

THE UNITED ARAB EMIRATES
THE MINISTRY OF AGRICULTURE AND FISHERIES
WATER AND SOIL DIRECTORATE

AL BASSIERAH DAM PROJECT
NEGOTIATION REPORT ON
TENDER NO. 22/81

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Japan International Cooperation Agency
February 1982

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NEGOTIATION REPORT

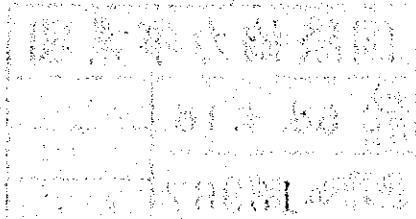
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TENDER NO. 22/81

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TABLE OF CONTENTS

	Page
SUMMARY	(1)
I. GENERAL	1
I-1. Technical Staff	3
I-2. Plant	5
I-3. Work Program	6
I-4. Temporary Works	9
II. BILL OF QUANTITIES	13
II-1. Outline of Negotiations	13
II-2. Progress and Results of Price Negotiations .	16
II-3. Alternative 1	23
II-4. Alternative 2	27
III. RECOMMENDATION	31
APPENDIX-A	33
APPENDIX-B	35

ABBREVIATIONS AND UNITS OF MEASUREMENT

MAF	The Ministry of Agriculture and Fisheries, U.A.E.
JICA	Japan International Cooperation Agency
T/E Team	Tender Evaluation Team dispatched by JICA
T/E Report	Tender Evaluation Report submitted to the MAF on January 7, 1982
Project	The Al Bassierah Dam Project
COSTAIN	Costain International, Ltd.
DUTCO	Dutco Construction Co. Ltd.
J&P	Joannau & Paraskevaides (Overseas) Ltd.
AST	Overseas Ast Co. Ltd.
B/Q	Bill of Quantities
mm	Milimeter
cm	Centimeter
m	Meter
km	Kilometer
sq.m	Square meter
cu.m	Cubic meter
kg	Kilogram
sec	Second
%	Percent
DH	Dirham

SUMMARY

- (1) From the middle of December 1981 to the beginning of January 1982, the T/E Team dispatched by JICA carried out the evaluation of the offers submitted by four tenderers, and prepared the draft and final tender evaluation reports under the cooperation of the MAF representatives. The draft and final tender evaluation reports were submitted to the MAF on December 30, 1981 and on January 7, 1982, respectively.
- (2) On December 31, 1981, the MAF representatives and the Team held a meeting to discuss the evaluation results and finalization of the evaluation report, and selected COSTAIN as the negotiable tenderer based on the comprehensive study of the offers of which detailed descriptions are made in the Evaluation Report on Tender No. 22/81. On the same day, the MAF requested, by telex, COSTAIN to submit supplemental data to its offer on January 5, 1982.
- (3) In evaluation, mis-computations and errors in the offers were corrected in accordance with the Instructions to Tenderers. After the correction, it was revealed that COSTAIN's tender price was the lowest among the four. On the other hand, COSTAIN has proposed the shortest construction program of 10 months in total since, having the existing camp at Dibba for the on-going Dibba harbour project, COSTAIN can shorten the temporary works period by four to five months in comparison with the other tenderers. The major works of this harbour project are earth works, therefore, COSTAIN has been presently operating its camp for about 300 laborers, canteen, P.C. block plant, concrete butcher plant of 50 cu.m/hr and crushing plant of 120 ton/hour in capacity, etc., in Dibba in addition to its main office for the project, store, workshop, laboratory and so forth. All of these facilities will be timely and effectively utilized for the Project if the contract is made with COSTAIN.
- (4) Taking into consideration the advantages of COSTAIN mentioned in above (3), the MAF selected this contractor as the negotiable tenderer. However, for prudence sake, the MAF and the Team called the other tenderers for briefing of the evaluation results and for clarification and confirmation of obscure points in their offer. At the meeting

- with these tenderes, on January 10 and 11, 1982, the Team requested them to submit supplemental data if they wish. Based on the clarification made at the meeting, DUTCO withdrew its request for the advance payment, order to commence the work in April 1982, and its counter offer to substitute the riprap works with gabion mattresses.
- (5) The meeting was followed by the substantial price negotiations with COSTAIN. The Team inquired into the construction methods and prices of COSTAIN focussing on the work items of which offered price was pointed out to be too high in the Evaluation Report. Specially the work items of stripping, filling to filter, rock embankment, riprap, gabion, concrete, etc., were carefully checked up in the negotiations. As a result, COSTAIN offered the revised price of DH 24,717,465.90 after the first stage of negotiations by reducing DH 3,160,853.00 from its original price of DH 27,878,318.90. The difference between this revised price and the evaluated price in the Evaluation Report is so small as 1.8%. However, in compliance with a request of the MAF, the Team continued the negotiations with COSTAIN for further possible reduction of the construction price. As a result of this second stage of negotiations, COSTAIN offered the construction price of DH 21,873,632.90 (Alternative -1) assuming that the stone pitching could substitute for the concrete works of the spillway. However, this offer of the substitution was technically rejected by the Team.
- (6) The negotiations led to the construction price of DH 22,114,681.80 (Alternative -2). This price depends on the assumption that the miscellaneous works of DH 422,760.00 which consist of DH 318,080.00 for the service road and DH 104,680.00 for the replacement of power distribution line, and the daywork schedule of DH 252,944.10 could be cancelled. However, the Team considers that smooth execution of the construction works cannot be expected without the budget for daywork schedule and further more that the replacement of power line is inevitably required. Therefore, by deleting only the price of DH 318,080.00 for the service road, the Team recommends the construction price of DH 22,472,305.90 for the construction works of the Project.

(incl. Daywork,
(v. power line drop/correction)

I GENERAL

The JICA T/E Team submitted the final tender evaluation report to the MAF on January 7, 1982. With the verbal approval of the MAF on the report on January 10, 1982, the Team started from that day briefing of the evaluation results to all the participated tenderers at the conference room of the MAF in the attendance of a MAF representative. Simultaneously, the Team requested the tenderers to make explanation on obscure points in their offer, and to submit supplemental data to the MAF for the Team's verification and confirmation. Such supplemental data were submitted of tenderers' free will. The major items of hearing made by the Team to tenderers were the technical staff mobilization, equipment to be used, experience in similar works, specially in dam construction, work program, materials, counter offers and bill of quantities, etc. To COSTAIN the MAF sent a request telex dated December 30, 1981, to submit supplemental data to its offer, and the data were submitted to the MAF on January 5, 1982. Under the situations, hearing with COSTAIN was carried out on the supplemental data as well. The progress and results of negotiations with COSTAIN are described in Section I-1 of this chapter and Chapter II, therefore, the offers made by the other three tenderers are herein mentioned. Attendants to the meetings for briefing are listed in Appendix A.

AST (Overseas AST Company Ltd., Dubai, UAE):

Original price : Dh 66,818,330.00

Corrected Price : Dh 66,817,836.00

Order in Tenderers : Last

Hearing was made with only one participant from AST from 8.00 to 10.00 am. on January 11, 1982. Through the hearing, the following were confirmed:

- * AST could not make a full study on the tender requirements due to the limited estimate period of 20 days.
- * AST proposed the longest construction program among others, paying special attention to the penalty system in this country.
- * AST has no more intention to submit any supplemental data to the MAF since AST believes to have submitted the best offer

that could be prepared within the limited time.

DUTCO (Dutco Construction Co., (Pvt) Ltd):

Original Price : Dh 25,943,490.00
Corrected Price : Dh 28,601,330.00
Order in Tenderers : Second

Hearing was carried out with four participants from DUTCO from 18.00 to 20.00 pm, on January 10, 1982. As a result of the hearing, DUTCO expressed on January 13, 1982, its intention to withdraw the three memoranda submitted with the original offer as follows:

- a) Payment of an advance of 25 percent of the construction cost;
- b) Request for the order to commence the works by end April 1982, and;
- c) 30 cm thick stone-filled gabion mattresses in place of the riprap works for Item 3.10, Main Dam.

Instead of the above c), DUTCO newly offered the riprap not in accordance with the Specifications, but in accordance with an international Specifications at the rate of Dh 143.41 and the amount of Dh 5,879,810.00. This amount is nearly equal to the original amount of DUTCO for the gabion mattresses.

This proposal as well as the original offer for gabion mattresses, are, needless to say, rejected pursuant to Article 2.4, General Requirements of the Instructions to Tenderers.

J & P (Joannau & Paraskevaides (Overseas) Ltd:

Original Price : Dh 33,788,782.00
Corrected Price : Dh 33,788,780.30
Order in Tenderers : Third

Hearing was carried out with three participants from J&P from 16.00 to 18.00 pm on January 11, 1982. At the meeting J&P informed the Team that the information on the major hearing items having been submitted to the MAF together with its offer was not for this particular project but for general projects in which J&P may have chances to participate, and to supplement the information, J&P submitted to the

J&P (Contd.) ... submitted to the ...

MAF the following data on January 14, 1982.

a) Construction Programme:

A construction programme of 12 months in total showing the schedule of 16 items of works.

b) Proposed Site Agent, Engineer, Laboratory Engineer and Staff requirements:

Totally 15 persons only, inclusive of one Site Agent (Engineer), one Site Engineer and one Laboratory Engineer.

c) Previous Experience of Dam Construction:

Four dam projects in Cyprus and the Wadi Ham and Wadi Bih Projects in UAE.

d) Method Statement for Main Items:

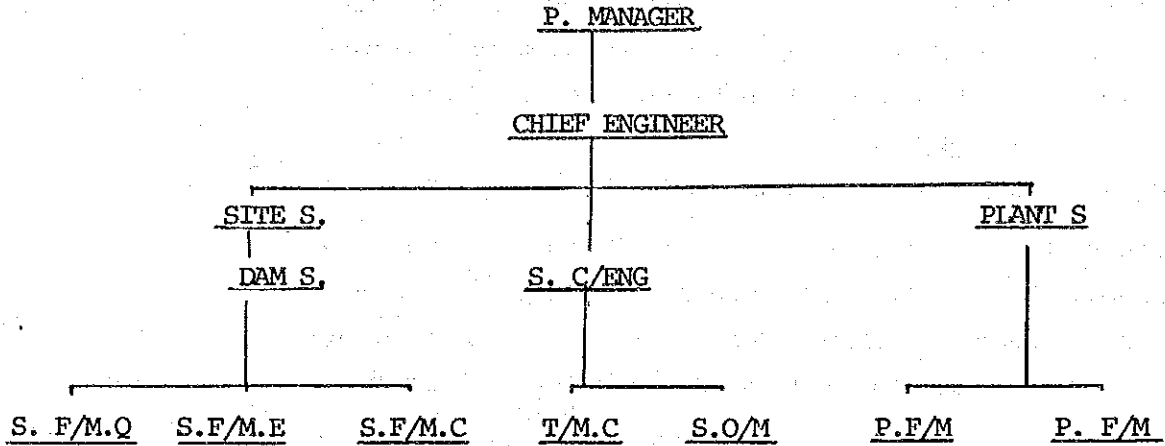
A statement outlining, in eight paragraphs, the construction method and schedule of earth works, rock works and concrete works. It is noted that J&P proposed in this statement an economical operation plan of construction equipment such as excavation and hauling by bulldozer and scraper.

The progress and results of negotiations with COSTAIN and the Team's recommendation are described hereinafter.

I-1 Technical Staff

The proposed site staff of 33 persons consists of 10 U.K. expatriates and 23 local employees. As regards the organization, the Site Superintendent, Senior Civil Engineer and Plant Superintendent are assigned under the Project Manager assisted by the Chief Engineer. Each Superintendent manages foremen in his field who directly control construction works. The Senior Civil Engineer is responsible for laboratory tests, materials control, setting out and progress of construction works. The Site Organization Chart is shown below:

SITE ORGANIZATION CHART



Notes:

P. Manager	:	Project Manager	:	Mr. N.P. Taylor
Chief Engineer	:	Chief Engineer	:	Mr. N.D. Platt
Site S.	:	Site Superintendent	:	Mr. G. Pope
Dam S.	:	Dam Superintendent	:	Mr. D.J. Davies
S.C/Eng	:	Senior Civil Engineer	:	Mr. B. Alymer
Plant S.	:	Plant Superintendent	:	Mr. P. Townsend
S. F/M. Q	:	Section Foreman, Quarry.		
S. F/M. E	:	Section Foreman, Earthwork		
S. F/M. C	:	Section Foreman, Concrete Work	:	Mr. T. Wragg
T/M. C	:	Civil Engineer, Testing, Materials Control	:	Mr. K. Dalat
S. O/M	:	Setting out, Measurement		
P. F/M	:	Plant Foreman		

I-2 Plant

For dam construction projects, plant is, in general, as important as the contractor's staff organization. Effective operation of plant to meet the quantitative requirement in construction works is pre-requisite for smooth progress of the works. An operation plan of plant shall be carefully formulated by engineers having a rich experience in dam construction prior to the commencement of the works at Site.

As informed in the Tender Evaluation Report, COSTAIN has proposed 26 types and 105 units of plant for the Project. Furthermore, it has proposed an allocation programme of plant on weekly basis dividing them into four groups;

- 1) The First Group of Plant
Temporary and preparatory works such as quarry stripping, excavation at borrow areas and securing rock materials for riprap, etc., will be carried out mainly by excavating and hauling equipment such as bulldozers, graders, truck-drills and lorries, etc.
- 2) The Second Group of Plant
Sand and gravel embankment for the central zone of the dam, filling to filter, rock embankment and riprap works for dam body with rock materials will be made by bulldozers, rollers, bowsers, trucks, cranes, etc. Specially at the borrow area of sand and gravel shovel roaders will be operated to make simultaneously, excavation and loading following the surface stripping by bulldozers. Sand and gravel materials will be hauled and dumped by truck as ordered by foremen, spread in a 40 cm layer by bulldozer and compacted by vibrating roller with watering by bowser when necessary.
- 3) The Third Group of Plant
Rock excavation, concrete and gabion works for the spillway will be carried out by bulldozer, truck-drill, loader, truck mixer and crane for concrete placing.

4) The Fourth Group of Plant

The conduit works consist of the common excavation, pipe laying and concrete works. Bulldozers will be operated for excavation, hauling, wasting and back-filling, and a crane for concrete pipe laying and concrete placing. The details plant allocation programme is shown in Tables I-1(1) and I-1 (2).

I-3 Work Programmes

COSTAIN submitted a weekly work programme (draft) for the Project. The entire work program period is 42 weeks. In this programme the construction works are divided into four groups as follows:

i) The First Group of Works

The first group of works consists of 13 items including the mobilization, construction of access road, preparatory works at the borrow area, etc. COSTAIN has scheduled to complete these works in a 32-week period after the site hand-over.

The time consuming works among the first group of works are the excavation of borrow area (25 weeks) and securing of riprap materials (26 weeks).

ii) The Second Group of Works

The second group is for the main dam works, and consists of six items of which major items are the sand and gravel embankment, filling to filter, rock embankment, and riprap works. COSTAIN has scheduled to start these works in the eighth week from the site handover, and complete in a 23 to 27 week period.

iii) The Third Group of Works

The third group is for the spillway works. COSTAIN has scheduled to start the works in the ninth week after the site hand-over, and to complete the rock

excavation in a seven-week period, concrete works for the spillway crest in a six-week period and gabion works in a 13-week period. The total work period is a 23-week period.

iv) The Fourth Group of Works

The fourth group is for the conduit works. This group mainly consists of the earth works and concrete works. COSTAIN has scheduled to complete the works in a 6.5-week period, starting in the ninth week after the site hand-over when the stripping of the dam foundation is to be completed. The detailed work programme proposed by COSTAIN is shown in Table 1-2.

I-4 Temporary Works

Receiving an order from Fujairah Government, COSTAIN has been constructing Dibba Harbour for cement export since October, 1980. Presently the construction of waterbreaks and dredging are under the way. For the harbour project, COSTAIN has the following facilities at Dibba.

(1) Facilities

- * Main Office
- * Laboratory Office
- * Mechanical Workshop
- * Carpenter Shop
- * Store
- * Quay wall blocks precast yard
- * Buttress wall precast yard
- * Concrete Batch Plant : Min. 50 cm³/hr
- * Crushing Plant : 120 ton/hr
- * Labour Camp : 300 labourers
- * Zannah Quarry Site

COSTAIN will fully utilize the above-mentioned existing facilities. In addition, COSTAIN has proposed the following facilities at the

TABLE 1-2 WORK PROGRAMME

Description	Week No.																																																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	42	42									
Mobilisation																																																			
Access Roads																																																			
Strip Dam																																																			
Strip Borrow Area																																																			
Excavate Abutments																																																			
Excavate Trench																																																			
Excavate Borrow Area																																																			
Strip Rock Overburden/Quarry																																																			
Excavate and Screen Rock																																																			
Excavate and Crush Filter																																																			
Rip-Rap 21-Site																																																			
Prepare Rip-Rap																																																			
Divert O.H. Electric Cable																																																			
DAM																																																			
Filling to Core																																																			
Filling to Filter																																																			
Filling to Rock																																																			
Rip-Rap Paving																																																			
Crest Concrete Kerb																																																			
Gravel Paving																																																			
SPIELWAY																																																			
Excavation in Gravel																																																			
Excavation in Rock																																																			
Concrete to Crest																																																			
Gabions																																																			
CONDUIT																																																			
Excavation in Gravel																																																			
Lay Conduit Pipes																																																			
Concrete to Surround																																																			
Concrete to Headwalls																																																			
Gabions																																																			
Masonry																																																			
Surface Access Road																																																			

site:

- * Site Office/Toilets
- * Store
- * Plant Services Shelter
- * Labour Canteen/Ablution
- * Generator House

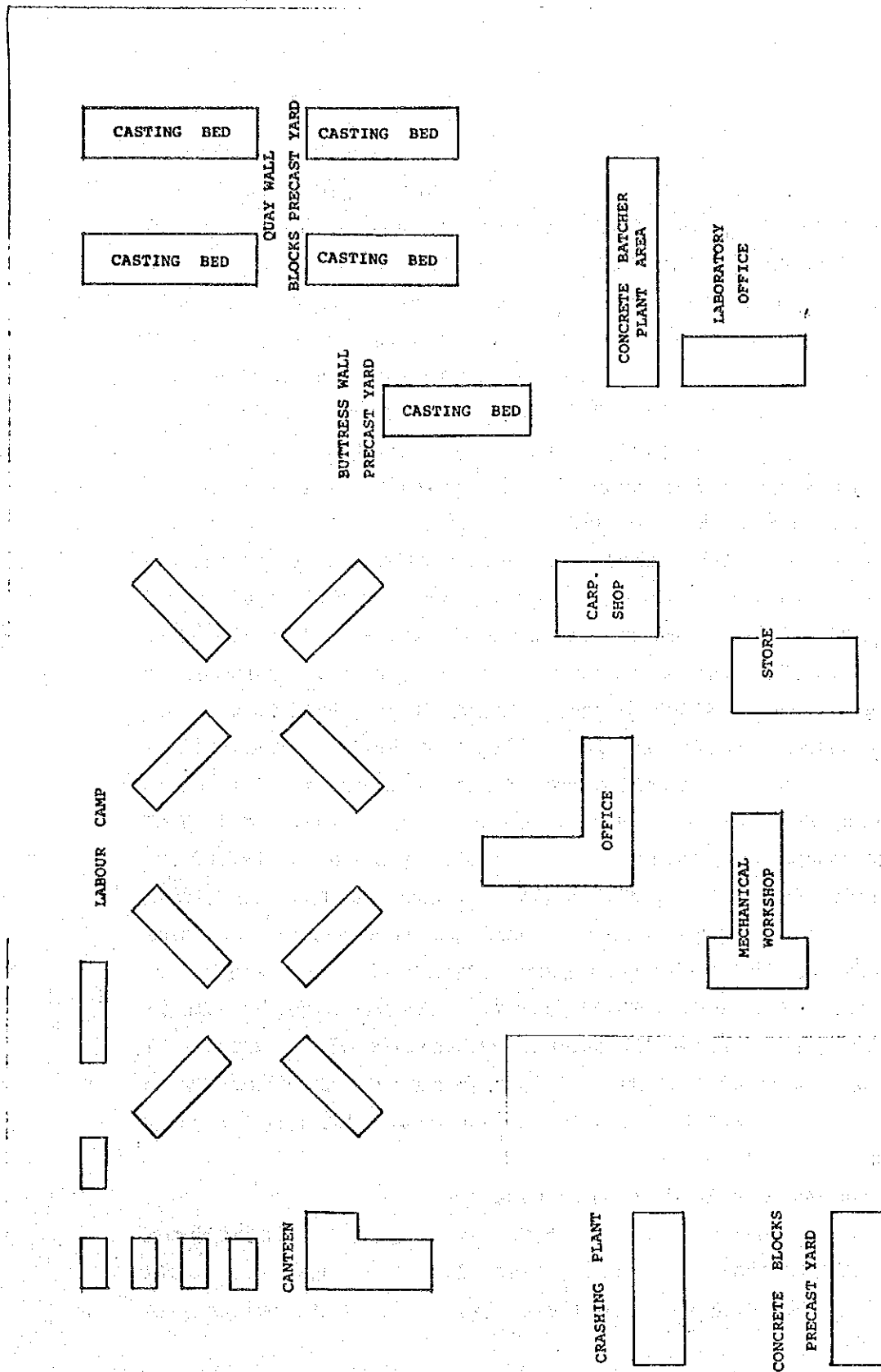
(2) Quarry Site

Totally about 251,000 cu.m of rock materials are required for the dam, that is, 210,000 cu.m for the rock zone and 41,000 cu.m for the riprap. For the rock materials, 80% of the excavated materials for the spillway is fully utilized. To supplement, COSTAIN has proposed to obtain rock materials of about 193,000 cu.m at a quarry located on the left bank around 1.5 km downstream of the dam site.

(3) Access Road

COSTAIN has proposed to construct two access tracks from the Dibba-Masafi trunk road to the left bank at the dam site, one for access from the upstream and the other from the downstream. These two access trunks will run in parallel with the dam axis at the site with a distance of about 200 m from the dam axis.

FIGURE 1-1 TEMPORARY WORKS AREA IN DIBBA



II. CONSTRUCTION COST

II - 1 Outline of Negotiation

In the stage of evaluation some miscomputations and unadequate proposals on the use of construction materials were found in COSTAIN's offer, and corrected by the Team pursuant to Article 2.4. of the Instructions to Tenderers. The original and corrected tender prices of this tenderer are compared as follows:

* Original Tender Price: DH 27,879,188.42

* Corrected Tender Price: DH 28,011,900.40

The details of the above-mentioned tender prices are shown in the Evaluation Report on Tender No. 22/81 (see Tables 2-6 to 2-10), and the summary is shown in Table 2-1 of this report. On the other hand, the MAF's estimated amount of DH 19,800,000.00 for the construction works of the Project has been revised to DH 23,272,500.00 taking into consideration the price escalation since October 1980 as well as the proposed working program of 10 months by COSTAIN, etc., resulting in a difference of about four million Dirhams between the revised amount of the MAF and the corrected tender price of COSTAIN.

To fill the gap, negotiation meetings were held between the T/E Team and COSTAIN with the participation of the MAF representatives in the middle and end of January, 1982, mainly based on the estimated rates which were computed in consideration of the daywork rates submitted by COSTAIN. In this report, Section II-2 describes the progress and results of price negotiations with COSTAIN whereas Sections II-3 and II-4 describe the alternative studies (1) and (2), respectively. The prices in the three stages, that is, negotiation stage and alternative study (1) and (2) stages are compared as follows:

	Construction Price	Saving Amount
Negotiation	24,717,465.90	3,160,853.00
Alternative (1)	21,873,632.90	6,004,686.00
Alternative (2)	22,114,681.80	5,763,637.10

COSTAIN has made the following request both in the negotiation and alternative study (1) stages.

"It is requested that the maximum liquidated damages, (Cl.47C1) of the Conditions of Contract, be reduced from 25% to 10% and

TABLE 2-1 SUMMARY OF NEGOTIATED PRICES WITH COSTAIN

Description	(Unit: Dirhams)			
	Offered Price	Corrected Price	Negotiated Price	Alternative(1) Alternative(2)
PART I. General	870,848.00	870,848.00	870,848.00	870,848.00
PART II. Site Installation	5,694,780.00	5,694,780.00	5,694,780.00	5,694,780.00
PART III. Main Dam	16,159,450.00	16,159,450.00	13,464,590.00 (2,694,860.00)	11,926,610.00 (4,232,840.00)
PART IV. Spillway	3,222,193.00	3,222,193.00	2,900,778.00 (321,415.00)	2,017,685.00 (1,204,508.00)
PART V. Conduit	1,255,343.80	1,388,925.30	1,110,765.80 (144,578.00)	1,110,765.80 (144,578.00)
PART VI. Miscellaneous	422,760.00	422,760.00	422,760.00	- (422,760.00)
PART VII. Daywork Schedule	253,813.60 ^{1/} 252,944.10 ^{2/}	252,944.10	252,944.10	- (252,944.10)
TOTAL:	27,879,188.42 ^{1/} 27,878,318.90 ^{2/}	28,011,900.40	24,717,465.90 (3,160,853.00)	21,873,632.90 (6,004,686.00)

NOTE: Parenthesized figures show savings from the offered prices.

1/ Figure by original Tender

2/ Figure after correction of mis-computation

NOTE TO TABLE 2-1

Negotiated Price

The negotiated price of DH 24,717,465.90 is only by 1.8 percent higher than the evaluated price of Dh 24,273,000.00, and considered reasonable. (See Page 43 of the Evaluation Report)

Alternative (1)

The price of DH 21,873,632.90 premises the following;

- (a) Stone pitching is provided for the crest of spillway instead of concrete;
 - (b) Quart schist is used for finishing the slopes of dam body; and,
 - (c) The cost for Part VI. Miscellaneous is excluded.
- However, the Team cannot accept (a).

Alternative (2)

The price of DH 22,114,681.80 premises the following;

- (a) Concrete works are made for the crest of spillway;
- (b) Quart schist is used for finishing the slopes of dam; and,
- (c) Costs for Part VI. Miscellaneous and Part VII. Daywork Schedule are excluded.

this request is made pursuant to the Ministry's telex of April 23rd 1981 on this subject. on Wadi Ham Project." As a matter of course, the above mentioned is a matter beyond the judgement of the T/E Team, therefore, no discussions are herein made on this request. It is hoped that the MAF and the relevant authorities would make a study on this matter if necessary.

II-2. Progress and Results of Price Negotiations

The major negotiated items inclusive of these of which breakdown is required in the T/E Report are as follows:

<u>Item No.</u>	<u>Negotiation Items</u>	<u>Description</u>
Part I		GENERAL
1.01		As-built drawings
Part II		SITE INSTALLATION
2.01		Construction and Running of Necessary Facilities
2.03		Illumination
2.06		Storing Area
2.07		Power Supply
2.08		Water Supply
2.09		Accident and Fire Prevention
2.10		Safety Precautions
2.15		Construction Procession Plant
2.16		Field Laboratory
Part III		MAIN DAM
3.05		Embankment of Filter
3.06		Embankment of Rock
3.07		Plain Concrete
3.10		Riprap
Part IV		SPILLWAY
4.03		Reinforced Concrete
4.07		Gabion
Part V		Conduit
5.03		Level Concrete
5.04		Reinforced Concrete
5.10		R.C. Pipe

5.12

Gabion

Progress and results of price negotiations are herein mentioned for each of the above-listed items.

- 1) Items expressed "INCL" or "In Rate" in the original offer. COSTAIN filled "INCL" or "In Rate" in the blank for the following six items because of the difficulty to estimate the cost of these items separately from the others mainly due to the estimation method of COSTAIN.

<u>Item No.</u>	<u>Descriptions</u>
1.01	As-built drawings
2.03	Illumination
2.06	Storing Area
2.09	Accident and Fire Prevention
2.10	Safety Precautions
2.15	Construction Procession Plant

However, in accordance with the request of T/E Team, COSTAIN computed by the other method and submitted the separated costs for these items. The separated costs are judged to be slightly low except the cost for as-built drawings. However, since COSTAIN has proposed to utilize the most of its existing facilities in Dibba for the Project after the completion of its on-going Dibba harbor project. Therefore, it is considered that the relatively low costs will not cause hindrances in executing the construction works with safety. Thus, the separated costs newly offered are deemed appropriate. The discussion on the other items will be made hereinafter, accordingly.

- 2) Constuction and running of necessary facilities (Item 2.01).
The price originally offered by COSTAIN for this item includes all the costs needed for the items of illumination, storing area, accident and fire prevention, safety precaution and construction procession plant. However, the costs for these five items were separately summed up as mentioned above, resulting in the cost reduction for this item from DH 3,644,726 to DH 3,459,726. Its breakdown is as follows:

Breakdown of cost for item 2.01

Staff (Expatriate)	DH 940,556
Staff (Local)	637,984

Labour, others (Tee Boy, Messenger, etc)	76,734
Transport, Unallocated	735,382
Plant	379,797
Small tabs & tackles	20,000
Mobilization & Demobilization	122,118
Sub-Total	2,912,571
On-Cost	<u>547,155</u>
T O T A L	3,459,726

COSTAIN has proposed to mobilize 10 U. K. expatriate and 23 local staff to the Project. Assuming that the assignment period of one staff to the Project is eight months on an average, the averaged monthly salary of staff is roughly computed as follows:

Staff, Expatriate:

940,556 DH/10 persons/8 months = 11,757 DH/person/month

Staff, Local:

637,556/DH 10 persons/8 months = 3,467 DH/person/month

The above-mentioned amounts of monthly salary are deemed appropriate. The cost for transportation of the above-mentioned staff amounting to DH 735,382 is about triple of the offered cost for Item 1.06, Engineers Transport. Apart from it, the number of staff proposed by COSTAIN is about five times of the number of engineers, that is five persons on an average. Under the circumstance, taking it into consideration, the offered cost for transport, unallocated, is judged to be not unreasonably high.

Based on the above-mentioned, the cost of DH 3,459,726 for Item 2.01 is considered reasonable.

3) Power Supply (Item 2.07)

As mentioned above, COSTAIN has intended to utilize as much as possible for the Project its existing facilities in Dibba which

COSTAIN has installed for the on-going Dibba harbour project, and to provide the construction site with the necessary minimum facilities to cover the shortage of facilities' capacity in Dibba. The following facilities will be provided at the construction site.

- . Site Office/Toilet
- . Stores
- . Plant Services Shed
- . Labour Canteen/Ablution
- . Generator House

The cost offered for item 2.07 shall cover a necessary expenditure for power supply to the above-mentioned facilities as well as a purchasing price of a generator to be newly installed. In consideration of purchasing and maintenance costs of the generator and an installation cost of power supply line, the offered cost for this item is considered not too high. The maintenance cost of the existing constructor's camp at Dibba is not included in spite that COSTAIN intends to use it for the Project.

4) Water Supply (Item 2.08)

COSTAIN's intention for arrangement of the constructor's camp and office is mentioned above, therefore, water supply at the site is, in the opinion of COSTAIN, necessary only to the following:

- . Office/Toilet
- . Labour Canteen/Ablution
- . Generator House

It means that a cost for water supply required in the construction work is included in such items as, for instance, embankment of sand and gravel, concrete, etc.

Taking it into consideration, the offered cost for Item 2.08 is judged to be reasonable as far as water supply to the facilities at

the site is concerned

5) Field Laboratory (Item No. 2.16)

Having a laboratory at Dibba equipped with test equipment for concrete materials, mixing and compressive tests, COSTAIN need not to purchase many test equipment additionally for dam construction. Apart from it, some concrete material test equipment can be used commonly for embankment material test for dam construction as required by the specifications. Therefore, it is natural that COSTAIN can save much in this item compared with the other contractors. COSTAIN's offered price is reasonable.

6) Embankment of Filter (Item 3.05)

COSTAIN offered a relatively high price for this item since this contractor intended to use aggregate materials produced at its plant in Dibba located about 10 km distant of the dam site for embankment of filter of the dam body after mixing as instructed. On the other hand, the specifications do not necessarily require to use materials produced at a plant for filter embankment. Screened wadi materials at the site can be used for this purpose so far the Engineer's approval is given. Accepting this production method, COSTAIN has reduced the rate of filter from DH 47,61 to DH 34,00 and the amounts to DH 802,990.00

7) Embankment of Rock (Item 3.06)

In estimating, COSTAIN seems to consider that it is necessary to screen rock materials for embankment at the spillway site or at a quarry, before loading for hauling, in order to remove materials less than 5 mm and unadequate materials. The specifications have the restriction that materials less than 5 mm should not used for the embankment of rock. because rock materials of a large diameter shall be used for embankment, however, the graduation distribution of rock materials is not so important compared with that of concrete aggregate and filter materials. It is, however, anticipated that this prescription of the

specifications might cause a trouble between the Engineer (Supervisor) and the contractor. Taking it into account, it was considered that if this prescription was deleted, COSTAIN could reduce the rate to a considerable degree. On the other hand, with or without this description, the rock embankment of materials of around 5 mm in diameter should be avoided. The Engineer can instruct the contractor to remove such embankment at the site and supervise the embankment taking into account an average grandient distribution of rocks produced by explosion at quarry sites. The embankment as a whole is hardly affected even if a limited volume of materials less than 5 mm is mixed. If COSTAIN offers the high rate in order to avoid the trouble at the site due to the prescription of the specifications, it is not economical to persist in this prescription. Therefore, this prescription is detemined to be deleted resulting in the reduction of the rate from DD 22.17 to DH 20.50 and the amount of DH 350,700. Needless to say, the construction supervision for the rock embankment shall be made as described above even after deleting the prescription.

8) Concrete.

The concrete works consist of item 3.07, Plain Concrete, Item 4.03, Reinforced Concrete, Item 5.03, Level Concrete and Item 5.04, Reinforced Concrete. Discussions on the concrete works were made covering all the above mentioned items, therefore, descriptions herein are also made covering all the items.

The breakdown of concrete works submitted by COSTAIN shows that the materials cost such as cement and aggregate materials occupies a very high percent of 80 to 85% out of the total cost. One of the reasons is that COSTAIN has already had equipment for batching, mixing and houling etc. and only the operation and maintenance cost of the equipment is quoted. The other reason is that COSTAIN proposed a high cement consumption rate of 550 kg per one cubic meter of concrete on an average. This high cement consumption cannot be accepted

since the maximum cement use specified in the specification is 500 kg/cm. A reasonable cement consumption per cubic meter of concrete for estimation purpose might be 450 kg on an average. Accepting the above-mentioned suggestion of the Team, COSTAIN has made the following reduction of the rates, resulting the decreased amount of DH 900,000 in total.

ITEM No.	Description	Rate	
		Original	Correction
3.07	Plain Concrete	338.18	308.18
4.03	Reinforced Concrete	417.97	387.97
5.03	Plain Concrete	3 352.15	322.15
5.04	Reinforced Concrete	499.09	469.09

9) Riprap (Item 3.10)

For riprap COSTAIN proposed, in its original offer, to use limestone materials to be obtained at its existing Zannah quarry which is located about 5 km distant of the proposed dam site, to lift the materials by two units of heavy crane after completion of the dam embankment, one crane on the dam crest for the higher slopes and the other on the ground for the lower slope, and to finish manually. Furthermore, COSTAIN proposed the two steps of riprap works, one for rough finish of the slopes for easy placing of riprap and the other for further final surface finishing, that is, the riprap works. However, what is required by the specifications is not the riprap works with limestone obtained at a quarry, but the works with similar shaped and relatively large size materials obtain in the wadi or at a quarry for the rock embankment materials. Furthermore, in respect of the construction method, it is not necessary to provide the riprap works by operating heavy cranes after completion of the dam embankment since the works can be made without cranes in parallel with the progress of the embankment works, for instance, for each one to two layers of embanking. If COSTAIN's original offer for this item is high due to the proposed materials or construction method, it should be reduced. Accepting these, COSTAIN

has reduced the rate of riprap works from 119.37 DH/cu.m to 82 DH/cu.m, resulting in the reduced amount of DH 1,532,170.00.

10) Gabion (Items 4.07 and 5.12)

COSTAIN submitted, in its original offer, two prices for gabions assuming two cases as follows:

Case - 1: The Gabions specified in the specifications are used for the construction works; and,

Case - 2: As alternative, the gabions which COSTAIN has been presently using in the other projects in UAE are accepted.

The breakdown of both prices indicates that the cost of the cage of gabion occupies 92 to 90% of the total cost. In consideration of the required function of gabion, the alternative offer of COSTAIN is accepted resulting in the reduction of the rate from DH 191,00 to DH 143,47 and the reduced amount of DH 384,993.

11) R.C.Pipe (Item 5.10)

COSTAIN has offered asbestos cement pipes instead of R.C. pipes for the reason that R.C. pipes are difficult to come in hand in the neighborhood of Dibba. The pipes are required to play ^a role of only form works for concrete placing, therefore, no high strength of pipes themselves is required. If the Team insists to use R.C. Pipes ^{these} shall be manufactured at the site. In this case, it might be difficult to have R.C. pipes with the designed internal roughness coefficient and the expected pipe joints by the design engineer. Therefore, the Team accepts the proposal of COSTAIN on the pipes.

12) Total Price

Due to the above mentioned reduction of rates, COSTAIN's tender price goes down to DH 24,717,465.90. Amount for each part of the Bill of Quantities is shown in table 2-1.

II-3. Alternative 1

As already mentioned above, the Team and COSTAIN arrived at the negotiated price of DH 24,717,465.90 through repeated negotiations. The

MAF requested to start the second stage of cost negotiations with COSTAIN. Needless to say, further negotiations for cost reduction inevitable require some relaxation of specifications.

Taking into consideration the above mentioned, the Team and COSTAIN held negotiation meetings again, and as a result, COSTAIN offered the total price of DH 21,873,632.90 on January 24, 1982. The construction price for each part of the B/Q is shown in Table 2-1. The second revised offer from COSTAIN is outlined hereinafter.

1) Stripping (Item 3.01)

In dam construction, stripping is made at the dam foundation and for borrow pit. According to the specifications, the contractor should waste excavated materials at both the dam foundation and borrow pit to a spoil tank. However, in order to save the cost it is considered that the excavated material will be push adjacent to the borrow pit area and subsequently spread and levelled in the borrow pit on completion of the borrow pit excavation.

Due to the above-mentioned relaxation of specifications, the stripping rate of COSTAIN is reduced from 4.55 DH/cu.m to 2.60 DH/Cu.m, resulting in the saving of 214,500 DH and the amount is reduced from 500,500 DH to 286,000.

2) Embankment of Filter (Item 3.05)

As mentioned in section 11-2 of this report, the rate for filling to filter has been reduced from DH 47.61 to DH 34.00 and the amount from DH 2,808,990 to DH 2,006,000. No alternative measures for further reduction are considered.

3) Embankment of Rock (Item 3.06)

No alternative measures for further reduction of the rate are considered in respect of the embankment of rock. The stone facing is provided in place of the riprap works, resulting in an increase in the volume of rock embankment from 210,000 cu.m to 251,000 cu.m. The rate of 20.50

DH/cu.m is applied as decided in the previous negotiations with COSTAIN, therefore, the amount for this item increases from DH 4,655,700 to DH 5,145,500.

4) Riprap (Item 3.10)

The specifications require that 50 cm-wide riprap works with selected materials will be provided on the slopes of rock embankment, however, this requirement is revised to only surface finishing shown in the Tender Drawing with materials to be used for rock embankment. The quantity is 82,000 sq.m and the rate is 14.61 DH/sq.m. The amount is

DH 1,198,020. The deduction of price for the embankment of rock and riprap in the first and second negotiation stages is compared with the original price as follows: (Unit: Dirham)

<u>Description</u>	<u>Original Amount</u>	<u>Negotiated Amount (1)</u>	<u>Negotiated Amount (2)</u>
Embankment of rock	4,655,700	4,305,000	5,145,500
Riprap	4,894,170	3,362,000	1,198,020
TOTAL	9,550,870	7,667,000	6,343,520

5) Plain Concrete (Item 3.07)

No alternative measures for further reduction from the negotiated amount is considered.

6) Level Concrete (Item 5.03)

No alternative measures for further reduction is considered.

7) Reinforced Concrete (Item 5.04)

No alternative measure for further reduction is considered.

8) Crest Concrete of Spillway (Related Items 4.03, 4.04, 4.05 and 4.06)

Instead of concrete works, the Spillway crest is provided with rock filling, and stone pitching in cement mortar is made in about 25 cm wide on the surface of filled rocks. The B/Q items 4.03 to 4.06 are deleted, and the new items for rock filling faced with stone pitching in cement mortar is added. These amendments of B/Q result in a reduction

of DH 553,993 from the original offer for the spillway crest as shown below:

Item	Description	Unit	Qty	(Unit:Dirhams)	
				Rate	Amount
Original items to be deleted					
4.03	Reinforced concrete	cu.m.	2,000	417.97	835,940
4.04	Reinforced Bar	Kg	13,000	2.42	31,460
4.05	Formworks	Sq.m.	300	41.19	12,357
4.06	Curved Formworks	Sq.m.	700	58.28	40,796
T O T A L					920,553
New Item to be added					
4.03	Rock filling faced with stone pitching in cement mortar	Cu.m.	2,000	183.28	366,560

The reduction from the original offer:

$$920,553 - 366,560 = 553,993 \text{ DH}$$

9) Gabion (Item 4.07)

Out of 5,500 cu.m. of gabions, 3,000 cu.m of them to be placed downstream of the spillway are placed without gabion cages. In other words, the dry stone filling with similar natured rocks to those for gabion works is provided in place of gabion for that portion.

In this way, the cost for gabions can be reduced by DH 650,515 from the original amount as shown below:

Item	Description	Unit	Qty	(Unit: Dirhams)	
				Rate	Amount
Original:					
4.07	Gabion	Cu.m	5,500	191.00	1,050,500
Second Revised:					
4.07	Gabion	Cum	2,500	143.77	358,675
4.08	Dry Stone Filling	m Cu.m.	3,000	13.77	41,310
Total of 4.07 and 4.08					399,985

The reduction from the original offer:

DH 1,050,500 - DH 399,985 = DH 650,515

10) Gabion (Item 5.12)

No Alternative measures for further reduction of the rate for gabions from the negotiated rate can be considered.

11) Service Road (Item 6.01)

The service road for operation and maintenance does not directly affect the construction works if it is cancelled. The reduction by means of cancelling the service road amounts to DH 318,080. It is expected that this road will be constructed by other authorities in future.

12) Replacement of Power Distribution Line (Item 6.02)

The work is prerequisite for completion of the dam construction on schedule although it is not the major works involved in the dam construction. However, the work could be cancelled, if it could be made during the first twelve weeks of the contract to enable the contractor to progress the work.

In case of a delay of this works, the MAF has to relieve the contractor from the penalty for the delay of the major works, and pay to the contractor losses caused by the delay of the major works. The reduction by cancellation of this work amounts to Dh 104,680.

13) Total Construction Price

These revisions reduce the total construction price to Dh 21,873,632.90 as broken down in Table 2-1.

II-4. Alternative 2

COSTAIN submitted to the MAF its second revised offer dated January 24, 1982 of which total construction price is

Dh 21,873,632.90 assuming the revisions of design and specifications outlined in Section 11-3, Alternative I.

This section deals with the Team's considerations on the proposed revision of specifications by COSTAIN.

(1) Stripping (Item 3.01)

COSTAIN'S proposal on this item is acceptable since this is only the matter of the construction method not affecting the functions of the dam.

(2) Embankment of Filter (Item 3.05)

This is a second revised offer, and is not a new proposal.

(3) Embankment of Rock (Item 3.06)

This is a second revised offer and is not a new proposal.

(4) Riprap (Item 3.10)

From the technical point of view, this method of finishing the dam slopes is acceptable with the maximum allowable concession.

(5) Concrete (Items 3.07, 5.04)

This is a second revised offer, and is not a new proposal.

(6) Crest Concrete of Spillway (Related Items 4.03, 4.04, 4.05 and 4.06)

In order to release the design flood discharge avoiding damages on the dam body as caused by overflow from the dam crest, etc., a concrete spillway has been designed for this dam. The flow velocity on the spillway crest when the design flood discharge is released has been determined.

at 5.6 m/sec on an average. Therefore, COSTAIN'S proposal to provide the spillway crest with rock-filling faced with stone pitching in place of concrete works is not acceptable from the technical point of view in consideration of the safety of the spillway itself as well as of the main dam body.

(7) Gabion (Item 4.07)

This proposal to provide the bottom protection downstream of the spillway instead of gabions could be technically acceptable.

(8) Gabion (Item 5.12)

This is a second revised offer, and is not a new proposal.

(9) Service Road (Item 6.01)

Without the service road, the operation and maintenance will be very inconvenient in future.

However, the cancellation of this item might be unavoidable under the present circumstances.

It is expected that the service road will be constructed by other authorities in near future.

(10) Replacement of Power Distribution Line (Item 6.02)

The replacement of power distribution line means the removal of an obstacle, it is not part of the major works. This work could be cancelled without problems if the replacement is made by other authorities in time. The time extension and reimbursement that COSTAIN is requesting are considered to stand to reason.

(11) Total Construction Price

In consideration of the above mentioned, the total construction price in Alternative II arrives at Dh 22,114,681.80 after excluding the amount for daywork schedule which is considered unnecessary during the dam construction period of 10 months.

Amount by Parts is shown in Table 2-1.

III. Recommendations

Technical staff to be mobilized, detailed construction program, plant allocation and the relevant construction prices were the major subjects of price negotiations with COSTAIN. Through the negotiations, the Team clarified the ambiguities of COSTAIN's offer, and made advice from time to time on the interpretation of specifications and the methods of construction and plant operation, etc. As a result, COSTAIN made a reduction of the construction price from the original price of DH 27,873,319.90 to the negotiated price of DH 24,717,465.90, resulting in the reduction of DH 3,160,853.00. This negotiated price is nearly equal to the evaluated price (target price of negotiations) of DH 24,272,240.00 with a slight difference of 1.8%. However, in compliance with a request of the MAF, the Team continued negotiations with COSTAIN for further possible reduction of the construction price, and COSTAIN offered the price of DH 21,873,632.90 assuming the stone pitching for the spillway crest instead of the concrete works as well as the cancellation of the item of miscellaneous works amounting DH 422,760.00. The Team cannot accept, however, the COSTAIN's proposal for the spillway since the concrete works are for the necessary minimum concrete structure of the spillway from the technical view point. The Team considers that the construction price of DH 21,873,630.00 is insufficient for smooth execution of the construction works for the Project by the reason that the miscellaneous works cannot be completely cancelled. Specially, the replacement of power distribution line will be inevitable for the main dam works. Even if the replacement is made by the other authority, this work has to be completed at latest in parallel with the dam construction.

Furthermore, the cost of daywork schedule is required in any projects to cope with unexpected events during the construction period.

The cost is a contingency. Needless to say, smooth progress of

Construction works cannot be expected without such cost. In consideration of the above mentioned matter, the Team considered that the construction cost of DH 22,472,305.90, that is, the alternative (2) of DH 22,114,681.80 plus DH 252,944.10 for daywork schedule plus DH 104,680.00 for the replacement of power line is the minimum required amount for construction works of the Project. The price is by some DH 1.8 millions lower than the negotiated price of DH 24,272,240.00, and by some DH 0.8 million lower than the revised price of DH 23,272,500.00 based on the price escalation and work condition proposed by COSTAIN. Furthermore, the unit cost per cubic meter of the dam body makes no great difference with that of the on-going Wadi Ham project, a similar natured project in UAE.

Apart from the cost aspect, COSTAIN'S work program of 10 months in total is the most acceptable among others since starting after rainy April 1982, the construction works will be completed before the beginning of the next rainy season.

Based on careful studies on temporary works and plant that COSTAIN has already had in Dibba, the proposed staffing plan and the rich experience in dam construction as well as the cost aspect, it is recommended that the MAF will make a start for the contract with COSTAIN at the above mentioned amount.

APPENDIX A

ATTENDANTS TO THE MEETING FOR BRIEFING

MAF: Mr. Taisser Adlbi
Project Co-Manager
Soil and Water Department
Ministry of Agriculture & Fisheries, UAE

JAPANESE TEAM: Mr. Mujio Matsumoto
Leader of JICA Tender Evaluation Team for
the Project.

Mr. Hiroshi Kondo
Member of the Team

Mr. Noboru Moritani
Member of the Team

AST: Mr. John P. Voue
B.Sc. Civ. Eng.

DUTCO: Mr. Colin J. Marshall
General Manager

Mr. Rafique Akkeilah
P.A. to General Manager

Mr. Richard A. Padmore
Senior Estimator

Mr. Colin R. Fuller
Project Manager

COSTAIN:

Mr. S. Said
C.Eng., BSc. MICE
Dubai Area Manager

Mr. B.S. Craske
Senior Estimator

Mr. J.M. Farrell
A.I.Q.S.
Senior Quantity Surveyor

J & P:

Mr. M. Zambarloukos
Contract Manager

Mr. B.Q. Denman
Chief Quantity Surveyor

Mr. J. Lewis
Quantity Surveyor

APPENDIX B
BILL OF QUANTITIES

This Bill of Quantities shows the construction price after correction of mis-computation, negotiated price and Alternative (2). The items which are revised through the negotiation and alternative study are separated as follows:

- a) Parenthesized figures show the original offer after correction of mis-computation.
- b) 1/ shows negotiated price.
- c) 2/ shows price by the alternative study.

The total construction price of each case is as follows:

a) Original Construction Price	27,878,318.90 Dirhams
b) Negotiated Price	24,717,465.90 Dirhams
c) Alternative (2)	22,114,681.80 Dirhams

Bill of Quantities

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
<u>PAR I. GENERAL</u>					
1.01	As-built Drawings	(G.S.1. 4) L.S.			10,000.00 ✓ (INCL)
1.02	Setting Out	(G.S.1. 9) L.S.			13,409.00 ✓ (23,409)
1.03	Signpost and Notice Board	(G.S.1.16) L.S.			5,939
1.04	Engineer's Office	(G.S.1.17) L.S.			394,402
1.05	Engineer's Residences	(G.S.1.18) L.S.			196,472
1.06	Engineer's Transportation	(G.S.1.19) L.S.			234,591
1.07	Progress Report and Photographs	(G.S.1.20) Month	10	1604	16,040

Sub-Total 870,848

Bill of Quantities

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u>	<u>Amount</u>
					Dh
<u>PART II. SITE INSTALLATION</u>					
2.01	Construction & Running of Necessary Facilities	L.S.	(G.S.2. 3)		3,459,726 <u>L</u> (3,694,726)
2.02	Custody and Protection	L.S.	(G.S.2. 4)		59,718 <u>L</u> 20,000 <u>L</u>
2.03	Illumination	L.S.	(G.S.2. 5)		(INCL)
2.04	Telecommunication	L.S.	(G.S.2. 6)		88,918
2.05	Access	L.S.	(G.S.2. 7)		163,711 <u>L</u> 10,000 <u>L</u>
2.06	Storing Area	L.S.	(G.S.2. 8)		(INCL)
2.07	Power Supply	L.S.	(G.S.2. 9)		355,763
2.08	Water Supply	L.S.	(G.S.2.10)		23,757 <u>L</u> 5,000 <u>L</u>
2.09	Accident and Fire Prevention	L.S.	(G.S.2.11)		(INCL)
2.10	Safety Precautions	L.S.	(G.S.2.12)		20,000 <u>L</u> (INCL)
2.11	Sanitation and Medical Care	L.S.	(G.S.2.13)		54,048
2.12	Facilities for Site Operation	L.S.	(G.S.2.14)		1,009,610
2.13	Cleaning-up, Restoration	L.S.	(G.S.2.15)		118,786
2.14	Waste Disposal & Sewage Treatment	L.S.	(G.S.2.16)		10,891 <u>L</u> 150,000 <u>L</u>
2.15	Construction Procession Plants	L.S.	(G.S.2.17)		(IN RATE)
2.16	Field Laboratory	L.S.	(G.S.2.18)		165,052
Sub-Total					5,694,780

Bill of Quantities

Page 3

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
3.01	Stripping	(G.S. 3. 4) cu.m	110,000	2.60 (2.55)	286,000 2/ 500,500)
3.02	Common Excavation	(G.S. 4. 4) cu.m	56,000	2.01	269,360
3.03	Rock Excavation of Dam Abutment	(G.S. 6. 4) cu.m	400	19.37	7,748
3.04	Embankment of Sand & Gravel	(G.S. 10. 4) cu.m	370,000	2.72 3.40	2,856,900 1/ 2,006,000 1/
3.05	Embankment by Filter	(G.S. 26. 3) cu.m	59,000	(47.61)	2,808,990 1/
3.06	Embankment of Rock	(G.S. 11. 4) cu.m	210,000	20.50 (22.17)	4,305,000 1/ 4,655,700 1/
3.07	Plain Concrete	(G.S. 13. 18) cu.m	300	308.18 338.18	92,454 1/ 101,454)
3.08	Formworks	(G.S. 14. 8) sq.m	1,400	22.60	31,640
3.09	Paving of Dam Crest by Gravel	(G.S. 23. 2) cu.m	800	41.86 49.72	33,488 1/ 2,008,520 1/
3.10	Riprap	(G.S. 28. 2) cu.m	41,000	82.00 (119.37)	3,362,000 1/ 4,884,170)
	Sub-Total				11,926,610 2/ 12,464,590 1/ (16,159,950)

Bill of Quantities

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
<u>PART IV. SPILLWAY</u>					
4.01	Common Excavation	(G.S. 4. 4) cu. m	10,000	4.81	48,100
4.02	Rock Excavation	(G.S. 7. 5) cu. m	73,000	16.48	1,203,040 U
				38797	775,940 U
4.03	Reinforced Concrete	(G.S. 13. 18) cu. m	2,000	(477.97)	835,940 U
4.04	Reinforcing Bar	(G.S. 15. 5) kg	13,000	2.42	31,460
4.05	Formworks	(G.S. 14. 8) sq. m	300	51.19	15,357
4.06	Curved Formworks	(G.S. 21. 2) cu. m	700	58.28	40,796 U
				399,985 U	
4.07	Gabion	(G.S. 21. 2) cu. m	5,500	143.47	789,085 U
				(191.00)	(1,050,500)
	Sub-Total				2,511,678 U
					2,900,778 U
					(3,222,193)

Bill of Quantities

Item No.	Description	Unit	Quantities	Rate	Amount
				Dh	Dh
PART V. CONDUIT					
5.01	Conduit Excavation	cu. m	4,500	7.13	33,085.0
5.02	Backfill	cu. m	600	1.75	1,050.0
5.03	Level Concrete	cu. m	50	322.15	16,107.5
5.04	Reinforced Concrete	cu. m	650	357.15	232,047.5
5.05	Reinforcing Bar	kg	25,000	2.42	60,500.0
5.06	Formworks	sq. m	500	41.19	20,595.0
5.07	Dowel Bar	No.	600	17.82	10,692.0
5.08	Water Stop (B = 400 mm)	m	140	67.29	9,420.6
5.09	Elastic Filler	sq. m	100	356.36	35,636.0
5.10	R. C. Pipe	m	130	801.45	104,188.5
5.11	Masonry	cu. m	800	166.30	133,040.0
5.12	Gabion	cu. m	2,600	193.47	503,022.0
5.13	Wire Stabler of Pipe	No.	130	191.00	24,830.0
	Sub-Total			59.39	7,720.7
					1,110,765.8
					(1,255,343.8)

Bill of Quantities

Page 6

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
<u>PART VI. MISCELLANEOUS WORKS</u>					
6.01	Service Road (w = 7.0 m Asphalt paying)	m	2,000	159.04	318,080
6.02	Replacement of Power Distribution Line	m	2,000	52.34	104,680
Sub-Total					422,760

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u>	<u>Amount</u>
				Dh	Dh
<u>PART VII. DAYWORKS SCHEDULE</u>					
<u>Labour</u>					
7.01	Labourer	day	700	71.07	49,749.0
7.02	Mason	day	70	94.02	6,581.4
7.03	Concretor	day	70	94.02	6,581.4
7.04	Bar Bender	day	70	94.02	6,581.4
7.05	Carpenter	day	70	94.02	6,581.4
7.06	Mechanic	day	70	123.50	8,645.0
7.07	Foreman (in charge of labourer)	day	70	129.68	9,077.6
<u>Materials</u>					
7.09	Explosive including detonater	kg	30	10.26	307.8
7.10	Coarse aggregate	cu.m	30	28.80	864.0
7.11	Fine aggregate	cu.m	20	28.80	576.0
7.12	Sand	cu.m	30	28.80	864.0
7.13	Portland Cement	ton	10	450.00	4,500.0
7.14	Reinforcing Bar	ton	10	1,980.00	19,800.0

Bill of Quantities

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
7.15	Softwood (all size)	cu. m	10	1,080.00	10,800.0
7.16	Bitumen 60/70 Penetration Grade	ton	20	1,560.00	31,200.0
7.17	Wire (all size)	kg	30	2.40	72.0
7.18	Gasolin	liter	300	1.00	300.0
7.19	Diesel oil	liter	150	0.90	135.0
7.20	Heavy oil	liter	150	0.90	135.0
<u>Plant</u>					
7.21	Bulldozer from 80 to 100 HP	Hour	30	98.24	2,947.2
7.22	Bulldozer from 100 to 200 HP	Hour	30	98.24	2,947.2
7.23	Bulldozer over 200 HP	Hour	30	212.71	6,381.3
7.24	Scraper from 10 to 12 cu. m struck	Hour	30	424.80	12,744.0
7.25	Scraper over 12 cu. m struck	Hour	30	638.90	19,167.0
7.26	Tractor, from 100 to 200 HP	Hour	60	36.26	2,175.6
7.27	Backhoe Shovel, from 1.0 to 1.5 cu. m capacity	Hour	30	76.55	2,296.5
7.28	Wheel Type Loader, from 1.5 to 2.5 cu. m capacity	Hour	30	136.74	4,102.2
7.29	Dump Truck, from 10 - 12 ton capacity	Hour	40	120.00	4,800.0
7.30	Dump Truck, over 12 ton capacity	Hour	30	144.00	4,320.0

Bill of Quantities

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Quantities</u>	<u>Rate</u> Dh	<u>Amount</u> Dh
7.31	Vibrating Rollar, from 8 to 10 ton	Hour	30	68.09	2,042.7
7.32	Truck Crane, from 10 to 15 ton	Hour	30	112.90	3,372.0
7.33	Crawler Drill, any size	Hour	30	48.17	1,445.1
7.34	Air Compressor, 90 PS or below	Hour	30	36.00	1,080.0
7.35	Air Compressor, over 90 PS	Hour	30	42.68	1,280.4
7.36	Rock Drill, 30 kg class	Hour	20	2.40	48.0
7.37	Leg Drill, 15 kg class	Hour	30	2.40	72.0
7.38	Leg Drill, 30 kg class	Hour	30	2.40	72.0
7.39	Pick Hammer, any size	Hour	30	4.20	126.0
7.40	Concrete Mixer, 0.5 cu. m class	Hour	40	30.00	1,200.0
7.41	Concrete Mixer, 0.2 cu. m class	Hour	40	24.00	960.0
7.42	Concrete Vibrator, 4 PS class	Hour	70	60.00	4,200.0
7.43	Pump, 10 PS class	Hour	70	19.68	1,377.6
7.44	Generator, over 100 KVA	Hour	20	45.64	912.8
7.45	Generator, 100 KVA or below	Hour	20	36.00	720.0
7.46	Water lorry, 6,000 liter	Hour	20	50.11	1,002.2
7.47	Agitator Car, 3.0 cu. m class	Hour	20	112.92	2,258.4
7.48	Mixer Truck, 3.0 cu. m class	Hour	20	112.92	2,258.4
7.49	Vibrating Compactor, 4 PS class	Hour	20	24.00	480.0
7.50	Motorgrader, from 80 to 100 HP	Hour	20	141.05	2,821.0
Sub-Total					252,944.1

SUMMARY OF BILL OF QUANTITIES

<u>DESCRIPTION</u>	<u>AMOUNT</u>	Dh
PART I GENERAL	870,848.0	
PART II SITE INSTALLATION	5,698,720.0	2)
PART III MAIN DAM	13,244,590.0	4)
PART IV SPILLWAY	(16,159,450.0)	
PART V CONDUIT	2,511,078.0	2)
PART VI MISCELLANEOUS WORKS	(3,222,193.0)	
PART VII DAYWORKS SCHEDULE	1,110,765.8	4)
TOTAL	(1,255,893.8)	2)
	- 0 -	
	(922,760.0)	2)
	- 0 -	
	(252,949.1)	
	22,114,681.8	2)
	24,717,465.9	4)
	(27,878,318.9)	

