

Assessment the Irrigation and Drainage Networks in AL- Manathera district using GIS

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Abstract:

This work is carried out in Al-Manathira Center (which includes Al-Heera sub district, Al-Mishkahab sub district, and Al-Qadisiya sub district) located in Najaf governorate. This study concern in the irrigation and drainage networks and their installations. For this region the study is presented by two stages for standing on important problems for irrigation and drainage projects. The first stage is to describe the irrigation networks and identify the unemployed parts need repair and which parts need to be replaced, where Arc map GIS version 10.2 can be used to create geo-database for the irrigation and drainage network, their installations, recorded Regulators and pumps performance. Installations of irrigation and drainage network need maintenance, feature class of Arc map GIS recorded: 5 Regulators, 1 Pump station. While the second stage is to describe the drainage networks and determine their efficiency. Finally, the effect of this is on the amount of water leaking, the area of cultivated land and the impact on the quantity of the crops.

Keywords: Irrigation networks, Drainage networks, Regulators, Pump stations.

تقييم شبكات الري والبزل في قضاء المناذرة باستخدام نظم المعلومات الجغرافية

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الخلاصة:

نُفذ هذا العمل في مركز المناذرة (الذي يشمل ناحية الحيرة وناحية المشخاب وناحية القادسية) في محافظة النجف, التي تحظى بشبكات الري والصرف ومنشآتها. وبالنسبة لهذه المنطقة، نفذت الدراسة على مرحلتين للوقوف على المشاكل الهامة بالنسبة لتوقعات الري والصرف. المرحلة الأولى هي وصف شبكات الري وتحديد الأجزاء العاطلة عن العمل وبيان ما يحتاج منها إلى إصلاح وما يحتاج منها إلى استبدال, حيث برنامج نظم المعلومات الجغرافية استخدم لبناء قاعدة البيانات الأرضية لشبكات الري والصرف ومنشآتها وتسجيل أداء النواظم ومحطات الضخ. منشآت الري والصرف التي تحتاج إلى صيانة, قاعدة بيانات نظم المعلومات الجغرافية سجلت خمسة نواظم ومضخة واحدة. في حين أن المرحلة الثانية هي وصف

شبكات الصرف وتحديد كفاءتها. أخيراً معرفة تأثير ذلك على كمية المياه المتسربة و مساحة الأراضي المزروعة ومدى تأثير ذلك على كمية المحصول.

الكلمات المفتاحية: شبكات الري, شبكات البزل, نواظم, محطات ضخ.

1. Introduction

Iraq is one of the oldest countries in the world which have used irrigation systems, but it locates in the dry and semi-dry zone. It is due to nature of climatic characteristics, it cannot depend on rains in the construction of the agricultural economy and secure the production of food and industrial crops. The dry and semi-dry zone have been known for the amounts of rainfall on them are few, and irregular in distribution and interrupted over some years. This causes drying to some areas, so the Iraqis have adopted since the early ages on the agriculture irrigated, which is based essentially on the water sources of the rivers of Tigris and Euphrates, and streams them [1]. Water is the basic natural resources, it is important and essential to life for all living, and it is - rightly - the cornerstone of every economic and social development of the country is not surprising as it is said where there is found water life [2]. Irrigation and drainage network are an important element in agricultural development and the important means for soil conservation, protection, and thus earth elements development and increase its productivity. The productive capacity of agricultural lands are mainly dependent on provision of water needs and this necessarily requires irrigation network with high efficiency to ensure for linking of irrigation water at the right time and in the quantities required for the cultivated lands. Drainage network should be the same of statue because it plays a big role in determining the productive capacity of agricultural land, which required being

necessarily highly efficient in order to facilitate the disposal of excess water need. As excessive harm thirst and kill plantation, the excess water beats and kills it too; therefore the irrigation and drainage networks are interacting each other [3]. Irrigation can be defined as the process that supplies of soil by water by using methods and manners different to reserve wet level suitable to grow of vegetation,[4], while the drainage is defined as prevent excessive soil water pool (either on the soil surface or in the root zone of the plant) to provide continuous movement of water to bottom through the soil, [5]. At recent days ArcGIS and remote sensing have been used in the irrigation and drainage networks management where GIS application includes data layers of canals network with it's a database are: canal length, canal name, served area; and drainage network with it's a database include: name, length, current situation,[6].

2. Data used and Study area

2.1 Material and software used can be listed by;

- Water resources directorate data.
- The irrigation and drainage networks Map (scale is 1cm=1,750 meters) in JPEG form.
- Arc Map GIS version 10.2.
- Adobe Photoshop version 13.0.1.3 of CS6.

1.2 Study Area

AL-Najaf province locates in the south-west part of Iraq, see Figure (1), which is represented by longitude ($42^{\circ}50'00''$ - $45^{\circ}44'00''$) and by latitude ($29^{\circ}50'00''$ - $32^{\circ}21'00''$) covering an area of 2820288.47 hectares. It is bounded from the north by provinces of Babel and

Karbala and from east it is bounded by provinces Qadsia and Muthna, from south and south-west, it is bounded by Saudi Arabia kingdom. From west, it is bounded by Anbar province. *AL-Manathera* district center locates about 18 km south and south-west of AL- Najaf district center, covering an area of 76416.59 hectares, [7].

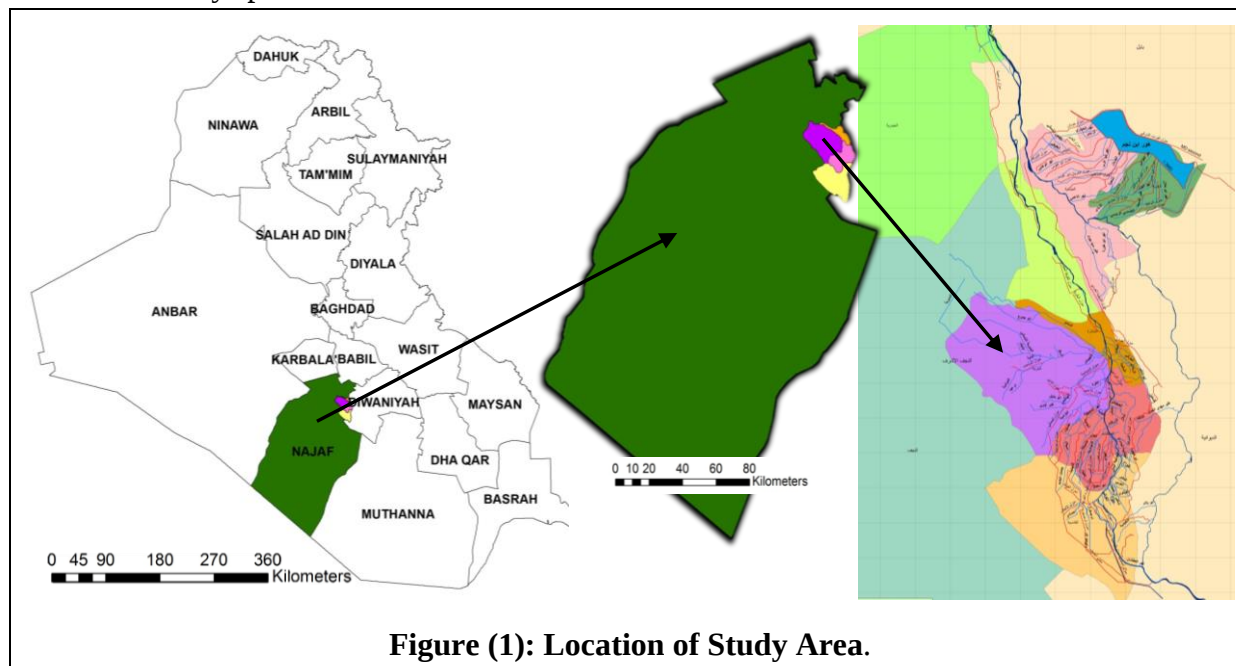


Figure (1): Location of Study Area.

3. Result and Discussion:

3.1 The Irrigation Networks Description

Al-Manathera district center consists of: Al-Heera sub district, Al-Mishkahab sub district and Al-Qadisiya sub district. It depends mainly on the Euphrates River and streams branched from it. The total cultivated area covered by this project is **150718** donums, with a total irrigated area of **146647** donums that includes network of branches, main, secondary and field drains, network of main and secondary unlined streams. The Euphrates River separates of two province, Najaf and Babel, where the length of main duct in study area reached about **75.2 km**, about **40 km** with out to branch any stream [9]. Branching River of Al-Kuf at Al-Manathera district center and Al-

Mishkahab sub district, and it branch continue until enter Al-Heera sub district, see Table (1) and Figure (2). Number. of branches of main and secondary of river of Al-Kufa from begin branch until end exit it at Al-Qadisiya sub district (**76**) branches with a total lengths about (**434.07**) km and a total discharges about (**705.06**) m^3/sec . These branches are distributed into (**12**) branches in Al-Heera sub district, that are reached a total length about (**117.2**) km with a total discharge about of (**66.454**) m^3/sec , and (**45**) branches in Al-Mishkahab sub district, with a total length about of (**188.175**) km with a total discharge reached of about (**128.606**) m^3/sec , while (**19**) branches in Al-Qadisiya sub district, with length of about (**128.695**) km with discharge of about (**510**) m^3/sec . the cultivated lands area which are benefited from these branches of about (**131947**)

donums, where it is distributed to about (47300) donums within Al-Heera sub district, (38056) donums within Al-

Mishkahab sub district and (46591) donums within Al-Qadisiya sub district.

Table (1) : Stream Network in Al-Manathera District Center[8]

Id	Stream name	Location	length\km	Discharge\m3\s	Irrigated area\donum	Canal type
1	Asadeer	Al-Heera sub district	28	3.28	5100	unlined\main
2	Abojdow	Al-Heera sub district	18	4.17	3250	unlined\main
3	Albdaria	Al-Heera sub district	26.2	8	8055	unlined\main
4	Allhebat	Al-Heera sub district	3	0	75	unlined \secondary
5	Alrbaa	Al-Heera sub district	2	0	50	unlined \secondary
6	ALdlela	Al-Heera sub district	1	0	50	unlined \secondary
7	Albdaria northern	Al-Heera sub district	11	0	300	unlined \secondary
8	Alabetar	Al-Heera sub district	2	0	50	unlined \secondary
9	Aldobsha	Al-Heera sub district	10	0	50	unlined \secondary
10	Amabd	Al-Heera sub district	4	0	50	unlined \secondary
11	Alshahria	Al-Heera sub district	4.2	0	0	unlined\main
12	Tobar alamam	Al-Heera sub district	5	0	1000	unlined\branch
13	Aboshriaa	Al-Heera sub district	1	0	300	unlined \secondary
14	Abohleel	Al-Heera sub district	4	0	200	unlined \secondary
15	Chahat alkadeem	Al-Heera sub district	7	28	4720	unlined\main
16	Altraa	Al-Heera sub district	6	4	0	unlined\main
17	ALazameya	Al-Mishkahab sub district	9.5	3.5	1200	unlined\main
18	Aljadwal	Al-Heera sub district	2	0.5	500	unlined \secondary
19	Chahat aljadeed	Al-Heera sub district	14	0	4000	unlined \secondary
20	Asyaad	Al-Mishkahab sub district	3	2.5	850	unlined \secondary
21	Aljadeda	Al-Mishkahab sub district	2	0	1550	unlined \secondary
22	Alyanee	Al-Mishkahab sub district	3	0	200	unlined \secondary
23	River of	Al-Mishkahab	3	1.5	900	unlined \main

	almjahela	sub district				
24	Altelila	Al-Mishkahab sub district	1	0	150	unlined \secondary
25	Aldbniya	Al-Mishkahab sub district	9.1	14.12	2500	unlined \main
26	Alglal	Al-Mishkahab sub district	6	0	100	unlined \secondary

The important branches Al-Kufa River according to length and area of benefited cultivate are: stream of Chahat, which it has a total length of about **(38.9) km, 5.4 km** at Al-Heera sub district, **28 km** at Al-Mishkahab sub district while ,5.5 km in Al-Qadisiya sub district, where lands are befitted from it about **27250** donums in Al-Mishkahab sub district and Al-Manathera district center, and from Chahat a group of irrigation streams such as (Asadeer, Abojdow, Albalaria, Alhashemi, Alshahria, Altraa, and ALazameya) with length about **(28, 18, 26.5, 13, 4.2, 4.2, and 3)** km respectively, as shown in Figure(1). But from left side of Al-kufa River in Al-Manathera district center, where branched from Al-kufa River four main streams, namely Kashaheel, Albachay, Abodananeer, and Alarfya) with length **(3, 2, 5.8, and 4.1)** km respectively and average discharge about **(1.08,1,3.25,and 3.25) m³/sec** respectively and which are benefited from them about 5000 dounms. Table (1) summarizes database included details for some streams. An important streams which are branched from Al-kufa river within Al-Mishkahab sub district represented as (Chahat, Aldbniya, ALazameya, main Alswaria, and Tobar sayad noor), with lengths about of **(28, 9.1, 9.5, 8.175, and 7)** km respectively and with a total discharge about **55.77 m³/sec**.

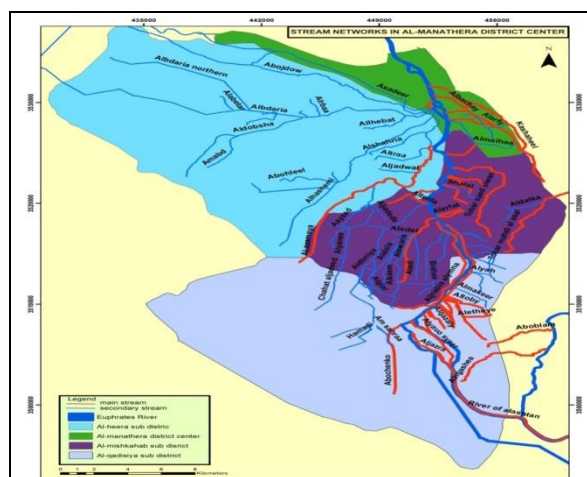


Figure (2): Stream Networks in Al-Manathera District Center.

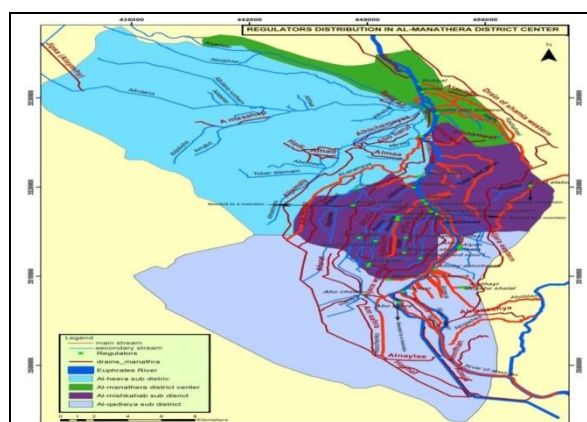


Figure (3) :Regulators Distribution in Al-Manathera District Center.

AL-Manathera district center has **33** Regulators that can be described as follows;

- On Al-Kufa river there are about **10 head Regulators** to control and manage the water levels in the main streams and **2 cross Regulators** on Al-Kufa river to raise and control water levels in it which are called

Alyauo regulator and Abo ashra reulator.

- On main streams there are **8 head Regulators** to control and manage the water levels in it and secondary streams, whereas **3 rear Regulators** on main streams namely (Moyahe shalal, Alethayi) and Moyaher Abodcheech to raise and control water levels in it and prevents the passing water toward drains of Aljara eastern and Aljara western respectively.
- On secondary streams there are **3 head Regulators** to control and manage the water levels in it, while **4 cross Regulators** on secondary

streams to raise and control water levels in it, but **3 rear Regulator** on secondary streams namely Al jaelan, Moyahe abo sofsafa and Abo chinko to raise and control water levels in it and prevented the passing water toward drains of Alfatla, prihy and Abohishniaa respectively. Totally there are **33 Regulators** which are distributed in Al-Manathera district center, **3 Regulators** in center, **3 Regulators** in Al-Heera sub district, **19 Regulators** in Al-Mishkahab sub district and 8 Regulators in Al-Qadisiya sub district, and shown in Figure(3). Table (2) presents details of Regulators.

Table (2): Details of Regulators in Al-Manathera District Center[8]

ID	Regulators name	Number of gates	Easting /m	Northing /m	Discharge m ³ /sec	Location	Area irrigated donum	State of Regulator	Structure Name
1	Abo ashra	4	450836	3507040	150	Al-Qadisiya	20000	unemployed of gates	Head
2	Abo chinko	3	448946	3507955	150	Al-Qadisiya	15000		Cross
3	Alyauo	7	451150	3508253	400	Al-Qadisiya	20000		Head
4	Moyaher Abodcheech	3	450293	3509630	150	Al-Qadisiya	1500		Cross
5	Altoby almoharab1	1	452966	3510807	150	Al-Qadisiya	1500		Head
6	Altoby almoharab2	1	448936	3511046	150	Al-Qadisiya	1500		Cross
7	Al jaelan	1	448922	3511029	150	Al-Manathera	1500		Cross
8	Alethayi	1	454620	3508758	5	Al-Qadisiya	1000		Cross
9	Moyahe shalal	1	454587	3508760	5	Al-Mishkahab	1000		Cross
10	Tobar saed noor1	3	452175	3512030	4	Al-Mishkahab	6000		Cross
11	Moyahe abo sofsafa	1	451298	3514327	1	Al-Mishkahab	350		Cross
12	alyah	1	454469	3513146	1	Al-Qadisiya	1100		Cross
13	Alzyadi	1	454481	3513254	1	Al-Qadisiya	1000		Cross
14	Asyara alcataa\1	1	449491	3513972	1	Al-Mishkahab sub district	1000		Cross
15	Abo ftayas	1	448552	3514335	1	Al-Qadisiya	4000		Cross
16	Abo sofsafa alqadsy	1	451298	3514327	1	Al-Mishkahab	350		Cross
17	Asyara afrayaa	1	449512	3513957		Al-Mishkahab	1000		Cross
18	Tobar saed Mohmad	1	450826	3516351	1.5	Al-Mishkahab	1500		Cross

19	Ashwala	2	450871	3516657	2	Al-Mishkahab	12000		Cross
20	Aljnabya alyomna alcataa\1	1	453106	3517003	1.5	Al-Mishkahab	1200	unemployed of gates	Cross
21	Tobar saed noor2	3	452774	3517260	4	Al-Mishkahab	6000	unemployed of gates	Cross
22	Tobar brahee2	2	452778	3517256	1	Al-Mishkahab	3000		Head
23	Al-Mishkahab	7	452808	3517581	750	Al-Mishkahab	36000		Head
24	Asyara	4	452308	3518507	15.3	Al-Mishkahab	1000		Head
25	Aldbenya	1	451769	3519988	14	Al-Mishkahab	2000		Head
26	Asyid	1	448374	3519847	1	Al-Manathera	1500		Cross
27	Ksrat chahat	2	448169	3517946	1	Al-Mishkahab	3500	unemployed of gates	Cross
28	Almjaheela	4	452071	3521215	1.5	Al-Mishkahab	6110		Head
29	Ksrat alabd	3	458625	3520349		Al-Mishkahab	2000	unemployed of gates	Cross
30	Chahat main	2	452234	3525669	20	Al-Mishkahab	17000		Head
31	Almalha abo dnaneer	2	453164	3528293	3.25	Al-Manathera	1800		Head
32	Kchkal	2	452089	3531571	1.1	Al-Manathera	1150		Head
33	Bachay	2	452270	3530677	2	Al-Manathera	500		Head

From Table (2), it is noticed the following;

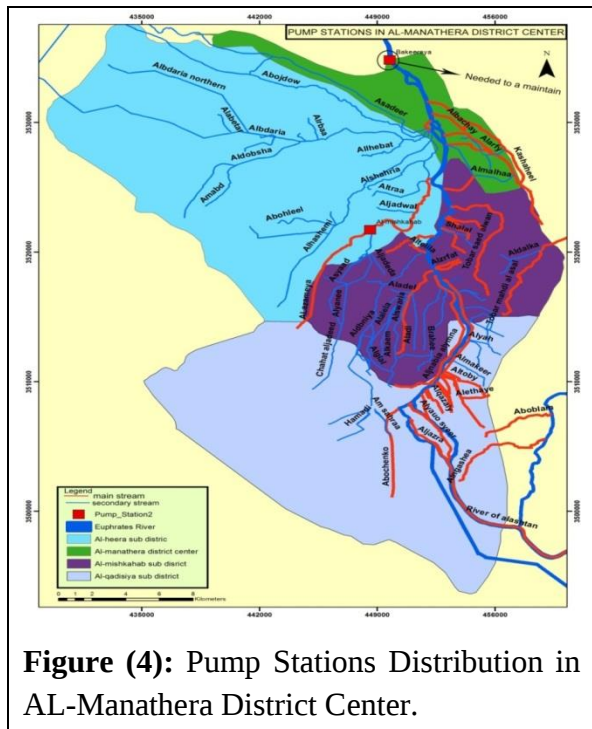
- About **28 Regulators** work well and a total irrigated area of **141360** donums.
- Whereas about **5 Regulators** (Abo ashra, Aljnabya alyomna alcataa\1, Tobar saed noor2, and Chahat main) have a malfunction of gates which identified by black color circle and serve a total irrigated area of **32700**

donums, as shown in Figure (3), and thus cause harm for the agricultural production.

AL-Manathera district center has two pump stations namely, Al-Mishkahab station and Bakeereya station that are shown in Figure (4), Al-Mishkahab station for pumping water from stream of ALazamyia to stream of Chahat aljadeed that works well and with total discharge of $3 \text{ m}^3/\text{sec}$.

Table (3): Details of Pump Stations in AL-Manathera District Center [8]

ID	Site Name	Location	Easting /m	Northin g /m	Total Number of Pumps	Discharg e of Each Pump	Power (KW)	Fuel type	Head (m)
1	Al-Mishkaha b	Al-Mishkaha b	448574	352171 6	3	$3 * 1 \text{ m}^3/\text{s}$	$3 * 224$	3 Diesel	13m
2	Bakeereya	Al-Manather a	449745	353482 7	2	$1 \text{ m}^3/\text{s} + 3 \frac{1}{4} \text{ m}^3/\text{s}$	$224 + 90$	1 Diesel +1Electric	12m



3.2 Drainage Networks Description

The drains of AL-Manathera district center (drains of AL-Kufa River) can be pointed as follows:

- **Drain of Aljamaly**

It is one of the extensions drain of the Hashaf main which stretches south toward Al-Qadisiya sub district between lands located south-west Al-Heera sub district the right side of Rivers of Al-Kufa, see Figure (5). It has a length at Al-Heera sub district of about (10.4) km with the mean discharge of (10) m^3/sec . It is

drained by gravity, and it takes a (western-eastern) extension until it ends in the drain of the Hashaf, south of Al-Mishkahab sub district.

- **Drain of Jipsa (Alayashy)**

This drain is one of the main drains, with a length of 12 km and mean discharge of $5m^3/sec$. It is drained by gravity and poured it in drain branches (Amasahap, Alhichamayaa, Syed Ali, Albrkat and Althoaar) within Al-Manathera district center, and it ends in the drain of the Hashaf. Table (4) summarizes database including of drain name, location, length in km, a discharge in m^3/sec and type.

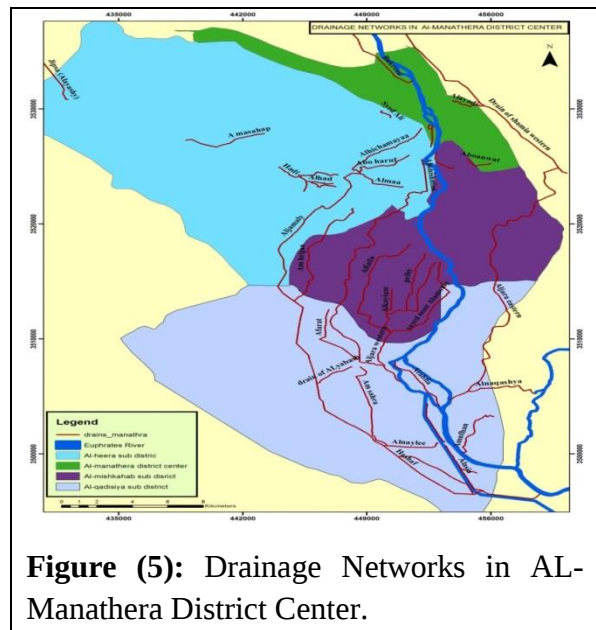


Table (4) : Drainage Networks in Al-Manathera district center[8]

Id	Drains name	Location	Length\km	Discharge m^3/sec	Type
1	Drain of Aljara eastern	Al-Mishkahab sub district	9	2	main drain
2	Alnaqashya	Al-Qadisiya sub district	2.5	2	branch drain
3	Drain of of Bakreea	Al-Manathera district center	6	0	main drain
4	Drain of Altoby	Al-Qadisiya sub district	2.2	0	branch drain
5	Drain of A masahap	Al-Heera sub district	10	4	branch drain
6	Drain of Jayer alfrwoon	Al-Heera sub district	1.5	0	Field drain
7	Drain of Alhad	Al-Heera sub district	3	0	Field drain
8	Drain Said Abas	Al-Heera sub district	5	0	branch drain

9	Drain of Almaa	Al-Heera sub district	3	0	branch drain
10	Drain of Alasia	Al-Qadisiya sub district	4	0	branch drain
11	Drain of Alhichamayaa	Al-Heera sub district	5.5	4	branch drain
12	Drain of Abohishniaa	Al-Qadisiya sub district	7	12	branch drain
13	Drain of said noor	Al-Qadisiya sub district	0	4	branch drain
14	Alfatla	Al-Mishkahab sub district	9	7	main drain
15	Drain of Alkayiam	Al-Mishkahab sub district	3	0	branch drain
16	Drain of prihy	Al-Mishkahab sub district	3	0	main drain
17	Drain of alyaseriya	Al-Mishkahab sub district	3	0	branch drain
18	Drain of Am hrijaa	Al-Mishkahab sub district	6	10	main drain
19	Drain of Afarat	Al-Qadisiya sub district	3	0.5	branch drain
20	Drain of ALyabash	Al-Qadisiya sub district	4	0	branch drain
21	Am sahraa	Al-Qadisiya sub district	6	3	branch drain
22	Drain of Atablia	Al-Qadisiya sub district	5	3	branch drain
23	Drain of Almonfhat	Al-Qadisiya sub district	4.2	2	branch drain
24	Drain of Am sahraa	Al-Qadisiya sub district	6	3	branch drain
25	Drain of Al-Qadisiya northern	Al-Qadisiya sub district	3	0	branch drain
26	Drain of Aljladia northern	Al-Qadisiya sub district	2	0.7	branch drain
27	Drain of Alnayaeer	Al-Mishkahab sub district	2	0	secondary drain
28	Drain of Aboanwat	Al-Mishkahab sub district	6	2	main drain
29	Drain of Alayadi	Al-Manathera district center	1.5	0	branch drain

- **Drain of A masahap**

This drain represents sub drains, and it has a length of **10** km and mean discharge of **4 m³/sec**, and it drains directly by gravity in the drain of jipsa main (alayashy), within Al-Manathera district center.

- **Drain of Alhichamayaa**

This drain represents sub drains, and it has a length of **5** km and mean discharge of **0.5 m³/sec**, and it takes direction northern-southern then drained directly by gravity in the drain of jipsa main(alayashy), within Al-Manathera district center.

- **Drain of Am hrijaa**

This drain extends in irrigated agricultural lands, it locates on the right side of the streams of Alazamia, with a

length of **5** km and mean discharge of **10 m³/sec**. This is one extensions a drain of the Hashaf. It takes direction of a (eastern- western) and it is drained by gravity.

- **Drain of Abohishniaa**

It is one of the longest main drains of Al-Mishkahab sub district, with a length of **16** km and mean discharge of **12 m³/sec**, it takes the trend of a (eastern- western), and it drains by gravity, then ends in Al-Qadisiya sub district at Drain of aljara eastern.

- **Drain of Alfatla**

This drain extends in irrigated agricultural lands from Alswaria stream in right side within Al-Mishkahab sub district, it has a length of **9** km and mean discharge of **7 m³/sec**. It takes a trend of a (northern- southern) and drained it by

gravity , and it ends in Al-Qadisiya sub district.

- **Drain of Aboanwat**

Drain of Aboanwat represents sub drains, it has a length of 6 km and mean discharge of $3 \text{ m}^3/\text{sec}$, then locates within Al-Mishkahab sub district and drained it by gravity in drain of Aljara eastern at Al-Qadisiya sub district.

- **Drain of the Hashaf**

It is one of the longest main drains within Al-Qadisiya sub district, with a length of 24 km and mean discharge of $30 \text{ m}^3/\text{sec}$, and the drain of the Hashaf represents geographical extension of the drain of Aljamaly and the drain of Amhrija which locates within the boundaries of Al-Mishkahab sub district, as they took a trend of a (northern- southern) within Al-Mishkahab sub district, and an (eastern - western) within Al-Qadisiya sub district, and drained water in sub drains such as drain of Asoanwy, Alqas, Arfeea (Tobar Arfeea) ,Algasheem, Aljladia, and drain of Alalwa (drain of Altbara), then drained it by gravity . It is extended until is meting a stream of Al-Qadisiya .

- **Drain of Aljara eastern**

This drain represents main drains in order to discharge the irrigation water excess from agriculture lands irrigated by stream of Jnabya alyasra and its branches (Ahamer, Alethay, and Alwah), it is has a length of 9.4 km with mean discharge of $20 \text{ m}^3/\text{sec}$, and ended it sub drains (drain of Alhmamea, Eastern Alwah, Jweiha, Qsad, Alohmr, Alohmr east, Almaa, Nkarh - Sabty, and, Alngeshah alhadeth). This drain overlaps with the administrative border between province of Najaf and province of Qadisiyah and it takes trend northern-southern abutting River of AL-Kufa from the left side and drained it by

gravity in stream of Alyaoo one branch of River of AL-kufa in Al-Qadisiya sub district.

- **Drain of Aljara western**

Drain of Aljara western represents main drains discharged by gravity which is poured sub drains (Adob, sayed noor Alamomy, Altrman, Hasraa, Abohishniaa). This drains located administratively within Al-Mishkahab sub district, the total length of this drain is 9.25 km with mean discharge of $25 \text{ m}^3/\text{sec}$ and it extends until enters Al-Qadisiya sub district center toward the west-east, and it ends in stream of Abo ashraa, one branch of River of AL-kufa from the right side.

- **Drain of Saed noor alamome**

This drain represents sub drains, has a length of 3.5 km and mean discharge of $4 \text{ m}^3/\text{sec}$, it takes direction (west-east), with discharged by gravity in drain of Ajara western.

- **Drain of Atablia**

This drain represents sub drains, has a length of 5.25 km and the mean of discharge $4 \text{ m}^3/\text{sec}$, it takes direction (west-east), with discharged by gravity in stream of yawoo a branch of Euphrates River.

- **Drain of Amahwat**

This drain represents sub drains, has a length of 3.1 km and mean discharge of $0.7 \text{ m}^3/\text{sec}$. It takes direction (west-east). It is discharged by gravity in drain of Alabodah .

- **Drain of Amnfhan**

This drain represents sub drains, has a length of 4.2km and mean discharge of $1 \text{ m}^3/\text{sec}$. It takes direction (west-east), it is discharged by gravity in drain of Alabodah .

- **Drain of Al-Qadisiya ALjaded**

This drain represents sub drains, has a length of **9.4 km** and mean discharge of **4 m³/sec**, it takes direction of north-south. The lands are located between stream of Alashtan and stream of Al-Qadisiya have been benefited from this drain, and it discharged by gravity toward the stream of yawoo.

- **Drain of Am sahra**

This drain represents sub drains, has a length of **6 km** and mean discharge of **3 m³/sec**, it takes direction west-east, it discharges by gravity in drain of the Hashaf.

- **Drain of Afarat**

This drain represents sub drains, has a length of **2.7 km** and mean discharge of **0.5 m³/sec**, it takes direction west-east, it is discharged by gravity in drain the Hashaf.

- **Drain of Alnaqashya**

This drain represents sub drains, has a length **1.9 km** and mean discharge of **0.5 m³/sec**, it takes direction (west-east), with discharged by gravity in drain of Alabodah.

4. Conclusions

Outcomes of field investigation during interviews with the staff and the farmers can be summarized as follows:

1. According to the above Table (1) all the streams unlined within Al-Manathra district center, where cause the water losses due to conveyance of water during a seepage processes as well as growth of a natural plants.
2. From the above Table (2), it can be noticed the following;
 - About 28 Regulators good work with a total irrigated area of 141360 donums.
 - Whereas, about 5 Regulators are unemployed of gates which are served a total irrigated area of 32700 donums, thus causes harm of the agricultural production.
3. All Regulators are worked manually except Regulators of Abo ashra and Alyauo are worked Electrically.
4. Bakeereya station needs a maintenance that has a total discharge of 1.25 m³/sec, where there is disrupted engine.
5. There are two main streams linked with drains of Aljara western and drain Aljara eastern, while there are three secondary streams linked with drains of Alfatla, prihy and Abohisniaa, may cause further pollution in their water at this sites, thus may be lead to lack agricultural production.

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