



## BOLIVIA

### INCAHUASI IRRIGATION PROJECT CHUQUISACA



<b>Client</b>	Prefecture of Chuquisaca Department								
<b>Financing</b>	KfW, Kreditanstalt für Wiederaufbau								
<b>Duration of Services</b>	06/2001 – 02/2008								
<b>Cost of Implementation</b>	<table border="0"> <tr> <td>Consultancy:</td> <td>2.5 Mio US-\$</td> </tr> <tr> <td>Construction:</td> <td>7.4 Mio US-\$</td> </tr> <tr> <td>Minor Works:</td> <td>2.9 Mio US-\$</td> </tr> <tr> <td>Suitability Works:</td> <td>0.6 Mio US-\$</td> </tr> </table>	Consultancy:	2.5 Mio US-\$	Construction:	7.4 Mio US-\$	Minor Works:	2.9 Mio US-\$	Suitability Works:	0.6 Mio US-\$
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#### Scope of Services

- Design and construction of mayor structures
- Final design of the 2 zoned earth dams and of main irrigation canals, minor and secondary structures
- Hydrological study
- Environmental impact study
- Geological and geotechnical study
- Design and supervision of minor structures
- Elaboration of tender documents
- Construction supervision of 2 zoned earth dams and of major hydraulic structures
- Construction supervision of minor and secondary hydraulic structures

## Brief Project Description

In the Incahuasi pampas exists an irrigation infrastructure which is characterized by its decentralization in 60 individual systems. These individuals systems feed irrigation areas from 13 to 225 ha totalizing in the whole zone approximately 4000 ha. The water intake works consist mainly of drainage galleries and some superficial intakes. The water is conducted by means of earth channels to the irrigation areas.

The project is sub-divided in the following sub-projects or sub-systems:

- Sub-System Terrado River, with 1581 ha of irrigation
- Sub-System Villa Charcas River, with 2111 ha of irrigation
- Sub-System Incahuasi, with 170 ha in the right margin and 179 ha in the left margin of the river Incahuasi.


**Minor Works:** These works consisted of drainage channel revetment, roads construction, aqueducts, sewerage, distribution intakes, water meters, and gabion construction in the margins of the rivers Villa Charcas, Terrado and Incahuasi. The works had the participation of the users.

**Major Works:** The major works were divided in two lots which are summarized as follows:


- LOT I: Sub-System Villa Charcas River: Challhua Mayu dam and its channels system
- LOT II: Sub-System Terrado River: Yana Khakha dam and its channels system



### Lot I: Challhua Mayu Dam and Main Channel System

	CHALLHUA MAYU DAM	CHANNELS AND CONNECTIONS		
		Left Margin	Right Margin	
Maximum height of dam	20.00 m	Total length	22.50 km	10.60 km
Crown length	247.00 m	Earth reaches lengths	14.00 km	3.20 km
Crown width	6.00 m	Revetment reaches lengths	6.80 km	6.70km
Maximum width in the dam foot	96.00 m	Siphon	1.70 km	0.70 km
Upstream slope (V : H)	1 : 2.5	Aqueducts	Various	Various
Downstream slope (V : H)	1 : 2.0	Distributors	Various	Various
Intake Pipe DIP	DN 500	Excavation	43.000 m <sup>3</sup>	Various
Regulating device	Butterfly Valve	Backfilling	3.700 m <sup>3</sup>	1.700 m <sup>3</sup>
		Cast iron for lining	1.825 m <sup>3</sup>	
		PVC pipe, DN 300	4.900 m	Considered in the left margin of the Channel

### Lot II: Yana Khakha Dam and Main Channel

	YANA KHAKHA DAM	CHANNELS AND CONNECTIONS	
		Left Margin	
Maximum height of dam	22.40 m	Total length	15.30 km
Crown length	285.00 m	Earth reaches lengths	4.90 km
Crown width	6.00 m	Revetment reaches lengths	10.00 km
Maximum width in the dam foot	107.00 m	Siphon	0.40 km
Free bord NWL	3.15 m	Aqueducts	Various
Free bord MWL	1.20 m	Distributors	Various
Upstream slope (V : H)	1 : 2.5	Excavation	28.000 m <sup>3</sup>
Downstream slope (V : H)	Butterfly Valve	Backfilling	3.200 m <sup>3</sup>
		Cast iron for lining	2.800 m <sup>3</sup>
		PVC pipe, DN 300	840 m