	2.3	0.023	—	G.S.B.	Estimated average
98	Ain Kheir ed Din	Springs No. 93 to No. 104 inc. are located in the vicinity of Hebron and not shown on the map	—	—	—	—	1.37	0.015	April 1926	P.H.D.	—
							0.16	0.0016	June 1926	P.H.D.	—
99	Ain Haskah		—	—	—	—	1.64	0.016	Feb. 1926	G.S.B.	—
							1.10	0.011	April 1926	G.S.B.	—
100	Ain Zerka		823	2700	—	—	6.8	0.067	Feb. 1926	G.S.B.	—
							1.33	0.013	July 1926	G.S.B.	—
101	Ain Tahouneh		—	—	—	—	5.5	0.054	May 1926	G.S.B.	—
							0.37	0.0036	July 1926	G S.B.	—
102	Ain Issa Hussan		—	—	—	—	0.95	0.993	May 1926	G.S.B.	—
							0.28	0.0027	July 1926	G S.B	—
103	Ain Unkur		—	—	—	—	2.8	0.027	—	G.S B.	Maximum with large decrease in summer
104	Ain Siari		—	—	—	—	19	0.19	—	G.S.B.	Maximum with large decrease in summer.
105	Ayun Shune		30	96	—	—	750	7.3	—		
106	Benyamina		—	—	29.5	97	—	—	—	P.H.D.	Average total of three springs
										P.I.C.A.	Two sunken wells giving abundant supply
107	Ghabie No. II		—	—	28	92	—	—	—		
	Ghabie No. IV		—	—	28	92	—	—	—	P.I.C.A.	4 sunken wells with abundant supply
	Ghabie No. V		—	—	34	112	—	—	—		
	Ghabie No. VI		—	—	39	194	—	—	—		
108	Kerkur		—	—	24	79	—	—	—	P.L.D.C.	Sunken well with abundant supply

APPENDIX I.
LIST OF SPRINGS AND WELLS
REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
109	Hedera	Coastal Plain	—	—	23.5	77	40	0.39	—	P.W.D.	Average of sunken well
110	Tulkarem Agr. School		—	—	88	289	—	—	—	G.S.B.	Sunken well gave a poor yield at 31 m. (102 ft.) depth and an abundant supply at 80 m. (262 ft.)
111	Herzelia		33	108	45	148	120	1.18	—	A.Z.C.	Sunken well with maximum supply
112	Ras el Ain		61	200	—	—	30,000	290	—	P.E.C.	Average
113	Mejdel Jaba (well)		—	—	25	82	—	—	—	P.W.D.	—
114	Tel Aviv (well)		—	—	31	102	40	0.39	—	T.A.M.	Wells are located in city of Tel-Aviv. Quantities are averages
115	Allenby (well)		—	—	32	105	140	1.37	—	T.A.M.	
116	Badrani (well)		—	—	26	85	55	0.54	—	T.A.M.	
117	Rutenberg (well)		—	—	37	121	55	0.54	—	T.A.M.	
118	El Muzeirah (well)	Coastal Plain	—	—	36	118	—	—	—	P.W.D.	—
119	Rantieh (well)		—	—	42	138	—	—	—	P.W.D.	—
120	Surafend (well)		48.5	159	32	104	—	—	—	G.S.B.	—
121	Ben-Shemen (well)		—	—	48	158	10	0.098	—	P.W.D.	Average
122	Bir Yacob (well)		—	—	80	262	—	—	—	P.W.D.	Water is found at 37m. (122 ft.) depth with abundant supply at 80 m. (262 ft.)
123	Rehovoth (wells)		70	230	30	98	—	—	—	G.S.B.	—
124	Ekron (well)		—	—	—	—	5.2	0.051	—	P.W.D.	Average
125	Khuldeh (well)		—	—	191	627	—	—	—	P.W.D.	Water is found at a depth of 87.7 m. (288 ft.)
126	Sorek Sta. (well)		—	—	24.2	79	—	—	—	G.S.B.	Abundant supply is found at 14 m. (46 ft.) depth
127	Beit Duras (well)		—	—	28	92	—	—	—	G.S.B.	—
128	Balin (well)		—	—	24	79	—	—	—	G.S.B.	—
129	Julis (well)		—	—	24	79	—	—	—	G.S.B.	—
130	Surmeil (wells)		—	—	—	—	—	—	—	G.S.B.	Water is obtained at a depth of 50-60 m. (165-195 ft.)
131	Beit Affeh (well)	Coastal Plain	—	—	64	210	—	—	—	G.S.B.	—
132	Ijseir (well)		—	—	28	92	—	—	—	G.S.B.	—
133	El Falujeh (boring)		—	—	49.5	162	—	—	—	G.S.B.	Abundant supply is obtained at 43 m. (141 ft.) depth
134	El Huleikat (boring)		—	—	85	279	1.67	0.016	—	G.S.B.	Supply was obtained at 76 m. (250 ft.) depth
135	Hamameh (well)		—	—	27	89	—	—	—	G.S.B.	—
136	El Mejdel (well)		—	—	32	105	—	—	—	G.S.B.	—
137	Ej-Jayeh (well)		—	—	28	92	—	—	—	G.S.B.	—

APPENDIX I.
LIST OF SPRINGS AND WELLS
REF. MAP I.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
138	Beit Jerjah (well)	Wells numbered 135 to 146 are located in Gaza district and not shown	—	—	20	66	—	—	—	G.S.B.	—
139	Beit Jerjah (boring)		—	—	53.2	175	1.67	0.016	—	G.S.B.	This av. supply was obtained 42.5 m. (140 ft.) depth
140	Bureir (well)		—	—	39	128	—	—	—	G.S.B.	Abundant supply was obtained at 57 m. (187 ft.) depth of Boring 140a
140a	Bureir (boring)		—	—	66	216	—	—	—	G.S.B.	—
141	Tumrah (well)		—	—	20	66	—	—	—	G.S.B.	—
142	Nejed (well)		—	—	26	85	—	—	—	G.S.B.	—
143	Beit Hanun (boring)		—	—	35	115	1.67	0.016	—	G.S.B.	This av. supply was obtained at 28 m. (92 ft.) depth
144	Gaza (wells)	Coastal Plain	—	—	—	—	—	—	—	G.S.B.	A dozen wells with a depth varying from 18-45 m. (59-148 ft.) and average depth of 26 m. (85 ft.)
145	Huj (well)		—	—	35	115	—	—	—	G.S.B	—
146	El Maharata (well)		101	330	91	296	—	—	—	P.W.D.	Village is located about 5 km. south of Huj

Note: The initials given in the column ORIGIN OF INFORMATION stand for the following:

P.E.C.	Palestine Electric Corporation.
G.S.B.	G. S. Blake.
B. & E.	Breuer & Elek.
P.I.C.A.	Palestine Jewish Colonization Association.
J.W.S.	Jerusalem Water Supply.
P.H.D.	Public Health Department.
P.L.D.C.	Palestine Land Development Company.
A.Z.C.	American Zion Commonwealth.
T.A.M.	Tel-Aviv Municipality.

APPENDIX II.

LIST OF SPRINGS AND WELLS

REF. MAP II.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
1	Ain el Mushereif	Acco to Ras-en-Nakurah	—	—	—	—	—	—	Sept. 1927	A.E.B.	Spring irrigates about 50 dunams (10 acres) of grove
2	Bir Kefr Nebid (well)		—	—	15	49	—	—	Sept. 1927	A.E.B.	Well supplies water for about 500 head of cattle
3	Bir Tayoune (well)		—	—	8	26	—	—	Sept. 1927	A.E.B.	Well irrigates about 6 dunams (1.5 acres) of oranges
4	Ain Kabry		122	400	—	—	163	1.60	—	P.H.D.	Probably minimum
							320	3.14	—	P.W.D.	Probably maximum
5	Ain Jathun		—	—	—	—	125	1.23	—	P.H.D.	Probably constant
6	Ain Fuwarrah		60	197	—	—	230	2.26	—	P.H.D.	Fairly constant
7	Ain Mafshukh		60	197	—	—	250	2.45	—	P.H.D.	Fairly constant
8	Ain Assal		71	233	—	—	210	2.06	—	P.H.D.	Fairly constant
9	Bir Mimas (well)		—	—	25	82	—	—	Sept. 1927	A.E.B.	Well supplies water for about 800 head of cattle
9a	Kefr Yasif (well)		—	—	42	138	—	—	Sept. 1927	A.E.B.	
10	Sheikh Assad (well)		—	—	4	13	—	—	Sept. 1927	A.E.B.	—
11	Ayun el Bass (Kurdaneh)		3.85	12.6	—	—	7,500	73.5	—	P.H.D.	Average yield. Spring fairly constant
12	Water Station		0.0	0.0	—	—	62	0.61	—	P.H.D.	Probably average
13	Ain es Sadeh		6.0	19.7	—	—	146	1.43	—	P.H.D.	Provably average
14	Belled es Sheikl (wells)		—	—	0.5	1.5	—	—	Aug. 1925	Dr. L.P.	Several shallow wells
15	Ain Tah. el Merfukah		—	—	—	—	12	0.12	Aug. 1925	Dr. L.P.	—
16	Ain Tah. er Rahib		—	—	—	—	10	0.098	Aug. 1925	Dr. L.P.	—
17	Harbaj wells		—	—	—	—	125	1.23	Aug. 1925	Dr. L.P.	—
18	Ras el Ain		85	279	—	—	55	0.50	—	P.H.D.	Prob. minimum
							100	0.98	—	P.H.D.	Prob. maximum
19	Ain Juba	Haifa Bay	—	—	—	—	0.6	0.0059	Aug. 1925	Dr. L.P.	—
20	Bir Rhureibeh		—	—	—	—	—	—	Aug. 1925	Dr. L.P.	Shallow well
21	Yadjur wells		—	—	0.5	1.5	—	—	Aug. 1925	Dr. L.P.	Several shallow wells
22	Ainel Beida		—	—	—	—	—	0.0014	Aug. 1925	Dr. L.P.	—
23	Ain Opp Avodath Israel		—	—	—	—	25	0.25	Aug. 1925	Dr. L.P.	—
24	Ayun el Ghufr		—	—	—	—	10	0.098	—	B.&E.	Prob. minimum
							33	0.32	—	B.&E.	Prob. maximum
25	Ain Tell Aly		—	—	—	—	20	0.20	Aug. 1925	Dr. L.P.	—
26	Ain Esfia		—	—	—	—	1.8	0.018	Aug. 1925	Dr. L.P.	—
27	Ain Kussis		—	—	—	—	1.5	0.015	Aug. 1925	Dr. L.P.	—
28	Ain el Khudeirah		—	—	—	—	7	0.069	June 1925	Dr. L.P.	—
29	Ain Kh. el Beida		—	—	—	—	3	0.029	June 1925	Dr. L.P.	—
30	Ain el Khashabeh		—	—	—	—	—	—	June 1925	Dr. L.P.	Shallow well
31	Ain Semunieh		—	—	—	—	8.3	0.081	—	B.&E.	Prob. average

APPENDIX II.

LIST OF SPRINGS AND WELLS

REF. MAP II.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
32	Ain es Sufsafeh (well)	Emek—North of Kishom	—	—	1.0	3.3	—	—	June 1925	Dr. L.P.	—
33	Ain Umik Bey		—	—	—	—	0.5	0.0049	Dec. 1924	Dr. L.P.	—
34	Bir Malul		—	—	—	—	—	—	Dec. 1924	Dr. L.P.	Very small yield
35	Bir el Emir		—	—	—	—	2	0.02	Dec. 1924	Dr. L.P.	—
36	Ain Muda Uarah		—	—	—	—	7.3	0.072	—	C.Q.H.	Minimum
37	Ain Yafa		—	—	—	—	0.25	0.0025	Dec. 1924	Dr. L.P.	—
38	Drainage system of wadi Nitveh		—	—	—	—	7.2	0.071	—	C.Q.H.	Minimum
39	Ain Is-hak		—	—	—	—	8	0.078	June 1925	Dr. L.P.	—
40	Ain esh Sheikh		—	—	—	—	25	0.25	—	C.Q.H.	Minimum
41	Ain el Beida		—	—	—	—	12.5	0.12	—	C.Q.H.	Minimum
42	Ain el Malhah		—	—	—	—	1.0	0.0098	Oct. 1924	Dr. L.P.	Yield estimated
43	Ain el Hilu		—	—	—	—	1.0	0.0098	Oct. 1924	Dr. L.P.	Yield estimated
44	Bir Jebata		—	—	—	—	0.3	0.0029	Nov. 1924	Dr. L.P.	—
45	Ain Hammameh		—	—	—	—	0.3	0.0029	Nov. 1924	Dr. L.P.	Yield estimated
46	Bir Jinjar		—	—	—	—	0.5	0.0049	Nov. 1924	Dr. L.P.	—
47	Ain Tell Shadud		—	—	—	—	10	0.098	Nov. 1924	Dr. L.P.	—
48	Ain Tell Thorah		—	—	—	—	8.3	0.082	—	B.&E.	Average
49	Bir el Muweilik		—	—	—	—	0.6	0.0059	Nov. 1924	Dr. L.P.	—
50	Ain el Majahiyeh		—	—	—	—	8	0.078	Nov. 1924	Dr. L.P.	—
51	Ain Tarbaneh		—	—	—	—	12	0.12	Nov. 1924	Dr. L.P.	—
52	Ayun Tell Keimun (wells)	Emek—South of Kishon	—	—	0.75	2.5	—	—	Sept. 1927	A.E.B.	A dozen shallow wells
53	Ain el Beida		—	—	—	—	5	0.049	Sept. 1927	A.E.B.	—
54	Ain Mughayer (wells)		—	—	1.0	3.3	—	—	Sept. 1927	A.E.B.	3 shallow wells
55	Ain el Bradj (wells)		—	—	1.75	5.75	—	—	Sept. 1927	A.E.B.	3 shallow wells
56	Ain Abu Zereik		—	—	—	—	2	0.02	Sept. 1927	A.E.B.	Water very clear
57	Abu Zereik (wells)		—	—	0.25	0.8	—	—	Sept. 1927	A.E.B.	A couple of shallow wells
58	Ain el Kunnib		—	—	—	—	5	0.049	Sept. 1927	A.E.B.	One shallow well
59	Ain el Kasab (wells)		—	—	0.75	2.5	—	—	Sept. 1927	A.E.B.	Half a dozen shallow wells
60	Ayun el Farth (wells)		—	—	1.0	3.3	—	—	Sept. 1927	A.E.B.	Several shallow wells
61	Ain el Tineh		—	—	—	—	22	0.22	Sept. 1927	A.E.B.	Fairly constant
62	Ain Yussef Bek		—	—	—	—	4	0.039	Sept. 1927	A.E.B.	Combines with stream of wadi thereby doubling the capacity
63	Ain Tureimeh		—	—	—	—	5	0.049	Sept. 1927	A.E.B.	A couple of connecting springs
64	Bir Raba (well)		—	—	0.5	1.5	—	—	Sept. 1927	A.E.B.	—
65	Ain el Fhakhireh		—	—	—	—	4	0.039	Sept. 1927	A.E.B.	Half a dozen shallow wells connecting with a spring

Appendix II.

List of Springs and Wells

Ref. Map II.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
66	Ain Ludd	Emek—South of Kishon	——	——	——	——	35	0.34	Sept. 1927	A.E.B.	Fairly constant
67	Mishra es-Sufa		——	——	——	——	16	0.16	Sept. 1927	A.E.B.	——
68	Ain Umm el Kellaid		——	——	——	——	5	0.049	Sept. 1927	A.E.B.	Two springs
69	Ain Ataruk		——	——	——	——	5	0.049	Sept. 1927	A.E.B.	——
70	Ain Beida		——	——	——	——	3.0	0.029	Sept. 1927	A.E.B.	——
71	Ain et Tineh		——	——	——	——	5	0.049	Sept. 1927	A.E.B.	——
72	Ain Kh. Medineh		——	——	——	——	8	0.078	Sept. 1927	A.E.B.	——
73	Ain Khallet ez Zuk		——	——	——	——	5	0.049	Sept. 1927	A.E.B.	——
74	Ain Buseileh (wells)		——	——	1.0	3.3	——	——	Sept. 1927	A.E.B.	Two shallow wells
75	Ain Deheel		——	——	——	——	——	——	Sept. 1927	A.E.B.	Small spring with insignificant yield
76	Ain Fawar		——	——	——	——	17.0	0.17	Sept. 1927	A.E.B.	Fairly constant
77	Ain el Mensi		——	——	——	——	17.0	0.17	Sept. 1927	A.E.B.	Fairly constant
78	Ain er Roz		——	——	——	——	22.0	0.27	Sept. 1927	A.E.B.	Fairly constant
79	Ain el Kubbeh		——	——	——	——	38.0	0.37	Sept. 1927	A.E.B.	Fairly constant
80	Tell ed Daheb (wells)		——	——	1.0	3.3	——	——	Sept. 1927	A.E.B.	Several shallow wells
81	Tel Abu Kudeis (wells)		——	——	1.0	3.3	——	——	Sept. 1927	A.E.B.	Several shallow wells
82	Bir Rummaneh (well)		——	——	3.0	10.0	——	——	Sept. 1927	A.E.B.	——
83	Jenin Spring (Upper)		——	——	——	——	100	0.98	——	Dr. L.P.	Principal spring of town; yields estimated to be
83a	Kenin Spring (Lower)		——	——	——	——	285	2.8	——	G.S.B.	Averages but are fairly constant
83b	Afuleh		50	200	11.0	——	20	0.02	——	Zion Common	——
84	Merchavia (wells)		——	——	4.5	14.75	2	0.02	Oct. 1924	Dr. L.P.	——
85	Ain Solam		——	——	——	——	6	0.059	Oct. 1924	Dr. L. P.	Probably constant
86	Ayun et Trab		——	——	——	——	2	0.02	Oct. 1924	Dr. L.P.	——
87	Wadi el Ain		——	——	——	——	12	0.12	Oct. 1924	Dr. L.P.	Borings
88	Ayun el Hufiyir		——	——	——	——	——	——	Oct. 1924	Dr. L.P.	Shallow wells
89	Ain el Mukhuzakah		——	——	——	——	5	0.049	July 1927	Dr. L.P.	——
90	Ain el Meiyiteh	The Jalud	——	——	——	——	60	0.59	July 1927	Dr. L.P.	——
91	Ain Tubaun		——	——	——	——	30	0.29	July 1927	Dr. L.P.	Probably constant
92	Ain Jalud		——	——	——	——	700	7	July 1927	Dr. L.P.	Fairly constant
93	Ain Ummel Ghuzlan		——	——	——	——	15	0.15	July 1927	Dr. L.P.	Fairly constant
94	Ain Nuris		——	——	——	——	28	0.26	July 1927	Dr. L.P.	Fairly constant
95	Ain Tell Joseph		——	——	——	——	36	0.35	July 1927	Dr. L.P.	Fairly constant
96	Ain er Rihaniyeh		——	——	——	——	120	1.18	July 1927	Dr. L.P.	Fairly constant
97	Ain ez Zahrak		——	——	——	——	21	0.21	July 1927	Dr. L.P.	Probably constant

Appendix II.

List of Springs and Wells

Ref. Map II.

Number	Name	District	Elevation		Depth		Yield		Date of Observation	Origin of Information	Remarks
			Metres	Feet	Metres	Feet	m³/h	C.F.S.			
98	Ain es Sokhneh	The Jalud	——	——	——	——	700	7	July 1927	Dr. L.P.	Fairly constant
99	Ain el Asy		——	——	——	——	4,000	40	July 1927	Dr. L.P.	Fairly constant but slightly saline
100	Ain Fawarah		——	——	——	——	500	5	July 1927	Dr. L.P.	Fairly constant
101	Ain el Jemain		——	——	——	——	2,500	25	July 1927	Dr. L.P.	Fairly constant
102	Ain el Josak		——	——	——	——	4,000	40	July 1927	Dr. L.P.	Fairly constant
103	Ain el Madua		——	——	——	——	500	5	July 1927	Dr. L.P.	Fairly constant
104	Ain (name unknown)		——	——	——	——	30	0.3	July 1927	Dr. L.P.	Two springs with yield estimated
105	Ayun Khurbet el Mujedda		——	——	——	——	350	3.4	July 1927	Dr. L.P.	Fairly constant
106	Ain es Soda		——	——	——	——	2,800	27	Aug. 1927	Dr. L.P.	Fairly constant
107	Ain et Tineh		——	——	——	——	7	0.07	June 1927	Dr. L.P.	Prob. constant
108	Ain Ummel Flus		——	——	——	——	235	2.3	June 1927	Dr. L.P.	Prob. constant
109	Ain el Meyiteh		——	——	——	——	15	0.15	June 1927	Dr. L.P.	Prob. constant
110	Ain Bala		——	——	——	——	——	——	June 1927	Dr. L.P.	Yield unknown
111	Ain el Menshiyeh	Beisan	——	——	——	——	500	5	June 1927	Dr. L.P.	Prob. constant
112	Ain el Trim		——	——	——	——	20	0.2	June 1927	Dr. L.P.	Prob. constant
113	Ain Sheikh S'emad		——	——	——	——	5	0.048	June 1927	Dr. L.P.	Prob. constant
114	Ain el Dugheim		——	——	——	——	3,000	30	June 1927	Dr. L.P.	Several large springs with fairly constant yield
115	Ain Umm'Amud		——	——	——	——	70	0.69	June 1927	Dr. L.P.	Prob. constant
116	Ain Sabhah		——	——	——	——	110	1.08	June 1927	Dr. L.P.	Prob. constant
117	Ain Nuseirah		——	——	——	——	125	1.23	June 1927	Dr. L.P.	Prob. constant
118	Ain en Nukhleh		——	——	——	——	72	0.70	June 1927	Dr. L.P.	Prob. constant
119	Ain Nusrah		——	——	——	——	80	0.78	June 1927	Dr. L.P.	Prob. constant
120	Ain el Majerah		——	——	——	——	200	2	June 1927	Dr. L.P.	Prob. constant
121	Ain es Sarem		——	——	——	——	20	0.2	June 1927	Dr. L.P.	Prob. constant
122	Ain Sh. Muhammed el Kabu		——	——	——	——	150	1.5	June 1927	Dr. L.P.	Prob. constant
123	Ain es Sufsafeh		——	——	——	——	90	0.88	June 1927	Dr. L.P.	Prob. constant
124	Ain el Mugharabeh		——	——	——	——	75	0.74	June 1927	Dr. L.P.	Yield estimated. Prob. constant
125	Ain el Khane Zir		——	——	——	——	28	0.27	June 1927	Dr. L.P.	Prob. constant
126	Ain el Malhah		——	——	——	——	34	0.33	June 1927	Dr. L.P.	Prob. constant
127	Ain Umm Haiyeh		——	——	——	——	75	0.74	June 1927	Dr. L.P.	Yield estimated. Prob. constant
128	Ain Umm Sidreh		——	——	——	——	80	0.78	June 1927	Dr. L.P.	Prob. constant

Note: The initials given in the column ORIGIN OF INFORMATION stand for the following:

P.H.D. Public Health Department.
P.W.D. Public Works Department.
C.Q.H. C. Q. Henriques.
A.E.B. A. E. Barrekette
G.S.B. G. S. Blake.
B. & E. Breuer & Elek.
Dr. L. P. Dr. L. Picard.