

Republic Of Iraq
Ministry of Higher Education
and Scientific Research
University of Technology
Building and Construction Dep.
Water and Dams Engineering Branch



**Design of Al Khamissyia Canal by using HEC-RAS
Software**

Annual project submitted to the department of
building of construction engineering of the University
of Technology in partial fulfillment of requirements for
the degree of B.Sc

In building and construction engineering

Submitted by

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

سُبْحَانَكَ اللَّهُمَّ إِنَّا نَعْلَمُ أَنَّكَ أَعْلَمُ بِمَا نَعْلَمُ إِنَّا نَعْلَمُ أَنَّكَ أَنْتَ

الْعَلِيمُ الْعَظِيمُ

صَلَّى اللَّهُ عَلَيْكَ الْعَظِيمِ

لِلسورة البقرة (٣٢)

July 1958

Dear Mr. [Name],

I am writing to you regarding the [Topic]

As you know, the [Topic] is a very important [Topic]

and I am sure that you will find it of interest.

I am sure that you will find it of interest.

Very truly yours,

[Name]

[Title]

[Address]

[City]

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1. The first part of the document is a list of names and addresses of the members of the committee.

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LIST OF ABBREVIATIONS

CRIM	Center for the Restoration of Iraqi Marsh lands.
FAO	Food and Agriculture Organization.
MOD	Main Outfall Drain.
MOE	Ministry of Environment
MOWR	Ministry of Water Resources.
UNEP	United Nation Environmental Program.
WHO	7World Health Organization.

CHAPTER ONE

INTRODUCTION

1.1 General

Al Hammar Marsh is considered as one of the largest Marshlands in Iraq. The marsh running below Euphrates River before it joins Tigris River, at Al Qurna City, from Al Nassiriyah City in Thi Qar Governorate to Al Chibaeich north of Al Basrah Governorate. Al Hammar Marsh is located between latitude 46° to 47° , and longitude 30° to 30.5° , bounded by Euphrates River as the north boundary, Shatt Al Arab River as the east boundary, and Al Basrah Water Supply Project main supply channel and the Main Outfall Drain as the south boundary, and Suq AshShuyukh as the west boundary.

During the last two dry years, there was a great shortage in the water required maintain Al Hammar Marsh. The area of the marsh was reduced greatly threatening the ecological system and economics of the marsh residents.

A suggestion was made by CRIM and other related ministries to make use of the MOD water to feed the marsh as *a temporary solution* that will prevent the marsh to dry again. CRIM studied the impact of this temporary solution on the water quality within the marsh and on the ecological system. CRIM carried out a hydrological routing analysis based on the objective of maintaining Al Hammar Marsh area and minimizing the evapo-transpiration, ET_0 , losses.

A suggestion was made to minimize the marsh area to a value that keeps contiguous lake during the period of high ET_0 and to be increased up during the period of low ET_0 . Accordingly, based on the incoming and outgoing discharges, the variation of inflow and outflows discharges, water level, marsh area, water volume, and the water quality within the marsh were specified. The decision which marsh operation is the optimal is based on minimizing the water quality deterioration within Al Hammar Marsh.

Based on the hydrological routing analysis, a mathematical hydraulic model was implemented to specify the submerged area within the marsh. The discharges that could be inflow into the marsh from the MOD and conserve the ecological system of Al Hammar Marsh within the acceptable international standards were specified according to results of the hydrological routing and the hydraulic models.

To divert these discharges from the MOD to the marsh it is necessary to construct an open canal with a control structure at the upstream of this canal to control these discharges.

CRIM studied several possible locations to divert the MOD water to Al Hammar Marsh. The conclusion that was made by CRIM is to divert an average of about $130 \text{ m}^3/\text{s}$ to Al Hammar Marsh from the MOD by constructing a linking canal. The canal intake is located downstream of the pump station at $136 +430 \text{ km}$ of the MOD, $E= 633137$ $N= 3407199$, and ends at a point within Al Hammar Marsh located by $E=637273$ and $N= 3411982$. This canal is called Al Khamissiya Canal.

1.2 Aim of the project

This project aims to prepare designs of Al Khamissiya Canal and hydraulic structure to control the inflow discharges from the MOD to Al Hammar Marsh.

1.3 Methodology of work

The methodology of carrying out this project can be summarized as follows:

- 1- Reviewing the related literatures,
- 2- Collecting the topographical, hydrological and water quality data,
- 3- Implementing a steady one dimensional hydraulic model by using the HEC- RAS software to simulate the flow in the MOD.
- 4- Using the HEC- RAS software to design the proposed canal ,
- 5- Using the HEC- RAS software to design the proposed control structure by using a steady one dimensional hydraulic model to simulate the flow in Al Khamissiya Canal.
- 6- Discussing the results and giving the necessary recommendations.

CHAPTER TWO AREA OF STUDY

2.1 Al-Hammar Marsh

Al Hammar Marsh is considered as one of the largest Marshlands in Iraq. The marsh running below Euphrates River before it joins Tigris River, at Al Qurna City, from Al Nassiriyah City in Thi Qar Governorate to Al Chibaeich north of Al Basrah Governorate. Al Hammar Marsh is located between latitude 46° to 47° , and longitude 30° to 30.5° , bounded by Euphrates River as the north boundary, Shatt Al Arab River as the east boundary, and Al Basrah Water Supply Project main supply channel and the Main Outfall Drain as the south boundary, and Suq AshShuyukh as the west boundary. **Figure 1** shows the general layout of Al Hammar Marsh.

Some parts of Al Hammar Marsh was isolated by constructed dykes and drained to facilitate the development and exploitation of oil resources by the South Petroleum Company. An unpaved road was constructed to connect the north part of Al Hammar Marsh with the south part at ArRumaila Oil Fields, separating the marsh into two parts, the east and west parts. This road has 334 culverts and three bridges with total length of 4350 m, CRIM 2008.

* Before construction of great dams and developing new irrigation projects in Turkey, Syria, and Iraq and the massive drainage and drying processes of marshes, during nineties of the last century, "Al Hammar Marsh was covering a third of Thi Qar Governorate with an area ranged between 2800km^2 of contiguous permanent marsh and lake, extending to a total area of over 4500km^2 during periods of seasonal and temporary inundation, it is approximately 120km long and 25km at its widest point.

The maximum depth at low water levels is 1.8m and about three meters at high water levels. During the summer, large parts of the littoral zone dry out, and banks and islands emerge in many places", UNEP 2001. Several branches from Euphrates River were feeding Al Hammar Marsh. Some of these branches are controlled by head regulators of different capacities varying between 50-500 m^3/s , with a total capacity of 1300 m^3/s . Al Hammar Marsh is also fed directly from an opening through the right embankments of Euphrates River with a capacity of 500 m^3/s . During flood seasons, Tigris River flow through Al Qurna Marshes then to Al Hammar Marsh though culverts and escapes that were constructed for this purpose, sometime the water of Al Qurna Marshes reaches high levels and flood toward Al Hammar Marsh over the road parallel to Euphrates River conveying. The main outlets of Al Hammar Marsh are AshShafi, Al Ghameej and Garmat Ali Rivers. These rivers discharge its flow to Shatt Al Arab River, CRIM, 2008.

During nineties of the last century 94% of the Al Hammar Marsh was dried. Some of the dried lands were used for agriculture purposes. Al Malha, AshShafi, Um Nakhla, and the Right Side Euphrates irrigation projects were constructed on these dried lands. CRIM, 2007.

Currently, the main feeders of Al Hammar Marsh are the main channels of the irrigation projects of Um Nakhla, Al Kurmashia, Al Malha, and AshShafi Irrigation Projects. Dwellers have breached the embankments and levees of Al Hammar Marsh near Al Chibaeich City allowing water to feed Al Hammar Marsh directly from Euphrates River. Al Hammar Marsh drains through Garmat Ali River into the Shatt Al Arab near Al Basrah. Garmat Ali River is formed by when AshShafi and Al Ghameej are jointed.

With the efforts of the Center for the Restoration of Iraqi Marsh lands, CRIM, and of Ministry of Water Resources of Iraq, MoWR, at some time, 900km^2 of Al Hammar Marsh area was restored, but that restoration was affected by last dry years.