



Terms of Reference (TOR) for

ENGINEERING SERVICE FOR **STRUCTURAL AND HYDROLOGIC DESIGN OF SMALL SCAL DAM PROJECT**

**INTERNATIONAL ORGANIZATION FOR MIGRATION IOM-IRAQ
2024**

Project Location:

	Governorate	District	Sub-District	Community	GPS
Location 1	Diyala	Al-Khalis	Al Edheem	Al Safra	(34.333541, 44.735521)
Location 2	Ninawa	Sinjar	Qayrawan	Ain Hisan	(36.308314, 42.215091)

DOCUMENT CONTROL SHEET

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TABLE OF CONTENT

PROJECT OVERVIEW	1
COMMUNITY CONTEXT	1
1- Ain Hisan village - Ninawa	1
2- Al Safra Village - Diyala	2
DELIVERABLES	3
SCOPE OF WORK.....	4
1- Topographic survey (Deliverable 1)	4
2- Soil investigation (Deliverable 2).....	4
3- Detailed Design (Deliverable 3).....	4
4- BoQ and Estimates (Deliverable 4).....	5
5- Project Implementation Supervision (Deliverable 5)	5
DURATION OF WORK / PROJECT MILESTONES	5
ORGANIZATION AND MANAGEMENT	6
REPORTS	6
QUALIFICATIONS OF THE SUCCESSFUL SERVICE PROVIDER.....	6
CRITERIA FOR SELECTING	6
ANNEX	9
ANNEX A: Aerial images for Ain Hisan and Al Safra villages proposed dam location and water irrigation pipe networks	10
ANNEX B: Remote Sensing Analysis for Ain Hisan and Al Safra villages in Ninawa	11

PROJECT OVERVIEW

The United Nations' International Organization for Migration (IOM) in Iraq is implementing multiple infrastructure projects that aim to contribute to Iraq's economic recovery by creating employment, revitalizing local economies, and addressing climate-induced displacement. IOM Iraq plans to implement climate-adaptive infrastructure projects in the Diyala and Ninawa governorates.

The projects include small-scale dams for rainwater harvesting and flood control. IOM seeks qualified external service providers to conduct detailed topographic surveys, soil investigations, and structural and hydraulic designs for these projects.

COMMUNITY CONTEXT

1- Ain Hisan village - Ninawa

Ain Hisan, a village in Sinjar, in Ninawa, falls within a watershed with an area of 233 square kilometers. The average rainfall is 360 mm/year (figure 1 in Annex B). Due to climate change, their rainfall pattern has changed and adversely affected rainfed agriculture, their main livelihood source. As a response, the plan is to build a rainwater harvesting dam. This is expected to store water during rainy season to be used during dry periods of the same season to overcome the rainfall pattern change. On the other hand, to support recharging groundwater which is depleting due to its heavy usage in a compensation of the unreliability of rainfall.

The runoff from the watershed varies significantly between different wet and dry years, however, there are minimum of two runoff events per year. The minimum and maximum calculated runoff for the past 10 years is 66 thousand and 12 million cubic meters respectively (figure 2 in Annex B). Following the budget and land constraints, it is not possible to build a large dam that can store the available runoff; hence, the expected amount of storage is something around 100,000 cubic meters. This can vary as low as 60 and as high as possible within the available budget and area constraints.

This water will be used to compensate irrigation shortages in the area as the current crops are wheat and barley, which uses huge amounts of water and land. Nonetheless, it is not within the project's scope to compensate all of it, rather, the project to support farmers without boreholes to get some water to sustain their livelihoods. Hence, the expected number of farmers to target is around 30 farmers, this means, around 625 hectares, in which the water will be distributed among them equally. As a result, each of them will have part of it, not all their lands irrigated from the project.

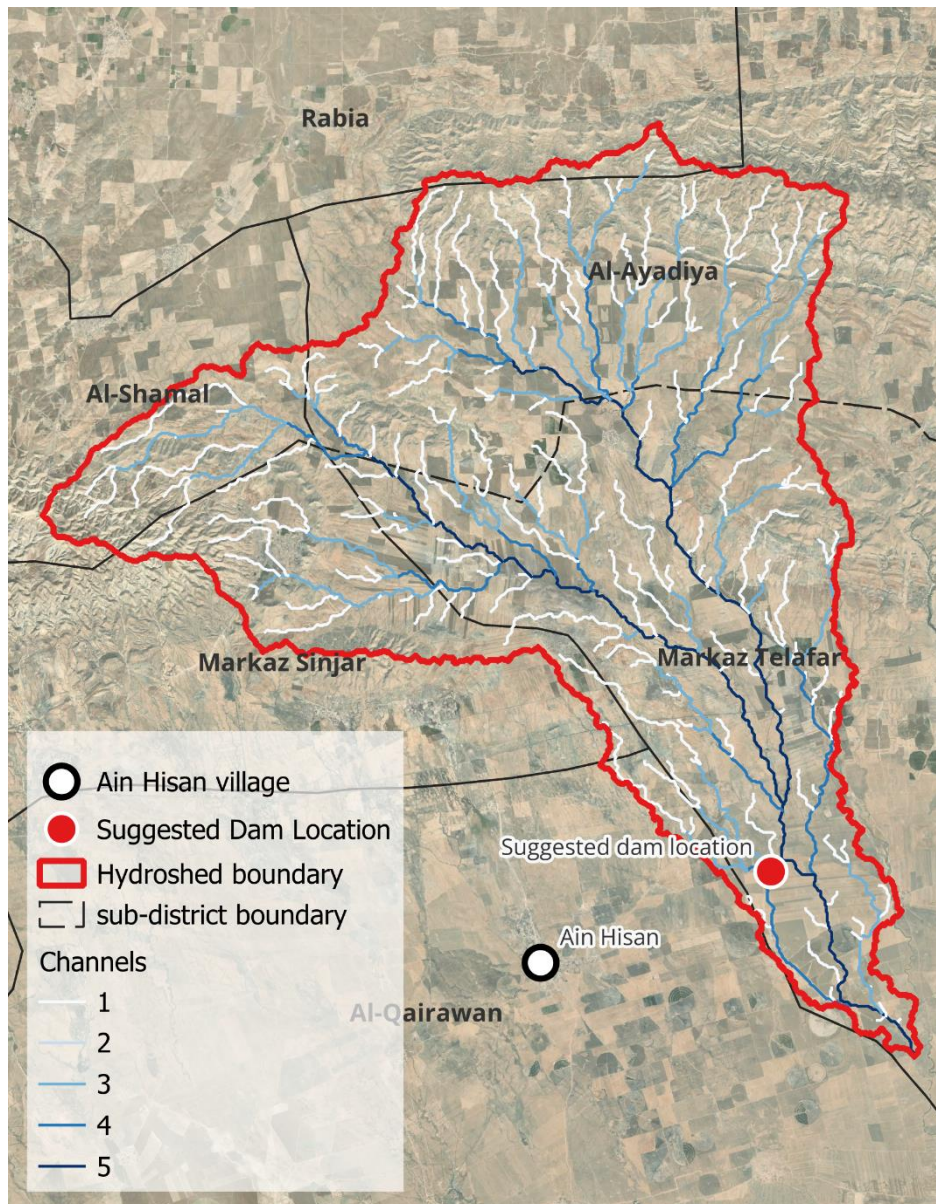


Figure 1: geographic area for Ain Hisan village in Ninawa-Iraq

2- Al Safra Village - Diyala

Al Safra, a cluster of 4 villages in AL Edheem, in Diyala, falls at the outlets of three watersheds from their mountainous area at their upstream. The average rainfall is 210 mm/year (figure 3 in Annex B). Due to climate change, their rainfall pattern has changed, intense rainfall events increased, and accordingly flooding events are getting more severe. The main valley that causes the floods usually is the watershed referred to as Basin-02 in map (PHOTO 2) below. As a response, the plan is to build a flood control dam on the outlet of that watershed. This is expected to stop or at least hold the flood to reduce the community's flood risk.

In addition, the community lacks drinking water sources due to the high rate of salinity in their groundwater sources also due to climate change and depletion of the source. Therefore, this will also work as a fresh drinking water source for the community. Hence, it is also expected to hold some water for the community throughout the year. The runoff from the watershed varies significantly between different wet and dry years, however, there are at least a few runoff events every year.

The minimum and maximum calculated runoff for the past 10 years varies from 127 thousand to few cubic meters (figure 4 in Annex B). Following the budget and land constraints, it is not possible to build a large dam that can stop all runoff; hence, the expected dam is expected to play as a flood breaker and store water amount of about 100

thousand cubic meters. Considering the topography and the study of the area, this might vary greatly. The stored water will be used to supply the villages with fresh drinking water. However, if the budget allows, it would be optimum to also have an agriculture water supply.

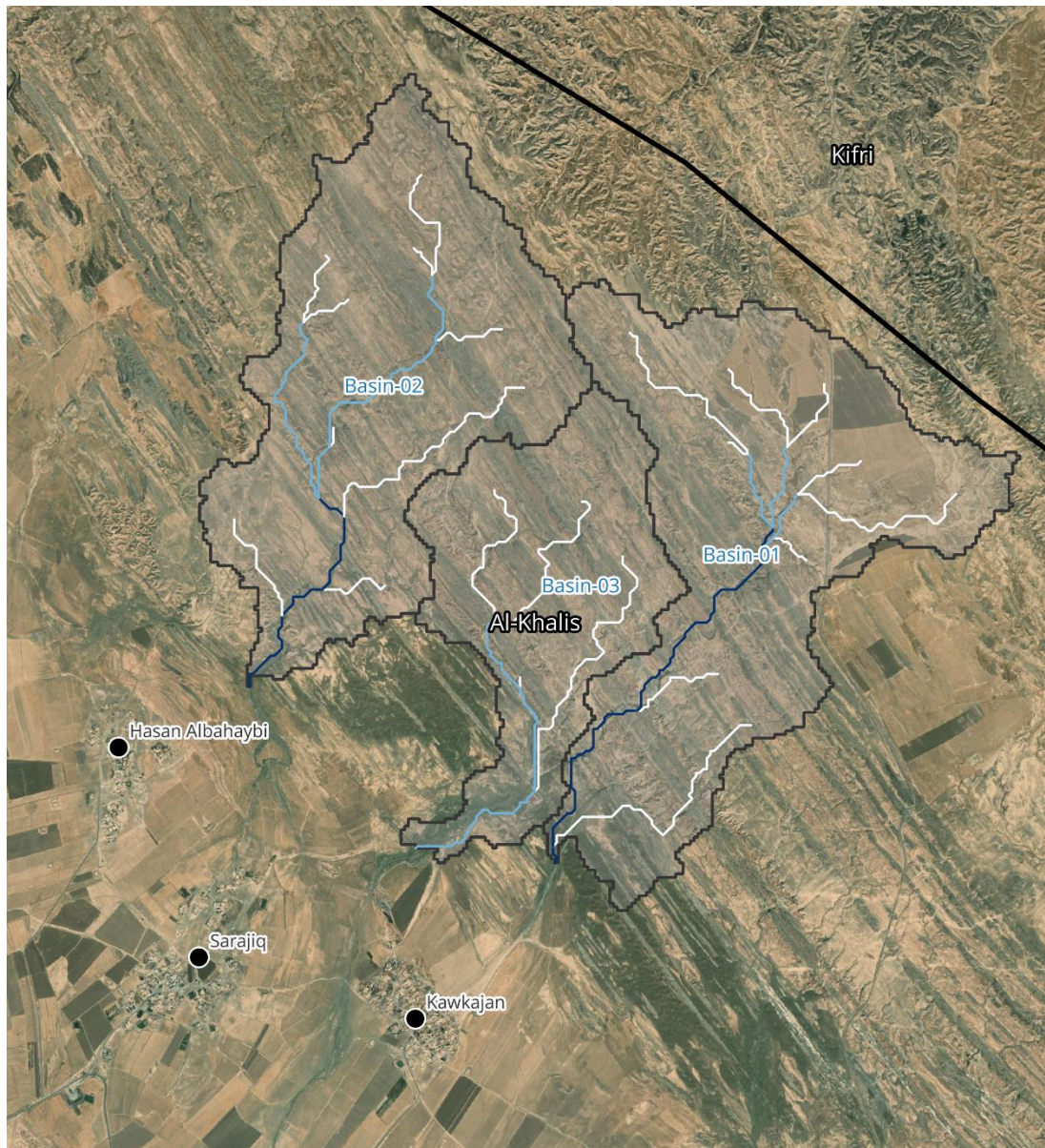


Figure 2: geographic area for Al Safra Village in Diyala-Iraq

DELIVERABLES

Deliverable 1: Conducting full topographic survey of the targeted valley.

Deliverable 2: Conducting soil investigation for proposed dam location.

Deliverable 3: Conducting detailed structural and hydraulic design for both small-scale dams.

Deliverable 4: Preparing Bill of Quantities and details estimates.

Deliverable 5: Project Implementation Supervision.

SCOPE OF WORK

All the study, tests and design work shall comply with internationally recognized standards, approaches, procedures and tools, which the consultant must explicitly describe upon submitting the proposal. In Iraq, the ACI, ASTM and AASHTO international standards specifications are applicable in the civil and mechanical construction and structural concrete works, in addition to Iraqi codes:

1- Topographic survey (Deliverable 1)

The consultant shall, equipped with all required survey tools and equipment, to conduct full topographic survey of the proposed dams locations.

- a) a detailed topographic survey and measurements of the proposed dam location to generate appropriate scale and contour interval of 0.5m, to allow accurate estimates of quantities, capacity of the reservoir for varying dam heights and to provide the necessary data for design work. Preparation of profiles and cross sections of the proposed dams at specific intervals.
- b) To specify the location/s for sampling and number of samples required and conduct soil investigation laboratory tests.
- c) Assess and map the quality and quantity of available construction materials for the micro-dams in the vicinity.
- d) Preparation of final report and recommendations based on the survey results.

2- Soil investigation (Deliverable 2)

The consultant must specify all related geotechnical tests and mechanical analysis of soil samples required for small-scale dam constructions according to National and international standards. Samples should be collected from each of the two locations that are required to determine the physical properties of the soils, minerals content and compaction characteristics necessary for small scale dams construction. The consultant is responsible for arranging all logistics to transfer the samples and perform the tests in an accredited laboratory.

The tests report shall include all the data required graphs and charts (if any), photos of collected samples at the samples preparations stages, inside the laboratories, and annex all tests results and reports.

3- Detailed Design (Deliverable 3)

Based on the findings of the soil investigation, topographic survey, existing climatologic and hydro-meteorological data, the consultant shall prepare a full structural and hydraulic design of the proposed small-scale dams. The designs shall consist of all the required drawings including plans, sections, elevations, details and analysis reports.

The design shall be equipped with a construction of spillway and overflow control measures, erosion and embankment seepage mitigation work, and necessary outlets for irrigation and silt cleaning purpose.

The consultant must consider the permeability of the fill materials and foundation, and flow of groundwater at the site, the type and design of any core or below ground cutoff within the embankment (if applicable), and the use of drainage works to collect and safely channel seepage water downstream of the embankment.

The consultant must also prepare a full hydraulic design to determine the dam's storage capacity, spillway capacity, and the volume of water in needs to handle. The spillway should safely discharge excess water during floods without causing erosion or damage. This includes calculating its capacity, type (e.g., overflow, side-channel), and dimensions. The consultant shall provide comprehensive and detailed design drawings in electronic format as annexes to the relevant reports. All drawings must be created using AutoCAD 2022 or the latest version, employing the metric system for drawing units. They should be presented on the IOM standard drawing template (Annex C) and be readable and printable in A4 format and other AX formats. Each sheet should contain sufficient data to clearly explain the design,

including layouts, plans, and sections. Additionally, a 3D model of the project—showing the dam, pond, and other components—must be produced using either SketchUp or Autodesk Revit software and should be printable in A4 format.

4- BoQ and Estimates (Deliverable 4)

The consultant should provide a detailed Bill of Quantities and estimates according to the design prepared under deliverable 03. The consultant should adjust the design within the available budget of USD 150,000 +/- 20%. The BoQ should consist of detailed technical specifications, measurement, analysis records, and rate analysis as per the current market price.

5- Project Implementation Supervision (Deliverable 5)

IOM will implement the projects through an implementing party (contractor), while IOM field engineers and quality control /quality assurance engineers will supervise and follow up the project's implementation activities. The consultant is required to conduct at least (3) field visits for each location at key stages:

1. During foundation construction.
2. At 50% progress of the dam construction.
3. At 80% of the dam construction.

Additionally, the consultant should be available online to address any urgent issue/s and provide technical support as needed... IOM will communicate technical issues via email and the consultant to be able to provide the technical input within 24 hours.

DURATION OF WORK / PROJECT MILESTONES

The following table identifies the deliverables and their respective time for completion that the Consultant/firm shall provide to successfully complete the services:

SN	Description					
		Week 01	Week 02	Week 03	Week 04	Week 05
1	Desk Review					
2	Topographic survey					
3	Soil investigation					
4	Full design.					
5	BoQ and Estimates					
6	Final Report					

This indicative schedule is intended to guide prospective consultants in preparing their proposal,. Consultant is free to propose modifications to the indicative schedule, with corresponding justifications, assuming overall assignment duration of not more than 5 weeks. The proposed detailed schedule shall be developed and presented to describe the key milestones and activities.

ORGANIZATION AND MANAGEMENT

IOM Iraq will assist in coordinating between the consultant and local authorities, facilitating access to relevant local authorities and institutions to obtain necessary historical data (hydrological, meteorological information). IOM will oversee and evaluate the consultant's deliverables. Should any issues arise that impact the consultant's performance, progress and results, the consultant shall communicate directly with IOM to address the problem or obtain necessary approval.

REPORTS

All reports shall be written in English, and SI units of measures, and softcopies of all data, investigation, and laboratory tests results, including the topographic survey data and AutoCAD files, GIS digital files, and any data collected, and analytical works conducted at all stages of the preparation process shall be submitted to IOM.

QUALIFICATIONS OF THE SUCCESSFUL SERVICE PROVIDER

The consultancy subject to this Scope of Services is intended to conduct a few surveys first, and then to prepare structural and hydraulic design of small-scale dams at the proposed locations. For this specific case, the principle Structural and hydraulic Engineers needs to have a level of proved engineering expertise of at least 10 years and be an expert in the relative field of work of dams' structural assessment and design review subjected to extreme event. In addition to structural engineer, consultant firm should have professional geotechnical engineer, and survey specialist. The Consultant/firm shall submit their CVs of the proposed technical personnel as part of the bid, to the Client's approval and assessment. Furthermore, the consultancy firm should have the following minimum capacities.

- a) The Consultant/ Firm must have a minimum of 5 years of relevant experience.
- b) The Consultant /Firm Should have Legal Identity to run this consultancy service and they have updated legal documents including Trade License.
- c) The consultant/firm should have strong resources on engineering background for team leader as well as team members to conduct these services and provide the required CVs of the team leader and team members.
- d) Experience with the United Nations will be considered as an added qualification for the similar nature of services.
- e) The Consultant/Firm should have sound financial capacity to run this Project.

CRITERIA FOR SELECTING

This section should indicate the full list of criteria which shall serve as a basis for evaluating offers and awarding the contract, based on technical and financial offers. It must also indicate if the award will be done in following manner:

To qualify for award of the Contract, bidders shall meet the following minimum qualifying criteria (Pass/Fail system), in case fail of any of the following criteria bidder will be disqualified in technical evaluation.

Criteria			Comment / proof provided	Pass/Fail
Part-A: Pre-qualification Criteria (Mandatory)	I	Existence of proof that business has been registered, Valid Business/incorporation registration certificate.	Trade License # Validity till:	
	II	Organization/Consultant Profile: Reputation of Organization and Staff / Credibility / Reliability / Industry Standing	Provided Organizational Profile:	
	III	Acceptance of IOM General Conditions Acceptance of IOM General Conditions of Contract for Civil Works	Submitted Acceptance of IOM General Conditions:	
	IV	Acceptance of UN supplier Acceptance of UN supplier Code of Conduct	Submitted Acceptance of UN supplier CoC:	
Part B - Evaluation Criteria	1	Previous Experience Minimum five years of experience in the same field and 1 sample / designs assessment works that commenced in past.	Documentary evidence of Minimum five Years and value: 1 Sample Assessment Works:	
	2	Financial Capacity - Provide evidence of Financial Stability, based on average Annual turnover for the last 2 years and bank statement of last 12 months. - Audit report or statement of turnover for the 2 years [with minimum value of USD 50,000/year] details of any outstanding claims or litigation against your company.	Annual turnover for the last 3 years: Bank Statement:	
	3	Resources/Personnel deployed for tendered project Consultancy company must have deployed following technical personnel but not limited only to - One (1) Principal Structural Engineer (Full time), with minimum MSc in Structural Engineering with minimum 10 years of experience in relevant/similar projects or BSc in Civil Engineering with minimum 10 years of experience in Structural projects. - One (1) Hydraulic Engineer (Full time), with minimum MSc in Hydraulic structures with minimum 7 years of experience in relevant/similar projects or BSc in Hydraulic structures with minimum 10 years of experience. - One (1) Geotechnical Engineer (Full time), with minimum MSc in Geotechnical Engineering with minimum 5 years of experience in relevant/similar projects or BSc in Civil Engineering with minimum 8 years of experience in Geotechnical design and review projects. - One (1) Field surveyor (Full time/need based), with minimum BSc Survey engineering with or a	Principal Structural Engineer: Qualification: Degree: Years of Experience: Membership: Hydraulic Engineer: Qualification: Degree: Years of Experience: Membership Geotechnical Engineer: Qualification: Degree: Years of Experience: Membership: Surveyor: Qualification: Degree: Years of Experience: Membership:	

		professional training in relevant field with minimum 5 years of similar experience.		
	4	Detailed Work Plan and timeline: • Provide work schedule as Gantt chart with overall maximum 5 weeks of completion time. The work schedule should be very detailed for of the activity to be commenced. • The work plan should be realistic and justifiable in view of the magnitude of the project.	Scheduled workplan duration: Suitability of workplan:	
Comments on overall assessment				

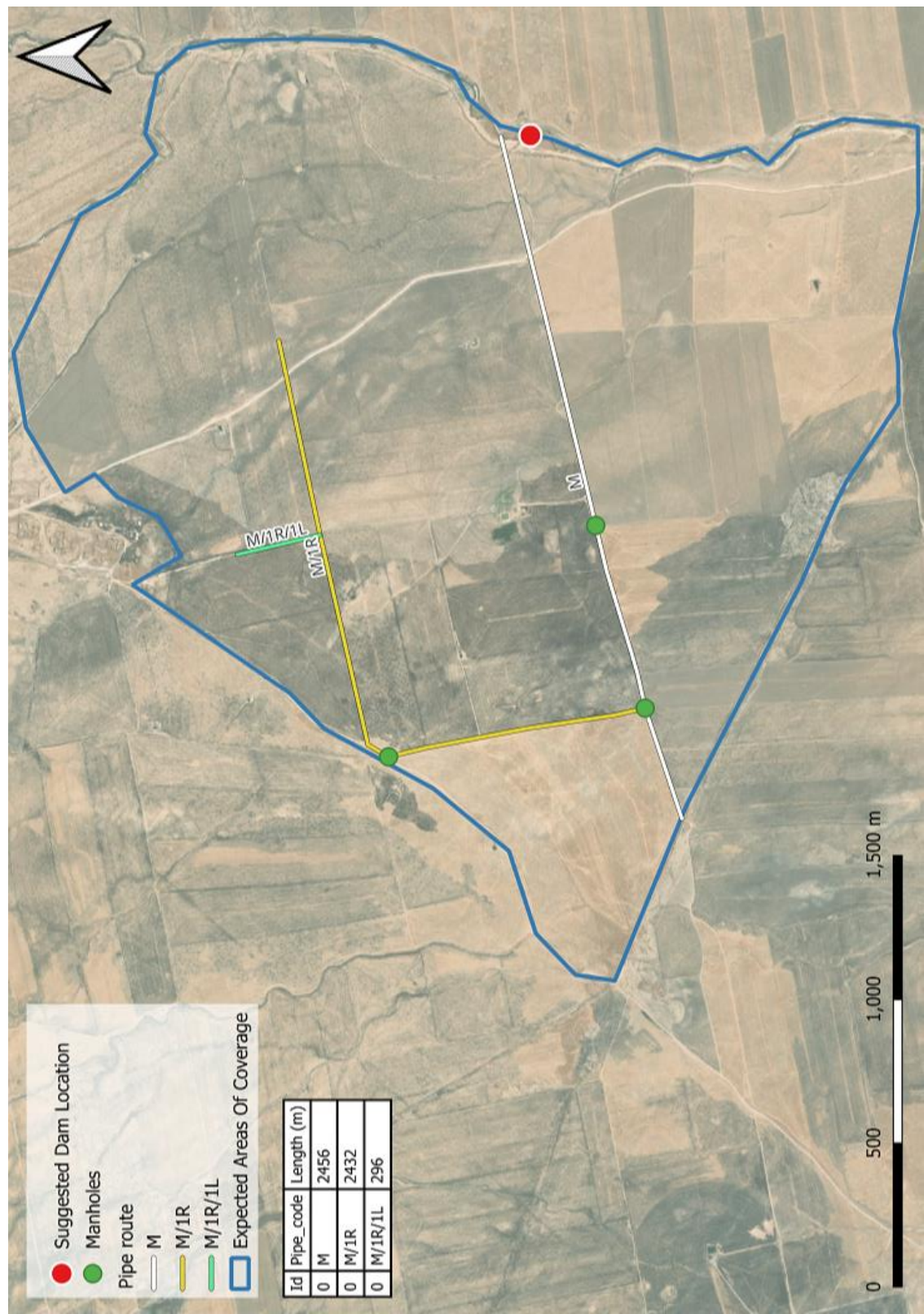
ANNEX

Annex A: Aerial images for Ain Hisan and Al Safra villages proposed dam location and water irrigation pipe networks

Annex B: Remote Sensing Report for Ain Hisan and Al Safra villages in Ninawa

Annex C: Financial proposal / BoQ Template for this proposal.

ANNEX A: Aerial images for Ain Hisan and Al Safra villages proposed dam location and water irrigation pipe networks



1- Ain Hisan:

A) Rainfall

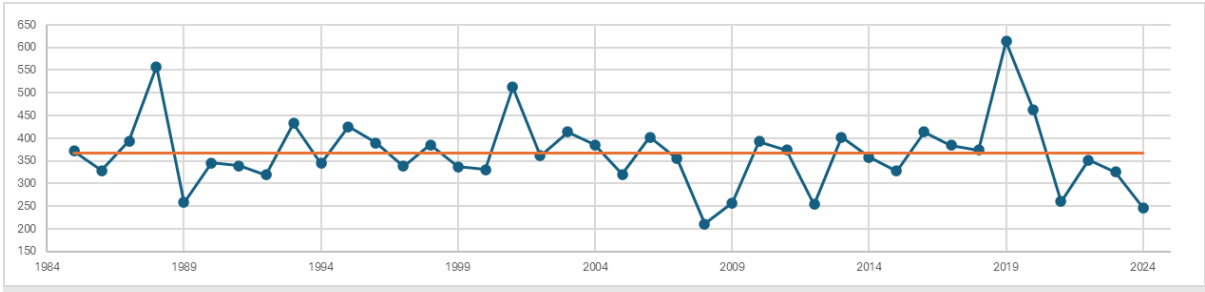


FIGURE 1: the

total annual precipitation

B) Runoff

Year	Runoff event	Max (wet condition)	Min (fair condition)
2014	10	1,822,910	104,571
2015	6	621,864	162,745
2016	8	5,840,383	93,236
2017	6	3,230,795	137,812
2018	7	12,795,275	378,052
2019	12	6,825,784	347,681
2020	7	6,691,205	162,534
2021	7	896,823	182,919
2022	7	2,285,915	66,865
2023	7	1,790,260	114,831
Average		4,280,121	175,125

FIGURE 2: the calculated max and min runoff amount and events for the past 10 years

2- Safra villages:

A) Rainfall

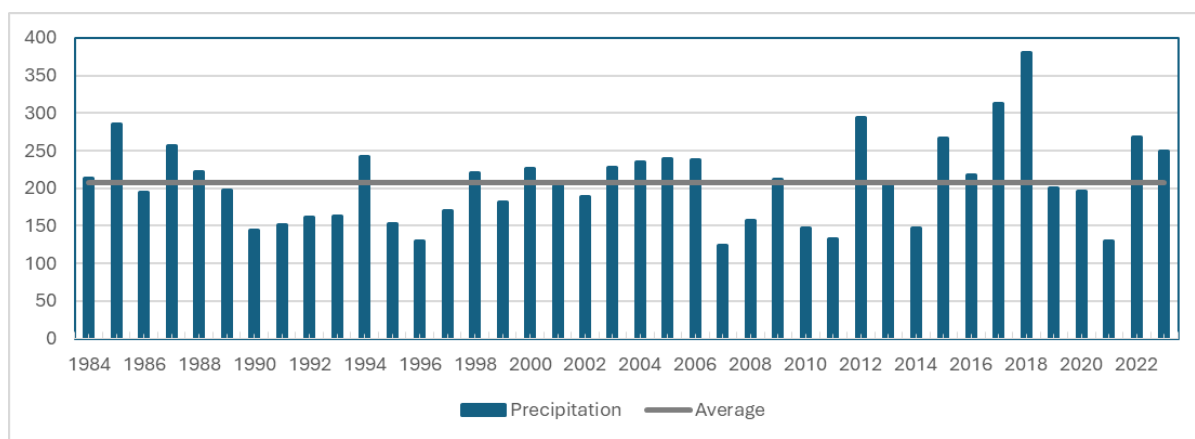


FIGURE 3: the

total annual precipitation

B) Runoff

Year	Runoff events	max (wet)	min (fair)
2014	7	25,171.7	0.7
2015	9	97,093.9	121.6
2016	6	100,342.7	101.3
2017	10	37,823.7	665.7
2018	15	315,772.2	106.8
2019	6	121,352.9	975.9
2020	8	84,423.4	53.9
2021	6	126,999.7	3.7
2022	7	126,096.6	19.4
2023	11	96,356.4	7.2
Average		113,143.3	205.6

Figure the calculated max and min runoff amount and events for the past 10 years

		Bill of Quantities (BOQ)				
Project Name : Engineering Service for Structural And Hydraulic Design Of Small Scale Dam Project Project Type : Infrastructure Project Locations: Diyala and Ninawa Project Duration:						
General Guidelines						
1	All the BoQ articles comprise supplying manpower, tools, machinery, equipment, transportation all necessary requirements to get the work done properly regardless of it's mentioned in the BoQ articles or not.					
2	IOM reserves the right to decide whether to award a single project or both projects to the winning vendor.					
3	Frequent site visits to the project location will be required. All BoQ articles include all expenses related to field visits.					
#	Description	Unit	Quantity	Unit price (USD)	Amount (USD)	Remarks
1	Location 1: Governorate: Diyala District: Al-Khalis Sub-District: Al Edheem Community: Al Safra GPS: (34.333541, 44.735521)					
A	Deliverable 1: Conducting full topographic survey of the targeted valley					
A.1					\$0.00	
A.2					\$0.00	
					\$0.00	
B	Deliverable 2: Conducting soil investigation for proposed dam location					
B.1					\$0.00	
B.2					\$0.00	
					\$0.00	
C	Deliverable 3: Conducting detailed structural and hydraulic design for small-scale dams.					
C.1					\$0.00	
C.2					\$0.00	
C.3					\$0.00	
					\$0.00	
D	Deliverable 4: Preparing Bill of Quantities and details estimates					
D.1					\$0.00	
D.2					\$0.00	
					\$0.00	
E	Deliverable 5: Project Implementation Supervision					
C.1					\$0.00	
C.2					\$0.00	
C.3					\$0.00	
					\$0.00	
Subtotal of Location 1 in Diyala					\$0.00	
2	Location 2: Governorate: Ninawa District: Sinjar Sub-District: Qayrawan Community: Ain Hisan GPS: (36.308314, 42.215091)					
A	Deliverable 1: Conducting full topographic survey of the targeted valley					
A.1					\$0.00	
A.2					\$0.00	
					\$0.00	
B	Deliverable 2: Conducting soil investigation for proposed dam location					
B.1					\$0.00	
B.2					\$0.00	
					\$0.00	
C	Deliverable 3: Conducting detailed structural and hydraulic design for small-scale dams.					
C.1					\$0.00	
C.2					\$0.00	
C.3					\$0.00	
					\$0.00	
D	Deliverable 4: Preparing Bill of Quantities and details estimates					
D.1					\$0.00	
D.2					\$0.00	
					\$0.00	
E	Deliverable 5: Project Implementation Supervision					
C.1					\$0.00	
C.2					\$0.00	
C.3					\$0.00	
					\$0.00	
Subtotal of Location 2 in Ninawa					\$0.00	
GRAND TOTAL for (Diyala + Ninawa)					\$0.00	

THE END