

**Iranian Cultural Heritage, Handicrafts
and Tourism Organization**

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM
Bridges, dams, canals, buildings and watermills
From ancient times to present

UNESCO
World Heritage Convention
Nomination of Properties for Inclusion on
The World Heritage List

Tehran 2008

The Emperor Shapur (A.D. 240-70), son of Artaxerxes the Sâssanian,
“Constructed Shâdzhurvân in Shushtar, one of the world’s wonders.”
The Compendium of Histories and Narratives dated A.D. 1126, p. 63.

In the name of God

Preface:

The Kârun River is one of the great rivers of Iran. It originates from the Zagros mountain straits and arrives in Khuzestan Province, reaching the Shushtar plain. Its turbulent waters were skillfully controlled by our ancestors to enable the prosperous development of the region since over 2,000 years ago. Innovative engineering feat were achieved to control the forces of the Kârun River water, applying the natural energy resource for irrigation, transportation, industrial, commercial, defensive and architectural purposes.

Over time, an advanced interconnected hydraulic system consisting of reservoirs, regulatory dams, inflow and diversion structures, sedimentation ponds and emergency outflows, was developed to channel water and energy for the following purposes:

- i. Industrial use for the operation of over forty watermills and other structures
- ii. Agricultural use drawing on channel outlets; and
- iii. Domestic water supply and air-conditioning, through underground channels.

The northernmost structure of this system called Band-e Mizân, ingeniously divided the Kârun River water into two branches with the proportion of 2:1, an achievement considered difficult even today. These branches are named: Shoteit or Chahar Dangeh (literally Four Parts) and Gargar or Do Dangeh (literally Two Parts). The Gargar Canal was entirely constructed by man. Another manmade canal, the Dâriun Canal, continues to serve to irrigate more than forty thousand hectares of Mianâb or Minoo (literally Paradise) fields. For nearly two thousands years, the Polband-e Shâdorvân Bridge/Dam was one of the few passageways allowing passage over Kârun River. It also brought up the level of the water which still runs a kilometer. This enabled further irrigation of the fields 40 kilometers away in southern Shushtar.

In spite of the scorching summer months of Khuzestan Province reaching over 50 degree centigrade, natural air conditioning and cool water were available everywhere in Shushtar historical town, through a refined underground canal network system built within the sandstone bedrock.

Shushtar became a buoyant trading center in the region, being the farthest point to which ships could travel from the Persian Gulf, thanks to the navigation capacity of the Gargar Canal. The

Kârun River was also used as a defensive dyke surrounding the Shushtar City. The entire hydraulic system was managed from the Salâsel Castle, the political seat of the local Governor, who effectively controlled all activities in the region.

This integrated, multi-purpose hydraulic system was one of the most sophisticated industrial achievements in the history of humankind before the Industrial Revolution, which continues to be used today. The Shushtar region has developed as the most important agricultural center of Iran throughout its history until now. The *Shushtar Historical Hydraulic System* enriched the traditions and culture, and continues to contribute to all aspects of Shushtar life. It also represents the strong desires of humankind to exist in harmony with the harsh natural environment.

The creation, conservation and continuation of the *Shushtar Historical Hydraulic System* represent an exceptionally comprehensive example of industrial heritage, advanced technology and water resource management developed in ancient Iran. It is one of the greatest engineering achievements of humankind, providing the mode for the flourishing of technological innovation directly resulting with economic and agricultural development. The outstanding universal value of the *Shushtar Historical Hydraulic System* has few parallels, if any.

The Government of the Islamic Republic of Iran is therefore honored to present to the international community, this World Heritage nomination dossier of the *Shushtar Historical Hydraulic System* for inscription on the prestigious UNESCO World Heritage List in 2009. Through the international recognition of the heritage values of the *Shushtar Historical Hydraulic System*, the Government of the Islamic Republic of Iran also seeks to contribute to intercultural dialogue. Finally, the Government of the Islamic Republic of Iran hopes this World Heritage nomination dossier will further the World Heritage Committee's Global Strategy for a more representative, balanced and credible World Heritage List.

2008 January 24

Tehran, Islamic Republic of Iran

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EXECUTIVE SUMMARY

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM

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Tehran 2008

State Party: Islamic Republic of Iran



The location of the city of Shushhtar in Iran

State, province or region:

Province of **Khuzestan**



The location of the city of Shushtar in the Khuzestan province

Name of Property:

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM

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Shushtar Historical Hydraulic System, General landscape

Geographical coordinates to the nearest second

Geographical coordinates of the main sites within the property:

No	Site Names	Geographical Coordinates	Map ref.
1	Band-e Mizân Dam	N: 32° 03' 1.21" E: 48° 51' 6.33"	III-1
2	Kolâh-Farangi Tower	N: 32° 03' 0.28" E: 48° 51' 4.91"	III -2
3	Gargar Canal (beginning point)	N: 32° 03' 1.21" E: 48° 51' 6.33"	III -3
4	Polband-e Gargar Bridge-dam	N: 32° 02' 7.02" E: 48° 51' 5.09"	III -4
5	Watermills and Waterfalls area	N: 32° 02' 6.35" E: 48° 51' 4.86"	III -5
6	Borj-e 'Ayâr Bridge-dam and Sâbe'in Sanctuary	N: 32° 01' 8.96" E: 48° 51' 1.36"	III -6
7	Mâhi-bâzân (Khodâ-âfarin) Bridge-dam	N: 32° 00' 0.31" E: 48° 51' 4.12"	III -7
8	Salâsel Castle	N: 32° 03' 0.67" E: 48° 51' 1.78"	III -8
9	Dâriun Canal (beginning point)	N: 32° 03' 0.67" E: 48° 51' 1.78"	III -9
10	Polband-e Shâdorvân Bridge-dam	N: 32° 03' 1.18" E: 48° 50' 9.05"	III -10
11	Band-e Khâk Dam	N: 32° 02' 1.39" E: 48° 50' 4.60"	III -11
12	Lashkar Bridge-dam	N: 32° 01' 9.50" E: 48° 50' 4.84"	III -12
13	Band-e Sharâbdâr Dam	N: 32° 01' 7.68" E: 48° 50' 9.23"	III -13

Textual description of the boundaries of the nominated property

- Textual description boundaries of the nominated property as follows:

The Summary of Description of Buffer zone

The buffer zone includes all areas which have close connections with SHHS from functional, structural, and visual point of view.

In the north, the buffer zone passes through some built-up areas which have close connections with SHHS. Then, southward, it includes agricultural areas and heights situated in the east of Gargar Canal.

In the south and west, the buffer zone still includes agricultural areas related to the Gargar Canal; moreover, it includes one built-up area called "Gavmish-Abad" as well as the old town.

N.B. Shushtar is situated in UTM zone 39

DESCRIPTION OF THE CORE ZONE

The core zone area begins from point (UTM: X: 298002.2, Y: 3548453.1, Z: 44; N: 32 3 15.3628 E: 48 51 37.4549) in the northern shore of Shoteit, and at a south-east direction connects to the south-western wall of Seyyed Mohammad Golabi tomb. Then, the core zone line corresponds with the western side of Seyyed Mohammad Golabi street as far as point (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N: 32 3 2.9822). From the eastern corner of a residential building, the direction changes towards north-west as far as point (UTM: X: 298106.8, Y: 3548097.9, Z: 45; E: 48 51 41.7093 N: 32 3 3.9018).

From the very point on, it goes southwards in direction of the eastern side of residential buildings of Dorudgar complex.

From point (UTM: X: 298056.6, Y: 35848011.6, Z: 53.9; E: 48 51 40.8231 N: 32 2 21.0449) (eastern corner of the last building) it is defined on the eastern border of Gargar Canal basin (western edge of Motahari park). Then, from the south western end of that park, point (UTM: X: 297878.1, Y: 3547559, Z: 44; E: 48 51 33.4014 N: 32 2

46.2644) returns towards Valiy-e Asr street (Seyyed Mohammad Golabi), and is defined on the eastern edge of the residential buildings of the town, as map II shows.

At the end of Tahmasebi alley, changes direction on the northern edge of residential blocks and inclines towards the river. Then, at a point in which the core zone line is parallel to Gargar Canal, the line goes south and passes by east of residential blocks, such that the last buildings adjacent to Gargar is always located inside the core zone. At the end of buildings adjacent to the eastern shore of Gargar, point (UTM: X: 297864, Y: 3546960.5, Z: 61.5; E: 48 51 33.3165, N: 32 2 26.8307) the core zone line is again on the eastern edge of Gargar Canal basin and goes southward.

North of Sâbe‘in Sanctuary and the Koshtârgah bridge, point (UTM: X: 297237.2, Y: 3546271.5, Z: 29.8; E: 48 51 9.9555 N: 32 2 4.0648) where the river shore widens, the core zone line is upon the eastern side of the farm adjacent to the river.

At point (UTM: X: 297205.7, Y: 3546120.5, Z: 31; E: 48 51 8.8697 N: 32 1 59.1437) the core zone line goes up to point (UTM: X: 297219.1, Y: 3546046.6, Z: 37.4; E:48 51 9.4363, N: 32 1 56.7539) upon the earth topography. From this point in the east of the bridge, the line is defined again on the natural topographic border with the farms east of Sâbe‘in Sanctuary.

At point (UTM: X: 297258.9, Y: 3545879.5, Z: 43; E: 48 51 11.0792, N: 32 1 51.3563) the core zone line lowers in the harmony with topography, while it is located west of the local road and east of the farms on Gargar Canal side. At the end of this road, and above the water way which joins Gargar eastward, the core zone line is defined respectively in the west, north and again in the west of the farms on Gargar Canal side. Then it continues as far as north of Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam area at the end point of farms. From point (UTM: X: 297351, Y: 3543572, Z: 30.4) the core zone is the western side of the heights adjacent to the Gargar Canal.

At point (UTM: X: 297404.4, Y: 3543096, Z: 44.3; E: 48 51 18.7284, N: 32 0 21.1100) the core zone distances itself from the river so that the heights just adjacent to the river are inside core zone. At point (UTM: X: 297544.1, Y: 3542674, Z: 44.6) located in the north of Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam, where the heights extend and the border between the plain and the mountain moves away from the area, the core zone encircles the peak of heights around the Mâhi-bâzân area projection, so that the peak and

its immediate valley are within the core zone. In the south of Mâhi-bâzân area, on the last point of the mentioned heights, the core zone line returns in the North West direction towards the western shore of the river. In the same direction, the core zone passes from north of a farm and in-between two fish breeding pools. Then, it goes northward coinciding with a local road among the farms. After crossing a Y-shaped road, still conforming to local farms access road, the line moves north, east and again north. At point (UTM: X: 297136.5, Y: 3542989.6, Z: 44.3; E: 48 51 8.6050, N: 32 0 17.4840) the core zone line rests on western side of heights adjacent to Gargar. From point (UTM: X: 297002.1, Y: 3543576.3, Z: 38.3; E: 48 51 3.0414, N: 32 0 36.4390) located between the farms and town limits, the core zone is the border between the town and natural basin of the river. From the end of the town limits (UTM: X: 296912.5, Y: 354463.7, Z:-14.6; E: 48 50 58.8245, N: 32 1 10.7969) onwards, the core zone line rests on the border between natural basin of the river and the farms west of Gargar Canal.

This trend goes on as far as south of Raghat stream, where it diverts to an eastern-western direction. As far as point (UTM: X: 296180.9, Y: 3545653, Z: 3.40; E: 48 50 30.1807, N: 32 1 43.3174), the core zone line is the edge of natural basin of the river. Then, the core zone is respectively the north fence of a workshop, the eastern side of Ahwaz road and Shahed square. Above the square, the core zone line rests on the western side of Allameh Shushtari and diverts from above the local access road north of residential blocks leftward as far as 100m off the main street.

From point (UTM: X: 295956.1, Y: 3545930.5, Z: 36.4; E: 48 50 21.4050, N: 32 1 52.1681) the core zone line continues in parallel with the main street northwards. After travelling 155m it turns right in parallel with the workshop.

Opposite the workshop, the core zone line coincides with the western part of Allameh Shushtari boulevard as far as the hydraulic facilities, at point (UTM: X: 296095, Y: 3546538.4, Z: 3, 40.9; E: 48 50 26.2528, N: 32 2 11.9881).

then it turns right as far as point (UTM: X: 296125.9, Y: 3546526.9, Z: 40.6; E: 48 50 27.4198 N: 32 2 11.6346).

This point joins southward point. (UTM: X: 296267.1, Y: 3546299.5 Z: 42.3; E: 48 50 32.9729, N: 32 2 4.3459).

From this point onward, the core zone line conforms to the south and eastern

border of residential blocks and from the last point connects point (UTM: X: 296335.4 Y: 3546185.7, Z: 48.9; E: 48 50 35.6617, N: 32 2 0.6968).

Then it encircles the natural cliff known as Tu- Asheghan and rests on the northern edge of Shahid Beheshti Boulevard. From point (UTM: X: 296252.6, Y: 3545937.2, Z: 39), (E: 48 50 32.6963 N:32 1 52.5780) the core zone line turns south and is defined upon the eastern and south border of the residential area of the town as drawn in map II.

From point (UTM: X: 296931.2., Y: 3545731.4, Z: 39; E: 48 50 58.7065, N: 32 1 46.3380) it goes south, and then changes route northwards. So that the core zone rests on in-between Gargar Canal and Raghbat stream and is the natural border of their natural basins. It joins again the town area limits at point (UTM: X: 297023.5, Y: 3545740, Z: 42; E: 48 51 2.2165 N: 32 1 46.6768), where goes north and passes respectively the eastern border of residential blocks, the eastern border of Adi-zadeh street, the western border of Fahmideh square, the eastern border of coast road as far as Emam Khomeini street, then it turns eastward, From the end of mentioned street, point (UTM: X: 297688.2, Y: 3546906.9, Z: 62.2; E: 48 51 26.6584, N:32 2 24.9779) the core zone line is defined upon buildings adjacent to Gargar Canal as far as mills square. In this square, the core zone border is the edge of shops and then, as the map shows, is the edge of the buildings adjacent to Gargar.

At the end of the buildings line, north of Shahid Sherafat Street, core zone turns left. In south of Kolâh-Farangi Tower, the line is defined conformed to the eastern edge of Qasem-zeyd Street. Following this route southwards, core zone turns direction from point (UTM: X: 297652.4, Y: 3547915, Z: 52.1; E: 48 51 24.5316, N: 32 2 57.6732) to northwest as far as point (UTM: X: 297598.6, Y: 3547970, Z: 46; E: 48 51 22.4396, N: 32 2 59.4333) where it changes direction again and goes southwest to join the northernmost edge of town buildings.

From the northern corner of Helale-Ahmar depot, point (UTM: X: 297304.1, Y: 3547996, Z: 47.1; E: 48 51 11.1973, N: 32 3 0.0904) the core zone line is consecutively coinciding with the western edge of that area, the south edge of the sport field, the western edge of the access road ending in Salâsel Castle, and the edge of buildings located south of Shah-safi mosque.

Afterward, it changes direction as far as the end of the residential blocks, point (UTM: X: 297118.2, Y: 3548086, Z: 47.9; E: 48 51 4.0451, N: 32 3 2.8815) where the line diverts towards the eastern edge of Dâriun Canal. Resting on the border of residential blocks, it continues southward to point (UTM: X: 296945.3, Y: 3548026.8, Z: 48.9; E: 48 50 57.5014, N: 32 3 0.8452) in Bateni square. Then, it links to point (UTM: X: 296908.7, Y: 3548016, Z: 44.6; E: 48 50 56.1149, N: 32 3 0.4710) at the beginning of the street ending in Azadegan bridge; at this point, the core zone connects with points number (UTM: X: 296883.2, Y: 3548032.3, Z: 48; E: 48 50 55.1308, N: 32 3 0.9835), (UTM: X: 296828.2, Y: 3548015.9, Z: 48.8; E: 48 50 53.0473, N: 32 3 0.4156), (UTM: X: 296670.4, Y: 3547929.1, Z: 43.4; E: 48 50 47.1001, N: 32 2 57.4963) and (UTM: X: 296547.1, Y: 3547861.6, Z: 42.6; E: 48 50 42.4529, N: 32 2 55.2257).

Then, according to the map it turns north and is defined upon the inner route of the coastal park. At the end of this path, at (UTM: X: 296409.9, Y: 3548296.9, Z: 39; E: 48 50 36.8932, N: 32 3 9.2645), the core zone goes north as far as the edge of buildings located on the northern shore point (UTM: X: 296416.8, Y: 3548566.1, Z: 56.3; E: 48 50 36.9512, N: 32 3 18.0060).

Then it continues eastwards upon the south fence of these buildings as far as Azadegan square. From the eastern fence of Jihad Keshavarzi building, the core zone rests upon the edge of Azadegan square and then the southern edge of the onset of coastal road, south of Shahenajaf. From the junction of this street, with Khane-sazi Street, the core zone line extends southeast then eastwards coinciding with the local road.

Afterwards from point (UTM: X: 297496.8, Y: 3548355.6, Z: 45.4; E: 48 51 18.2685, N: 32 3 11.8727) located on this path, the core zone passes respectively points number (UTM: X: 297551.3 Y: 3548317.2, Z: 41; E: 48 51 20.37, N: 32 3 10.99), (UTM: X: 297650.3, Y: 3548308, Z: 41; E: 48 51 24.1542, N: 32 3 10.4268), (UTM: X: 297831.6, Y: 3548317.5, Z: 44; E: 48 51 31.0560, N: 32 3 10.8520) and (UTM: X: 297940.7, Y: 3548370.7, Z: 45.3; E: 48 51 35.1735, N: 32 3 12.6489) Then, the line returns to the start point (UTM: X: 298002.2, Y: 3548453.1, Z: 44),

DESCRIPTION OF THE BUFFER ZONE

The buffer zone of SHHS comprises of two types: the built up area and the agricultural area (see map II).different sets of regulations apply in these two areas that is as follows:

Description of built-up areas in the buffer zone

The built up areas consists of four areas as follows:

I-The area located east of Gargar

II-The area located west of Gargar and south of Shoteit

III-The area located north of Shoteit

IV-The area located south of Shushtar and North West of Mâhi-bâzân bridge-Dam

Each with the following descriptions:

I-The area located east of Gargar

This area begins from north, opposite Band-e Mizân Dam entrance at point (UTM: X: 298194.9, Y: 3548172.7, Z: 48.4; E: 48 51 45.0102, N: 32 3 6.3862) and continues eastward on the northern border of the school as far as point (X: 298310.9, Y: 3548172.2, Z: 54.1; E: 48 51 49.4311, N: 32 3 6.4445). This point joints the northern corner of a building (UTM: X: 298346.1, Y: 3548130, Z: 48.7; E: 48 51 50.8043, N: 32 3 5.0975) and then, coinciding with the western border of residential blocks, the line extends southward to the south edge of Saheb-al-zaman Boulevard. Here afterwards the buffer zone line is the northern edge of the buildings, specified in the map, at the corner of the passageway, it turns again southwards conformed with the edge of residential blocks.

At the southernmost point of the buffer zone and on the border between residential blocks and farmlands, from point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51 40.8231, N: 32 2 21.0449) the core zone rests on the south edge of residential buildings and at the northwestern direction joins point (UTM: X: 297895.5, Y: 3546905.2, Z: 59; E: 48 51 34.5585, N: 32 2 25.0561) on the Gargar side. Here afterwards, the buffer zone is conformed with the core zone line, as previously described which as far as point (UTM: X: 297940.6, Y: 3547533.5, Z: 50.7; E: 48 51 35.8023, N:

32 2 45.4770), situated in the south of Shahid Motahari park and west of Valiy-eAsr avenue (Seyyed Mohammad Golabi). From this point onwards, the buffer zone line is the western edge of Valiy-Asr avenue northwards as far as point (UTM: X: 298194.9, Y: 3548172.7, Z: 48.4; E: 48 51 45.0102 N: 32 3 6.3862).

II-The area located west of Gargar and south of Shoteit

This area begins from point (UTM: X: 296908.7, Y: 3548016, Z: 44.6; E: 48 50 56.1149, N: 32 3 0.4710) the corner of Bateni square (at the beginning of the access road to Azadegan bridge) and turns right conformed with the edge of the square as far as point (UTM: X: 296912.1, Y: 3547984, Z: 45.8; E: 48 50 56.2688, N: 32 2 59.4346). From this point on, the line turns southward and conforming to the western edge of Allameh Shushtari Boulevard continues to Gadir square. Then, as shown in the map II, It encircles the western edge of the mentions square. From point (UTM: X: 29 76 23.2, Y: 35 46 935.8, Z: 48; E: 48 51 24.16, N: 32 02 25.87)

In Gadir square, the buffer zone continues in south-east direction band joins to the NBB point (UTM: X: 29 78 87.7, Y: 35 46 452, Z: 48; E: 48 51 34.60, N: 32 02 10.34) at eastern edge of Emam Khomeini street. Coinciding with the eastern edge of the mentioned street, the line goes southward and joins o point (UTM: X: 29 78 17.4, Y: 35 46 336.8, Z: 48; E: 48 51 32.01, N: 32 02 06.49) and point (UTM: X: 29 78 34.5, Y: 35 46 171.9, Z: 49; E: 48 51 32.29, N: 32 02 01.22). Hereafter, the buffer zone is conformed to the core zone line, so that it first continues to the east, then, after a short diversion to the south, it passes eastward south of the town area. Then, it passes Raghat stream from east and continues to the north following the core zone line.

As previously mentioned the buffer zone continues along western edge of Gargar basin to the north of built-up area. Then following the core zone it turns to the south-east until it joins the beginning point at Bateni square.

III-The area located north of Shoteit

This area begins at its northernmost spot from crossroads of Khanehsazi street and the coastal boulevard at point (UTM: X: 297257.6, Y: 3549377.8, Z: 65.2; E: 48 51 8.3775, N: 32 3 44.8942) and continues along northern edge of the latter street eastwards.

From point (UTM: X: 297714.3, Y: 3549287.5, Z: 48.9; E: 48 51 25.8518, N: 32 3 42.2582) the buffer zone line changes direction and goes on overlapping respectively the western and northern edge of Khanehsazi street as far as point (UTM: X: 297074.8, Y: 3548626 Z: 46.5; E: 48 51 1.9815, N: 32 3 20.3761). Here, it coincides with the northern border of the core zone line as far as point (UTM: X: 296416.8, Y: 3548566.1, Z: 56.3; E: 48 50 36.9512, N: 32 3 18.0060), where it extends west and then northward. In this way, it passes respectively points (UTM: X: 296417.1, Y: 3548647.4, Z: 52.2; E: 48 50 36.9007, N: 32 3 20.6447), (UTM: X: 296431.3, Y: 3548679.1, Z: 52.3; E: 48 50 37.4177, N: 32 3 21.6828), and (UTM: X: 296424.7, Y: 3548827.5, Z: 57.7; E: 48 50 37.0532, N: 32 3 26.4948) until it reaches to reach point (UTM: X: 296423.7, Y: 3548911.7, Z: 62; E: 48 50 36.9509, N: 32 3 29.2270) on the southern edge of Daneshgah boulevard. Here, on overlapping the southern edge of Daneshgah boulevard, it extends to the east then, after passing south of the square, goes north east as far as point (UTM: X: 296853.4, Y: 3549011.2, Z: 68; E: 48 50 53.2513, N: 32 3 32.7347). Here after, the buffer zone line redirects again eastwards.

After passing points (UTM: X: 297039.6, Y: 3549014.7, Z: 74.9; E: 48 51 0.3448, N: 32 3 32.9687), and (UTM: X: 297160.9, Y: 3549004.2, Z: 60.6; E: 48 51 4.9757, N: 32 3 32.7064), it reaches point (UTM: X: 297174.1, Y: 3548995, Z: 55; E: 48 51 5.4857, N: 32 3 32.4163) on the western edge of Khanehsazi street.

From his point on, it changes direction again and it passing along the western edge of Khanehsazi street. Connects with the start point of (UTM: X: 297257.6, Y: 3549377.8, Z: 65.2; E: 48 51 8.3775, N: 32 3 44.8942)

IV-The area located south of Shushtar and northwest of Mâhi-bâzân Dam

This area includes residential region called Gavmishabad (Shahrak-e Andisheh). The buffer zone begins from point (UTM: X: 296912.5, Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N: 32 1 10.7969) at the northeastern end of the vary region. they coinciding with the core zone line, if extends southward along Gargar Canal Point (UTM: X: 296952.6, Y: 35436363 Z: -14.2; E: 48 51 1.1107, N: 32 0 38.3446) at the south east of Sharak-e Andisheh , it continues towards south west and passes the farm lines as shown in map. From point (UTM: X: 296791.5, Y: 3543480 Z: 12.1; E: 48 50 55.0926, N: 32 0 33.1775),

the buffer zone line turns south, then west and afterwards north, while it overlaps the border of Sharak-e Andisheh with farmlands. following this path, it and passes points (UTM: X: 296818.3 Y: 3543384.1, Z: -9.1; E: 48 50 56.1861, N: 32 0 30.0823), (UTM: X: 296382.3, Y: 3543378.8, Z: -12.8; E: 48 50 39.5831, N: 32 0 29.6282) and (UTM: X: 296271.9, Y: 3543484.3, Z:-12.7; E: 48 50 35.2978, N:32 0 32.9808) until it reaches point (UTM: X: 296242, Y: 3544525.5, Z: -12.8; E: 48 50 33.3668, N: 32 1 6.7539) located at the north western end of Gavmish-Abad .From here on it turns west passing points (UTM: X: 296451.5, Y: 3544532.6, Z: -3.8; E: 48 50 41.3421, N: 32 1 7.1201), (UTM: X: 296558.9,Y: 3544600.9, Z: -13; E: 48 50 45.3815, N: 32 1 9.4063), and (UTM: X: 296626.4 Y: 3544601.5 Z: -9.6; E: 48 50 47.9524, N: 32 1 9.4695). Then it conforms with the edge of residential blocks and returns to the starting point of (UTM: X: 296912.5 Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N: 32 1 10.7969).

Description of agricultural areas in the buffer zone

The agricultural areas consist of five areas as follows:

V-The area situated north of Shoteit and Shushtar town

VI-The area located east of Gargar

VII-The area located east of Gargar and south east of Shushtar

VIII-The area located west and south of Shushtar

IX-The area situated south of Shushtar in-between Gargar and Raghhat rivers

Each with the following descriptions:

V-The area situated north of Shoteit and Shushtar town

V-The area situated north of Shoteit and Shushtar town

This area starts from point (UTM: X: 297074.8, Y: 3548626, Z: 46.5) on the coastal boulevard and at the intersection of built up area zone and core zone of SHHS. Then it continues northward overlapping respectively the northern and then the western edge of the mentioned boulevard (the buffer zone II) as far as points (UTM: X: 297714.3, Y: 3549287.5, Z: 48.9) and (UTM: X: 297711.8 Y: 3549441.1 Z: 39.1) which are at the shore of Karun river. Here after the buffer zone line crosses the river and joins respectively points (UTM: X: 297806.9, Y: 3549509.9, Z: 63) on the bank, and (UTM:

X: 297921, Y: 3549546.4, Z: 45.9) on the fence. Afterwards, as far as point (UTM: X: 298074.6, Y: 3549567.3, Z: 49.5), the line is still on the fence. Then as drawn in map II, it is specified on the edge of a road turning back to Shushtar. In this way the buffer zone extends first in an east to west direction, and then in a north to south direction as far as the intersection of Beinolpharamein with the mentioned road.

At Point: (UTM: X: 298879.3 Y: 3548260.2 Z: 75.1). This point joins another point (UTM: X: 298857.2, Y: 3548122.7, Z: 64). then it continue respectively westward on the edge of the building which are shown In map II, in this course, the buffer zone line crosses points (UTM: X: 298807.8, Y: 3548073.3, Z:68.4), (UTM: X: 298741.7, Y: 3548052.4, Z: 74.5), (UTM: X: 298628.8, Y: 3548202.5, Z: 75.2), (UTM: X: 298516.5, Y:3548131.9, Z:0.5), (UTM:X: 298441.3Y: 3548103.4,Z: 54.3) and (UTM:X:298369.5,Y: 3548119, Z:49.5) until it reaches point (UTM:X: 298346.1,Y: 3548130,Z: 48.7) located on the buffer zone line I. Hereafter it overlaps north borders of buffer zone line III and the core zone. Then after passing north of Band-e Mizân Dam and the northern shore of Shoteit, it rejoins the start point of (UTM: X: 297074.8, Y: 3548626, Z: 46.5) which was described before.

VI-The area located east of Gargar

This area begins from point (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N:32 3 2.9822) on the western edge of Valiy-eAsr avenue (Seyyed Mohammad Golabi) and continues on this line (and the buffer zone line I) as far as point (UTM: X: 297940.6, Y: 3547533.5, Z: 50.7; E: 48 51 35.8023, N:32 2 45.4770) .Hereafter, the line overlaps the core zone line and turns left. As discussed in the description of core zone, hence buffer zone line coincides with the border between the park and Gargar Canal basin. It firstly diverts to the east and secondly to the north as far as point (UTM: X: 298105.9, Y: 3548098.4, Z: 45; E: 48 51 41.6747, N: 32 3 3.9175). Then it changes direction eastwards and rejoins the start point of (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N:32 3 2.9822)

VII-The area located west and south of Shushtar

This area starts from point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51

40.8231, N: 32 2 21.0449) east of Gargar and south of residential blocks (on the buffer zone I) then it is coinciding with the western edge of the road passing southward amid farmlands and Bolbol desert, At the East of Mâhi-bâzân it passes point (UTM: X: 297879.3, Y: 3542944.4, Z: 48, N: 32 00 16.5; E: 48 51 36 93) then it turns southeast. At point (UTM: X: 297973.3, Y: 3542862.6, Z: 48; E: 32 00 13.90) it passes from northeast of eastern heights of Mâhi-bâzân area. Then, turns southward and rests on the western and eastern borders of two other heights, until at point C, it reaches a dry waterway and a valley which make the southern end of buffer zone. Following the mentioned directions, The line crosses the Gargar Canal and links to the farmlands crossroad, as it is shown in map II. Hereafter, the buffer zone line change direction to the north and west while it is overlapping the farm borders and reaches the Ahwaz Road. From this point northward, to the one set of Gavmish-Abad (Andisheh) the buffer zone is the eastern edge of Ahwaz road. From here on the buffer zone overlaps the southern access road of the township and the border of buffer zone IV and turns east and rests on the southern edge of buffer zone IV (as discussed earlier) .Then, along Gargar Canal valley and at the intersection of buffer zone IV and the core zone, at point (UTM: X: 296952.6, Y: 3543636, Z:-14.6; N: 32 00 36.52, E: 48 51 16.33) the buffer zone diverts southward conforming to the core zone line mentioned before. Following this trend, the buffer zone goes respectively to the south (upon the core zone line) and circles Mâhi-bâzân area, following the same line along Gargar Canal it returns northward until it reaches south of residential blocks at Gargar side at point (UTM: X: 297895.5, Y: 3546905.2, Z: 59; E: 48 51 34.5585, N: 32 2 25.0561).From this point the buffer zone line 2 overlaps buffer zone line IV and the edge of residential blocks and diverts southeast until it rejoins the start point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51 24.37, N: 32 00 07.5)

VIII-The area located west and south of Shushtar.

This area starts from point (UTM: X: 296431.3, Y: 3548679.1, Z: 52.4; E: 48 50 37.4177, N: 32 3 21.6828) on the northern edge of Dezful road. From this point on continues southward coinciding with the western border of buffer zone IV, then the western border of core zone. After crossing the river is defined upon the inner access road of the park, described earlier.

Afterwards, still upon the core zone line, passes point (UTM: X: 296547.1, Y: 3547861.6, Z: 42.6; E: 48 50 42.4529, N: 32 2 55.2257) and diverts towards northeast and Bateni square until, it reaches point (UTM: X: 296925.5, Y: 3547968.3, Z: 45.6; E: 48 50 56.7913, N: 32 2 58.9337) on the eastern edge of Allameh Shushtari boulevard. From this point the eastern edge of the boulevard is the border of buffer zone line which in a southwest direction extends as far as north of Pasdaran square to point (UTM: X: 296256.4, Y: 3546937, Z: 44.9; E: 48 50 32.0797, N: 32 2 25.0292). Hereafter buffer zone line is the eastern edge of the square as far as point (UTM: X: 296213.4, Y: 3546854.3, Z: 44; E: 48 50 30.5043, N: 32 2 22.3172). Then, in a southeastern direction, the buffer zone line makes the border between farmlands and the building area passing points (UTM: X: 296231.6, Y: 3546828.3, Z: 43.2; E: 48 50 31.2176, N: 32 2 21.4852), (UTM: X: 296334, Y: 3546678.5, Z: 44.5; E: 48 50 35.2333, N: 32 2 16.6898) and (UTM: X: 296405.9, Y: 3546571, Z: 44.5; E: 48 50 38.0546, N: 32 2 13.2475) it joins the north corner of buffer zone II at point (UTM: X: 296508.1, Y: 3546401.7, Z: 45.7; E: 48 50 42.0774, N: 32 2 7.8190). From here on the buffer zone line is still overlapping the buffer zone line II, so that it and first goes south west and then south until reaches Tu- Asheghan cliff at Point (UTM: X: 296455, Y: 3546122.3, Z: 49; E: 48 50 40.2667, N: 32 1 58.7166). Here, the buffer zone conforms the core zone line and after circling the cliff in a north western direction, it crosses south west of residential blocks and north of Khâk Dam area. After reaching Allameh Shushtari boulevard at point (UTM: X: 296095.5, Y: 3546538.4, Z: 40.9; E: 48 50 26.2528, N: 32 2 11.9881), it diverts southward. Then, it passes west of Shah Ali Bridge, its adjacent cliffs and west of Shahed square. Then, still upon the core zone line, it passes south and west of Raghat stream until reaches north of Gavmishabad (Andisheh township) at point (UTM: X: 296912.5, Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N: 32 1 10.7969). From here the buffer zone line overlaps the north line of core zone and diverts from north of Andisheh township westwards as far as point (UTM: X: 296242, Y: 3544525.5, Z: -12.8) at the northwestern end of the residential area, where it joins point (UTM: X: 296124.3, Y: 3544997.1, Z: 39.9) in the northwestern direction, and coincides with the northern edge of the road, until it reaches point (UTM: X: 294690.7, Y: 3546022, Z: 43.9). Here afterward the buffer zone line diverts northeast and overlaps the western edge of the road, passes east of Karun and extends as far as

point (UTM: X: 295940.8, Y: 3547899.5, Z: 42.4) near it. Here the buffer zone line crosses the river again and joins point (UTM: X: 296024.8, Y: 3548671.5, Z: 47.1) on the northern edge of Dezful road. Afterwards, it returns to the start point of (UTM: X: 296431.3, Y: 3548679.1, Z: 52.4)

IX-The area situated south of Shushtar in-between Gargar and Raghat rivers

This area is a small triangular shaped area enclosed at the intersection of Gargar and Raghat rivers. Its eastern and western borders overlap the core zone line as reported previously and its northern border (south of the residential area) coincides with the southern line of buffer zone 1: The above area is define by its corners as follows:

North eastern point (UTM: X: 297017.5, Y: 3545731.6, Z: 41)

North western point (UTM: X: 296931.2, Y: 3545731.4, Z: 39)

South eastern point (UTM: X: 296987.7, Y: 3545009.1, Z: 38)

South western point (UTM: X: 296937.5, Y: 3545012.8, Z: 31)

DESCRIPTION OF LANDSCAPE ZONE

The landscape zone starts from point A (UTM: X: 297881.5, Y: 3556297.1) in the north of Shushtar, near Do-Pirun Village and continues in the south-east direction and encircles north and north-east Mountains of Shushtar. Then, it returns to the point B (UTM: X: 305854.1, Y: 354824.4), so that the landscape zone encompasses Fadalak, Zar, Kushkak and Rish-gir mountains. From the last mentioned point, the line changes direction and joins point C (UTM: X: 311182.3, Y: 3544722.0) on the furthestmost of the eastern heights of Shushtar. Afterwards, it continues to the south and from point D (UTM: X: 310238.6, Y: 3539466.9) to point E (UTM: X: 309504.6, Y: 3533027.2), the line coincides with the road which goes southward to Ahwaz.

After passing point E, it turns to the east and connects with point F (UTM: X: 295000, Y: 3530289) on the peak of mountains located on the western side of Karun, Then, it continues toward north-west and passes respectively points G (UTM: X: 288030.8, Y: 3537941.8) and H (UTM: X: 284024.9, Y: 3549241.6) which are also on the peak of mountains overlooking the city on the western side of Karun.

From point H, the line turns towards north-east and joins point I (UTM: X:

287681.4, Y: 355353.4) on a road leading to the city of Dezful. Afterwards, the line conforms to the mentioned road until point J (UTM: X: 287935.7, Y: 3556296.4); then, it turns to the east and joins the first starting point.

**A4 size map of the nominated property,
Showing their boundaries and buffer zones**

Iranian Cultural Heritage, Handicrafts
and Tourism Organization

SHUSHTAR HISTORICAL
HYDRAULIC SYSTEM

SHUSHTAR
(Map-II)

-Built up Areas located within the
proposed world Heritage Buffer zone:

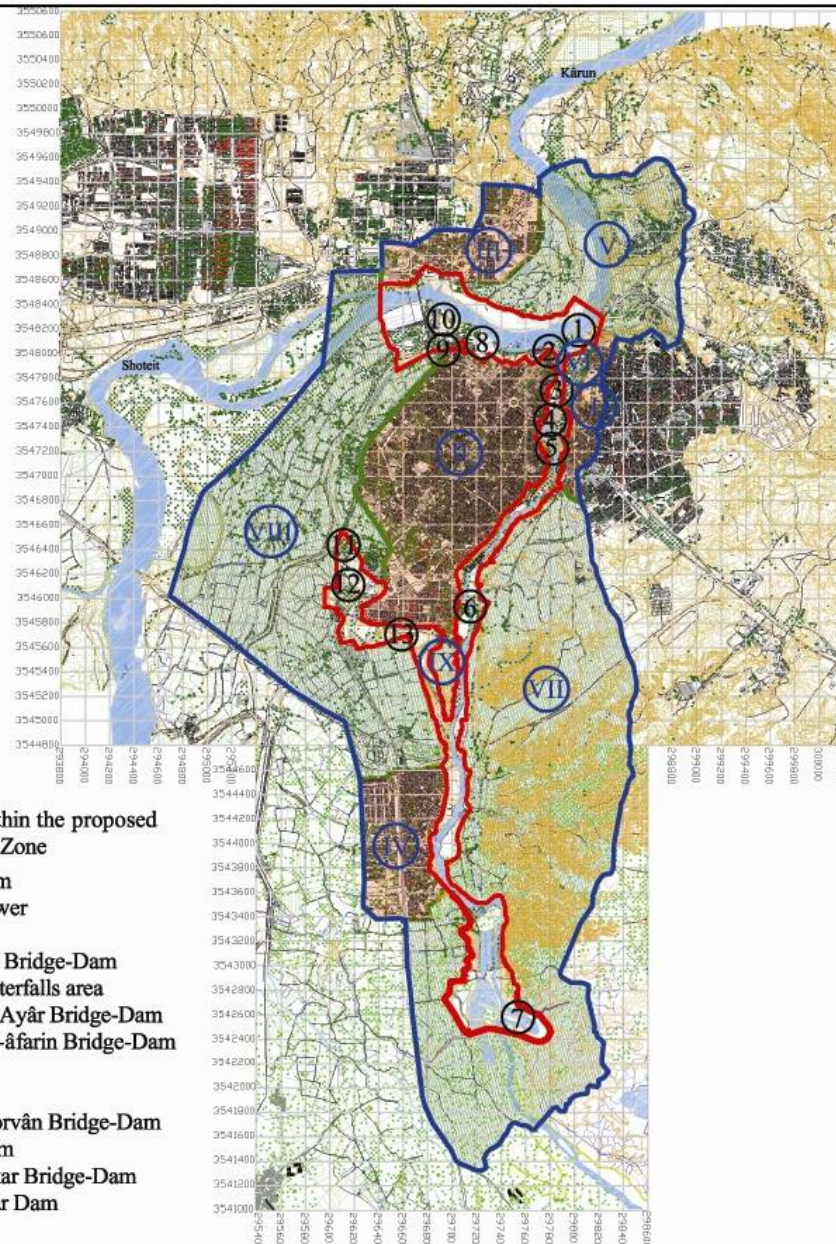
- I- Area East of Gargar.
- II- Area West of Gargar and South of
Shoteit.
- III- Area North of Shushtar.
- IV- Area South of Shushtar and Northwest
of Khodâ-âfarin Dam.

-Agricultural Areas located within the
proposed world Heritage Buffer zone:




- V- Area North of Shoteit and Shushtar
town.
- VI- Area East of Gargar Canal.
- VII- Area East of Gargar Canal and South
of Shushtar.
- VIII- Area West and South of Shushtar.
- IX- Area South of Shushtar between
Gargar and Raghat Canals.

Properties located within the proposed
World Heritage Core Zone

- 1 .Band-e Mizân Dam
- 2 .Kolâh-farangi Tower
- 3 .Gargar Canal
- 4 .Polband-e Gargar Bridge-Dam
- 5 .Watermills & Waterfalls area
- 6 .Polband-e Borj-e Ayâr Bridge-Dam
- 7 .Polband-e Khodâ-âfarin Bridge-Dam
- 8 .Salâsel Castle
- 9 .Dâriun Canal
- 10 .Polband-e Shâdorvân Bridge-Dam
- 11 .Band-e Khâk Dam
- 12 .Polband-e Lashkar Bridge-Dam
- 13 .Band-e Sharâbdâr Dam



LEGEND

- Core Zone 
- Buffer Zone 
- Area 1: Built-up areas 
- Area 2: Agricultural areas 

Shushtar Historical Hydraulic System Base
(SHHS; ICHHTO)

0 200 500 1000 1500 2000m

NO: Map-II



SHUSHTAR (Map-I)
Landscape, Core & Buffer zones

- LANDSCAPE ZONE REGULATIONS:**
- 1-According to the regulations of the Landscape zone, any program, project or intervention which can somehow change the natural, environmental, historical or cultural status of the Landscape (specially macro scale development projects ,c.g., construction of bridges, roads and highways, new town or high-rises as well as infrastructural facilities, power transfer plans, etc) must be approved by ICHHTO at all stages of planning and implementation.
 - 2-Construction of any macro scale industry establishments which may pollute the environment including: soil, water, air ,vegetation, etc. as well as projects witch significantly change the landscape, are forbidden.

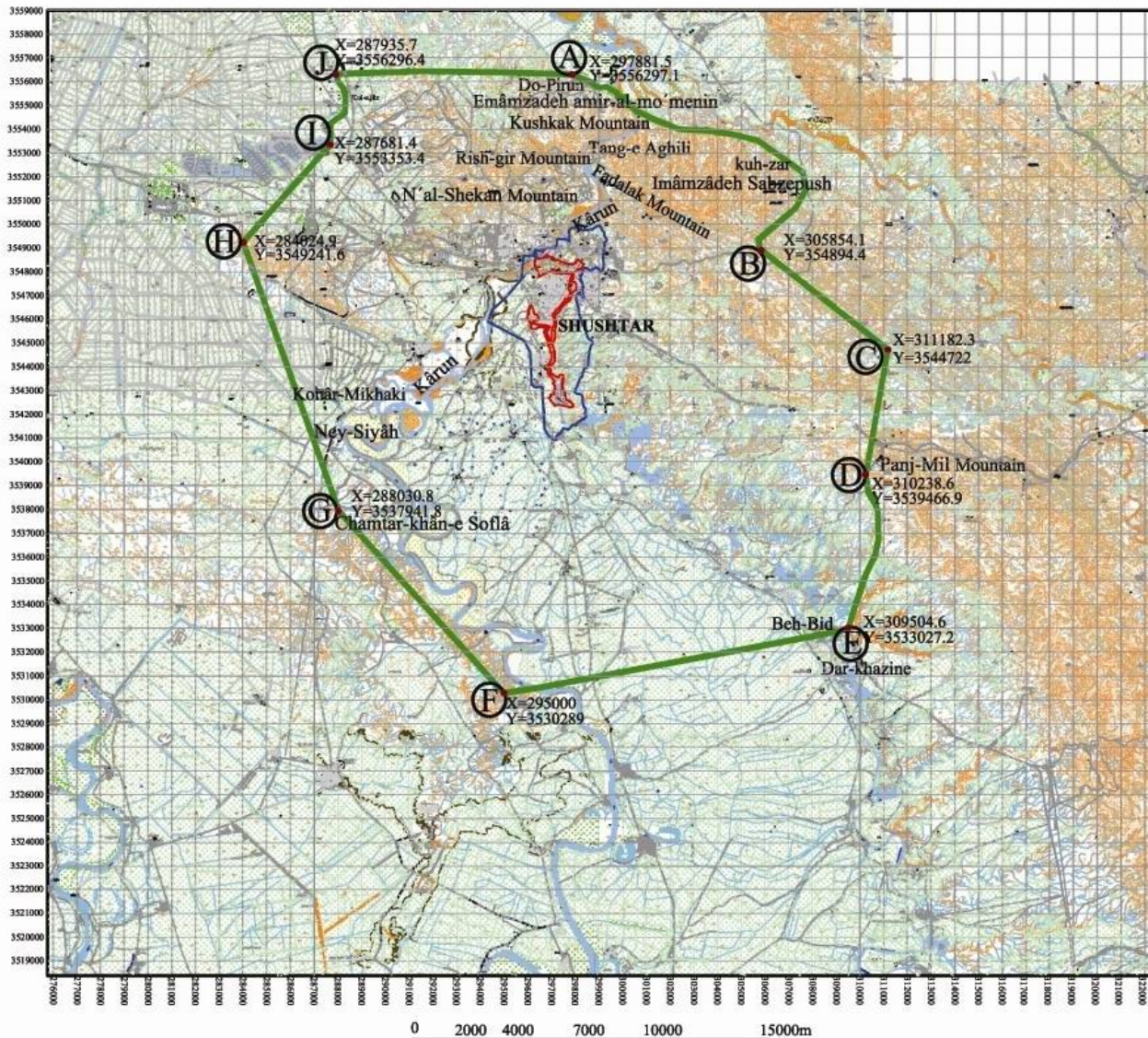
Geographical coordinates	UTM	
	X	Y
A	297881.5	3556297.1
B	305854.1	354894.4
C	311182.3	3544722
D	310238.6	3539466.9
E	309504.6	3533027.2
F	295000	3530289
G	288030.8	3537941.8
H	284024.9	3549241.6
I	287681.4	3553353.4
J	287935.7	3556296.4

LEGEND

Core Zone	
Buffer Zone	
Landscape Zone	

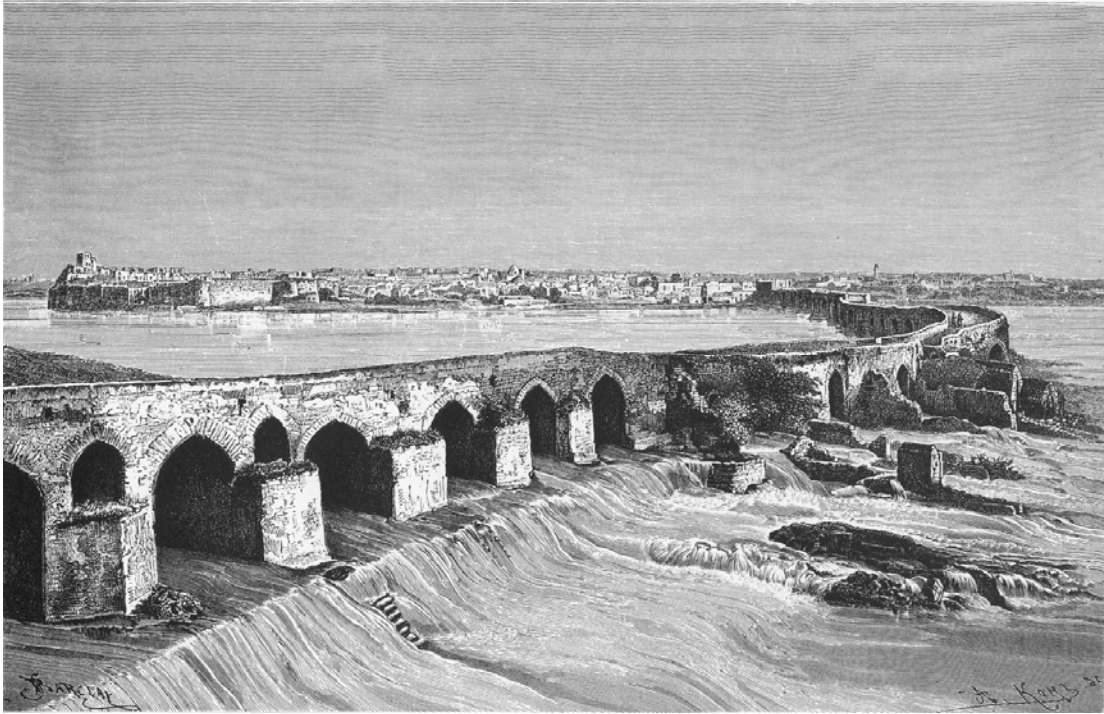
Shushtar Historical Hydraulic System Base
(SHHS; ICHHTO)

NO: Map-I



Justification

Statement of outstanding Universal Value



Shushtar. Engraving showing the Pol-Band-e Shâdorvân in the 1880s (after Dieu La Foie)

Criterion I: The outstanding universal value of Shushtar’s hydraulic system, symbolized by “*the Great Weir*” as the Arab writers of the Classical Period named its heart (Shâdorvân), resulted from the ingenuity and the impressive technical achievements reached in the creation of that complex in perfect harmony with its natural environment. Far from harming the environment, as it so often happens in our times, the “world wonder” has greatly enhanced the natural beauty of the site; in a way it has created it, showing a perfect example of interaction between man and nature. There are no single elements: bridges and dams, canals, built areas or gardens, but only one *ensemble*. The bridge-dam (Pol-band-e Shâdorvân), the water regulator dam (Band-e Mizân) and the mouth of the Gargar Canal fuse all together with the waters of the Kârun River while the Gargar waterway cuts deep into the rocks and dashes towards a second dam (Band-e

Gargar). Next to this structure, the roaring waters gush out of the tunnels bored into the vertical cliffs of the canal, run the mills and roll down stream to irrigate first the idyllic orchards on both side of the canal and then the fields. Nearly the whole system still functions as it did nearly two thousand years ago. These achievements were the cause of a consensus on considering the Shushtar hydraulic system, symbolized by Shâdorvan or “*the Great Weir*”, as a “world wonder”.

Indeed, at least for the last thousand years, the site of Shushtar has been recognized as a “world wonder”.¹ The fact was already stated nearly a century ago by the British scholar Guy Le Strange, the most eminent academic in the field of historical geography of the Classical Muslim World. A period during which the Arabo-Muslim civilization was at its zenith and the Islamic lands began in Spain to end in Central Asia. Muslim intelligentsia and connoisseurs were perfectly acquainted with the state of the world as it was then known: their fellow travelers and merchants had reached the outermost eastern Chinese limits and the Pacific Ocean. In fact their information was not only based on their own observations, but also on western classical depictions of the world. The relevant sources were available to them since the time of the famous Abbasside Caliph Harun al-Rashid (the contemporary to Charlemagne / Carolus Magnus, emperor of the Romans from 800 to 814) who seems to have been the first to have ordered the translations of Greek and Latin sources; the activity was pursued under his successors. The Pehlevi sources were translated too and, later, it is al-Biruni who went to India learned Sanskrit and produced a magisterial book on the state of India as it was nearly a thousand years ago, a book still being considered as a major source for old Indian studies. Thus, when qualifying Shushtar as a “wonder of the world”, the judgment of the Arab erudition of those days is based on all that quasi universal knowledge at its height; a verdict all the more interesting as the two entities - the Arabs and the Persians – did not always have the friendly relations: the Sâssanian Persian Empire had fallen to attacks of the Muslim Arabs and the East Roman Empire was in the throes of dislocation under their pressure. Here follows Le Strange’s statement on that point as reported in his

¹ This was also certainly the case in the pre-Islamic area (before the 7th century A.D.), but records from that period are very scarce compared to more recent times; however, the judgments of the Arabo-Muslim writers often reflect with admiration, especially in connection with buildings and sites, the opinion held previously by their predecessors. See the following lines in this section.

reference study entitled *The Lands of the Eastern Caliphate* first published a century ago and up to now often reprinted:

In the year 260 A.D. the Roman Emperor Valerian fell a prisoner into the hands of King Shapur (Sapor 1), the second monarch of the Sassanian dynasty, and during his seven years' captivity, according to the Persian historians, had been employed to build the Great Weir (Shâdhurwân) across the Dujayl [i.e. the Kârun River] immediately below Tustar [i.e. Shushtar]. ***This was held by the Arabs to be one of the wonders of the world***, and the remains of it still exist at the present day. The bed of the stream to the west of Tustar was paved, and the weir held back the water, enabling a part of the full river to be diverted above Tustar into an artificial channel [i.e. Gargar] turning off eastwards, which rejoined the Dujayl river many miles lower down after irrigating the lands through which it passed.²

Naturally, the Persian historiography looked also to the masterpiece as one of the world's wonder. The anonymous writer of the *Compendium of Histories and Narratives* who wrote his book in A.D. 1126 and had access to many sources now unavailable wrote that:

[the Emperor Shapur (A.D. 240-70), son of Artaxerxes the Sassanian] was as, his father, greatly dedicated to establish justice and rightfulness as well as to bring prosperity to the universe. **He constructed Shâdhurwân in Shushtar which is one of the world's wonders.** He also founded cities ... such as Beh-az-Andiv-Shâbur... which means Superior to Antioch and he built it similar to a chessboard as it had eight by eight intersected streets...³

In pursuing these works, the Sassanians were continuing a long tradition dating back at least to the Elamites when they built the canals that irrigates the nearby site of

² G. Le Strange, *The Lands of the Eastern Caliphate*, *op. cit.*, p. 235.

³ Anonymous, *The Compendium of Histories and Narratives*, *op. cit.*, p. 63.

Chogha Zanbil (its ziggurat is the largest and best preserved in the world and the monument, built by the Elamite king Untash-Napirisha in the middle of the 13th century B.C., was one of the first monuments to be inscribed on the World Heritage List). Later, Darius the Great, the Achaemenid king (521-485 B.C.), repaired these canals, and the foundation of the present Dâriun Canal in the west side of Shushtar is attributed to him. In fact it is thought that even the name of that canal derives from his name; the discovery of Achaemenid shards in the neighbourhood of that canal gives weight to such an assumption (see above, 2.b. History and Development). It is only by precaution that we have abstained from mentioning this early date in the subtitle of the present dossier as the considerable amount of water engineering works carried out by this great king is undeniable. Indeed, one must remember also that beside the tasks already mentioned, Darius is the one who finished the first “Suez” Canal. He did it, but by linking the Nile to the Red Sea through the Bitter Lakes, and not the Mediterranean to the Red Sea. Herodotus’ account is explicit on the issue as he wrote in the fifth century B.C.:

“The son of Psammetichus was Necos, and he too became the king of Egypt, and he was the first to attempt to dig a canal into the Red Sea; Darius the Persian was the second to dig it.”⁴ In 1866, Ferdinand de Leseps, during his preliminary reconnaissance for the construction of the Suez Canal, found this canal and then discovered the 1st of the four stela of granite on which Darius describes his deeds: “The king Darius declares: I am a Persian... I ordered this canal to be dug ... therefore this canal was dug ... and boats go from Egypt, by this canal, towards Persia...”⁵.

It is also under the Achaemenids that the *qanâts* (deep underground irrigation tunnels where the water moves by gravity in order to emerge) are introduced in Egypt.

⁴ Herodotus, *The History*, book II, 158.

⁵ Inscription on the stela of Shalouf, see P. Lecoq, *Les inscriptions de la Perse achéménide*, Paris, 1997, chapter 3. See also Pierre-Louis Viollet, *L’hydraulique dans les Civilisations anciennes*, Paris, 2000 (reedited in 2005) which has just been translated into English and published (*Water Engineering in Ancient Civilizations, 5000 Years of History*, tr. F. M. Holly, pub. by the International Association of Hydraulic Engineering and Research (IAHR), Madrid, Spain, 2007, pp. 69-73). He is, however, wrong on the origins of the *qanâts*, see the next references.

Bam, another WHS in Iran, shows some of the earliest examples of the usage of that technique.⁶



Shushtar, General view of the Watermills and the Waterfalls area

Criterion II: The *ensemble* of Shushtar Historical Hydraulic System exhibits an outstanding example of development over about two millenarities in technology, irrigation and town planning which results in a unique landscape design. It is perhaps not that much the individual elements in that ensemble, as significant and impressive as some of them are, that makes the *system* in Shushtar matchless, but *the combination of these numerous elements in a one single useful and harmonious entity*.

Western and Eastern civilizations have produced outstanding water engineering masterpieces, but none of them can truly be compared as an *ensemble* and in its *layout* with the Shushtar hydraulic system.⁷ Brief assessment and examination of some exceptional examples shed light on that point.

In China gigantic hydraulic works have been undertaken, for instance on the Yellow River, since the 7th century B.C. These impressive chef-d’oeuvres constructed and maintained over centuries were/are however basically canals interconnecting or

⁶ See A. Mousavi, “Qanats in Eraly Irrigation System in West Asia” and C. Adle in “Qanats of Bam: An Archaeological Perspective. Irrigation system in Bam, its birth and evolution from the Prehistoric Period up to Modern Times”, both articles published in *Qanats of Bam, A Multidisiplinary Approach*, eds. M. Honari, A. Salamat *et al.*, pub. UNESCO Tehran Cluster Office, Tehran, 2006, pp. 33-85 and 87-97.

⁷ We are only referring to the layout, landscape and composition, not to the *quality* of the work which may be subjective and/or contestable. The lines which follow do not intend to show *superiority* or *inferiority*, but to underline the *differences*.

irrigating waste regions over thousands of kilometers,⁸ they are not as in Shushtar a single unit presenting all the hydraulic, urban and landscaping elements in a single nucleus conceived under a single project.

On the other side of the world, in Spain, three dams, Alcantarilla, Prosperina and Cornalvo are roughly contemporaneous with dams in Shushtar, and surprisingly enough, two of them (Prosperina and Cornalvo, *circa* 100-130 A.D.) still function as those in the Persian town.⁹ But, even in these cases, these marvels are far from the local town which is Merida and none of them form a single landscape with that settlement as the Persian ones do in Shushtar. As to the Roman dame of the Gorge of Peyrou (Baume valley near Saint Rémy de Provence in France), the structure is no more extant as it has been buried under a new one built in 1891. The fine and ingenious Roman or Gallo-Roman aqueducts, in spite of the fact that they include bridges, tunnels, reservoirs *etc*, remain nevertheless truly different from the Shushtar specimen. Indeed these works do offer some specific comparative points with the Persian ensemble (for instance common constructors as Shâdorvân is supposed to have been built by the Romaine prisoners), but not a global one. The network of the distribution of water inside the old town of Shushtar in its turn may have had some resemblance with those partly in existence in Pompeii (buried under

⁸ It is no easy task to deal, or even to furnish, an adequate bibliography on this matter, but one can get a general picture of Chinese water engineering in consulting J. Needham and W. Ling, *Science and Civilization in China*, vol. IV, part II (Mechanical Engineering), Cambridge University Press, 1965 and N. J. Schnitter, *A History of Dams – The useful pyramids*, Balkema, 1994. As always, Pierre-Louis Viollet's study, *L'hydraulique dans les Civilisations anciennes (Engineering in Ancient Civilizations, 5000 Years of History)*, already cited above in this section, provides many drawings, pictures and plans on this matter; see pp. 222-257 in the English translation.

⁹ Alcantarilla, Prosperina and Cornalvo are the three largest Roman dams in Spain. The oldest is thought to be that of Alcantarilla, situated at the head of 50km long aqueduct that supplies the city of Toledo; its history reaches back to the 2nd century B.C. Prosperina dam (probably dating from around 100-110 A.D., from Trajan's period's) is situated 6km north of Merida and Cornalvo, situated 13km NE of Merida, is thought to date from the period of Hadrian, around 120 or 130 A.D. For an abridged description, history and drawings see Viollet, *Water Engineering in Ancient Civilizations*, *op. cit.*, pp. 167-170, figs. 6.28 and 6.29. For detailed descriptions see N. A. F. Smith, *The Heritage of Spanish Dams*, pub. The Spanish National Committee on Large Dams, Colegio de Ingenieros de Caminas, Canales y Puertos, 1992; N. J. Schnitter, *A History of Dams*, *op. cit.*; J. A. Fernandez Ordonez, *Catalogo de noventa presas y azudes espanoles anteriores a 1900*, Madrid, 1984.

Here it must be stressed that these dams are not in their turn the oldest ones in the world: for instance the dam reservoir No IV at Jawa (100km NE of Amman, Jordan) is datable to the end of the IVth millennium B.C.; it seems to be the oldest one in the world (S. Helms, "Jawa, site chalcolithique", *Les dossiers d'histoire et archéologie*, no 118, July 1987, pp. 92-94 and *idem*, "Paleo-Beduin and Transmigrant Urbanism", *Studies in the History and Archaeology of Jordan*, vol. I, Amman, 1987, pp. 97-113. See brief description and drawings in Viollet, *Water Engineering in Ancient Civilizations*, *op. cit.*, pp. 31-36. It goes the same for the canals: the Mesopotamian ones are much older and the Chinese constructions gigantic.

the ashes of Vesuvius in 79 A.D) or in the castellum of Nîmes (constructed under the emperor Claudius in the middle of the 1st century A.D, but it is hard to evaluate them as, unfortunately in this case, the Shushtar network has also greatly suffered, not from the ashes and the destruction of the town, but from the introduction of contemporary new water distribution technology.

On the contrary, Petra, the Capital of the Nabateans in the Negev (now in Jordan), offers a few points of comparison, but not enough to consider the two sites related: Petra's famous rock monuments have no connection at all with the buildings in Shushtar, and, being in the desert, Petra is waterless and had no watermills while Shushtar commands a large River whose water had given birth to a sort of watermill town. The vague common point lays in the fact that, probably at the beginning of the 1st century A.D., the Nabatians started to build in the rocky gorges of their land a dam (43m long, 14m high) on the Wâdi Musâ to divert its flush waters from their natural course to another wadi (Wâdi al-Mudhhim) through a tunnel (9m high, 6m wide and 88m long).¹⁰ The dam and the tunnel do offer in a way some resemblances with the Gargar dam (Pol-band-e Gargar / Darvâzeh Gargar) and its water diverting tunnel (Boleyti: about 4 to 8m large and 365m long), but that is all; the other elements present in Shushtar are missing in Petra, which is dead while Shushtar is alive.

In the Greek Classical world, the Lakissa canal which diverts the water from Kofini dam built on the Lakissa River, bears some distant resemblance to Band-e Mizân and the Gargar Canal¹¹ while the astonishing Eupalinos Tunnel in the Samos island may remind of the Boleyti Tunnel.¹² The other elements from Shushtar are different or not

¹⁰ For a concise description, plans and pictures see Viollet, *Water Engineering in Ancient Civilizations*, *op. cit.*, pp. 120-123.

¹¹ J. M., Balcer, "The Mycenaean Dam at Tiryns", *American Journal of Archaeology*, vol. 78, 1974, pp. 142-149 and concise information, plan and pictures in N. J. Schnitter, *A History of Dams*, *op. cit.* and Viollet, *Water Engineering in Ancient Civilizations*, *op. cit.* pp.92-95.

¹² J. Bonnin, *L'eau dans l'antiquité, l'hydraulique avant notre ère*, Eyrolles, 1984, Chapitre 9. Eupalinos was a nearly strait tunnel more than a kilometer long and large enough for the people in charge to circulate while Boleyti is a winding tunnel 365m long, 4 to 13m large and 6 to 15m high. The main difference is that in the Eupalinos Tunnel, the water supply conduit (a pipeline) was laid at the bottom of a narrow trench dug into the sideline of the floor of the tunnel; while the Boleyti Tunnel is provided, in its well preserved sections, with sidewalks on both side of a large canal in form of U dug into the floor of its gallery. In the Eupalinos Tunnel, its gallery remained nearly horizontal, while its trench sloped down gently so the water could move by gravity in its pipeline; but, in the Boleyti Tunnel, the whole structure (the gallery and the U canal) went downwards together. Compare the drawings in Viollet, *Water Engineering in Ancient Civilizations*, *op. cit.*, pp.95-96 with our sections and plans in map III-5-6.

present in the Greek examples. A more than millenary admiration for the Eupalinos Tunnel and the Shushtar hydraulic system seems to be the only true common points between these accomplishments: Herodotus considered the Eupalinos Tunnel, which is in ruin but still partially extant, as one of the marvels of the Hellenistic World.¹³

Closer to Iran, the irrigation network in ancient Urartu, in eastern Anatolia, was once supposed to have served as a model to the Iranian *qanât* irrigation system, but the related theory in this matter put forward by H. Goblot¹⁴ is now discarded due to the emergence of new archaeological discoveries proving that the *qanâts* of Bam (a WH site), or those excavated on the southern shores of the Persian Gulf in the United Arab Emirates and in Oman, are older than the Urartian waterworks.¹⁵

Last, but not least, as far back as the IVth millennium B.C, there were the extensive networks of water distribution in Mesopotamia conceived by the Sumerians, Assyrians or the Babylonians, but these waterworks have mostly disappeared and only traces of the old beds of these extensive canals have been thrown into light thanks to the studies carried out by Robert McCormick Adams in the 1960s and 1970s.¹⁶ The Shushtar network, also different, can nevertheless be considered as a live reminiscence of these first signs of human civilization as the Elamite, which flourished in Susa - Choghâ-Zanbil, and the Mesopotamian cultures were very close and sometimes identical. The natural environment is similar too: the vast plains of Khuzestan, where Shushtar is, and the neighboring Mesopotamia can be considered as one and the Kârûn River joins Tigris and Euphrates before the new gigantic watercourse thus formed joins the Persian Gulf.

¹³ Herodotus, III, 60.

¹⁴ H. Goblot, *Les qanât: une technique d'acquisition de l'eau*, Paris – La Haye – New York, 1979.

¹⁵ See C. Adle in “Qanats of Bam: An Archaeological Perspective. Irrigation system in Bam, its birth and evolution from the Prehistoric Period up to Modern Times”, *op. cit.*, pp. 33-85. For the *qanâts* on the southern shores of the Persian Gulf see R. Boucharlat, “Les Galeries de captage dans la péninsule d’Oman au premier millénaire avant J.-C.”, *Irrigation et drainage dans l’Antiquité, qanâts et canalisation souterraines en Iran, en Egypte et en Grèce*, ed. P. Briant, Paris, 2001, pp. 156-180.

¹⁶ Robert McCormick Adams, *The Uruk Countryside*, Chicago, 1972.



Shushtar, General view of Shushtar Historical Hydraulic System

Criterion V: Shushtar Historical Hydraulic System indeed stands as the flagship of an *ensemble* truly exceptional as a human settlement and land-use representative not only of Iran, but also in many ways of Mesopotamia. Both have of course their own millenary individualities which in some cases reflect also characteristics of other great civilizations; be it the Roman in the old world or the Islamic in more recent times. This situation was the result of the alternating war and peace periods in this region crossed by some of the most important national as well as international roads of communication between the West and the East, including the southern branch of the highway known in our time as the “Silk Road”. Men were in communication and exchanged ideas or goods, though with less intensity, even during the worse periods of economical upheaval or social disorder. The Achaemenid, Parthian and then the Sassanid empires versus the Greek dominion followed by the Roman Empire, first led by Rome and then by

Constantinople, saw multinational and multicultural exchanges which continued during the Islamic epoch. In close interaction with its natural environment, Shushtar's hydraulic complex bears testimony to these intercultural relations.

Reports points out that Shapur, the Sassanian emperor, used Roman labor force and engineering to built parts of Shushtar's hydraulic ensemble.¹⁷ The presence of the site of "Cesar Throne" (Takht-e Qeysar) on the northern rocky shore of the Kârun River still bears testimony to that fact. It has even been reported about a thousand years ago that a Roman architect, whose name has been persianified as Andimeshk, was the builder of the Shâdorvân bridge.¹⁸ The interrelation and interaction, either forced or voluntary, had a long history: Cyrus the Great, the Persian monarch, repaired after his bloodless entry into Babylon in 539 B.C. the embankment of Euphrates built previously by a local king. On the clay cylinder called "the Cylinder of Babylon" he reports: "I added to ... the banks protected by bricks, in the low-lying areas of the city, that a previous king had begun to build".¹⁹ Darius works to finish the first "Suez Canal", started by an Egyptian pharaoh, has already been mentioned here above. While these masterpieces of bygone eras exist no more, Shushtar's hydraulic system still bears testimony to an intense intercultural relation which in the case of Shushtar is, in addition, closely in interaction with the natural environment.

A primary characteristic of the Shushtar ensemble is that, contrary to many other old sites related to water engineering technology, the system is in this case alive and still largely functioning after about two thousand years. The water network shapes harmoniously a landscape composed of dams, bridges, watermills, built-up areas and orchards before running down to irrigates hundreds of thousands of agricultural lands.²⁰

¹⁷ See here just above, 2b, the justification for criterion I.

¹⁸ Anonymous, *The Compendium of Histories and Narratives*, written in 520 / 1126, *op. cit.*, p. 63. Some have suggested that Andimeshk was responsible for the building of the bridge in the neighboring town of Dezful, not the one in Shushtar. It has also been reported that the nearby town of Andimeshk still perpetuate his name.

¹⁹ See P. Lecoq, *Les inscriptions de la Perse achéménide*, *op. cit.*, chapter 3.

²⁰ Muqaddasi, the famous traveller from Jerusalem, wrote a thousand years ago that Tustar (the Arab name of Shushtar) was surrounded by gardens, where grapes, oranges, and dates grew abundantly; adding that no town of Khuzistan was more beautiful or pleasanter to live in, though he admits that the heat was extreme in summer. He also reports that the markets of Tustar were abundantly supplied; brocades, with embroidered cotton stuffs of all kinds were made there, the brocade (*Dibâj*) of Tustar being most famous. Muqaddasi [Maqdisi], *Ahsan al-taqâsim fî ma' refat al-aqâlim*, ed. De Goeje, Leiden, 1877, pp. 406, 410; pp. 234-235; G. Le Strange, *The Lands of the Eastern Caliphate*, *op. cit.*, pp. 234-235.

The fact that after such a longtime the system is on the whole still alive and dynamic is indeed a most astonishing positive point, but that dynamic also constitutes the main challenge of the future. Even though the *ensemble* has become vulnerable under the impact of irreversible changes imposed by our technological world, the essential aim remains to keep the system functioning without fundamentally altering its characteristics which makes it unique.

Criteria under which property is nominated

The *Shushtar Historical Hydraulic System* including bridges, dams, canals, buildings and watermills dating at least from the 3rd century A.D. to the Modern Times would meet the **criteria I, II and V** for the assessment of its outstanding universal value. The propriety is proposed to be inscribed on the World Heritage List as **a *single nomination***.

Criterion I: “*Represent a masterpiece of human creative genius*”

The outstanding universal value of Shushtar hydraulic system as a masterpiece of human creative genius transcending national boundaries has long been recognized. Indeed, the site has been qualified as a “*world wonder*” not only by the Persians themselves,²¹ but also already a thousand years ago by the Muslim elite.²² The qualification was not a vain word when used by the Arabo-Muslim connoisseurs as they had a vast knowledge of the known world of their epoch. In those days Classical Islamic Civilization was at its zenith. Islamic lands stretched from Spain to Central Asia and the Muslim travelers and merchants had reached its outermost eastern Chinese limits and the Pacific Ocean. The general admiration for the Shushtar site resulted often from the direct observation of that graceful ensemble and the ingenuity as well as technical wizardry

²¹ Anonymous, *The Compendium of Histories and Narratives (Mojmal al-tavârikh va'l qesas)*, written in 520 / 1126, Malek-o'Sho'arâ Bahâr ed., Tehran, 1318/1039, p. 63.

²² G. Le Strange, *The Lands of the Eastern Caliphate, Mesopotamia, Persia, and Central Asia from the Moslem conquest to the time of Timur*, Cambridge and London, reprint 1966, p. 235.

which had presided, in close relation with the natural environment, over the taming of a large river. A harmonious and most useful *system* was thus created in which impressive dams and canals conveyed water to the town of Shushtar, powered dozens of watermills and irrigated hundreds of thousands of hectares of agricultural lands while remarkable bridges linked together local and international destinations. In those classical days, the Shushtar “world marvel” was still functioning after eight hundred years as it does today. The twice millenary functional permanency of this water engineering network and its dependencies do indeed seem if not unique at least exceptional.

For further development, argumentations and references see below: section 3.b-Statement of Outstanding Universal Value, Criterion I.

Criterion II: “*Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on development in architecture or technology, monumental arts, town-planning or landscape design.*”

The Shushtar Historical Hydraulic System exhibits an outstanding example of development over about two millenaries in technology, irrigation and town planning which results in a unique harmonious landscape design. The elements of the ensemble are all consonant among themselves and with the environment forming altogether one single unique entity, an astoundingly beautiful scenery.

Western and Eastern civilizations have produced outstanding water engineering masterpieces, but none of them can truly be compared as an *ensemble* and in their *layouts* with the Shushtar Historical Hydraulic System. This affirmation does not imply that the Shushtar water engineering network is superior to magnificent examples found in other lands; what is significant is that the specimen at Shushtar is different: Here, for the last two thousand years, nearly all mechanisms known in old water engineering science have been applied in a harmonious way within a limited geographical space; and by taking advantage of the landscape, ingenious solutions have been found for the taming of the waters of a large river. An astonishing landscape is the result of this interaction between men and nature.

For further development, argumentations and references see below: 3.b-Statement of Outstanding Universal Value, criterion II.

Criterion V: *“Be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.”*

Shushtar Historical Hydraulic System stands as an *ensemble* if not unique but at least as an exceptional example of a human settlement and land-use representative not only of Iran, but also Mesopotamia and, in a way, the multi-facet civilization of the Roman Empire. The war and peace periods between the Achaemenids / Parthians / Sassanids versus the Greek / Roman power resulted in a multinational and multicultural exchanges which continued during the Islamic epoch. Shushtar’s hydraulic ensemble bears testimony to these intercultural relations that, in the case of Shushtar, are closely in interaction with the natural environment.

Contrary to many other old sites related to water engineering technology, the system in Shushtar is alive and still functioning after about two thousand years: It runs through an active town and then irrigates hundreds of thousands of good agricultural lands. The fact that the system is alive and dynamic is indeed a most astonishing positive point, but it also constitutes the challenge of the future: how to keep the system functioning in this restless changing hi-tech world without irremediably altering its characteristics which makes it unique.

For further development, argumentations and references see the following entry: section 3.b- Statement of Outstanding Universal Value, Criterion V.

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1

IDENTIFICATION OF THE PROPERTY

I.a. Country (and State Party if different)
Islamic Republic of Iran



Fig.1. The location of the city of Shushtar in Iran

1.b. State, province, or region,

Province of Khuzestan



Fig. 2. The location of the city of Shushtar in the Khuzestan province

I.c. Name of Property:

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM

Bridges, dams, canals, buildings and watermills
From ancient times to the present

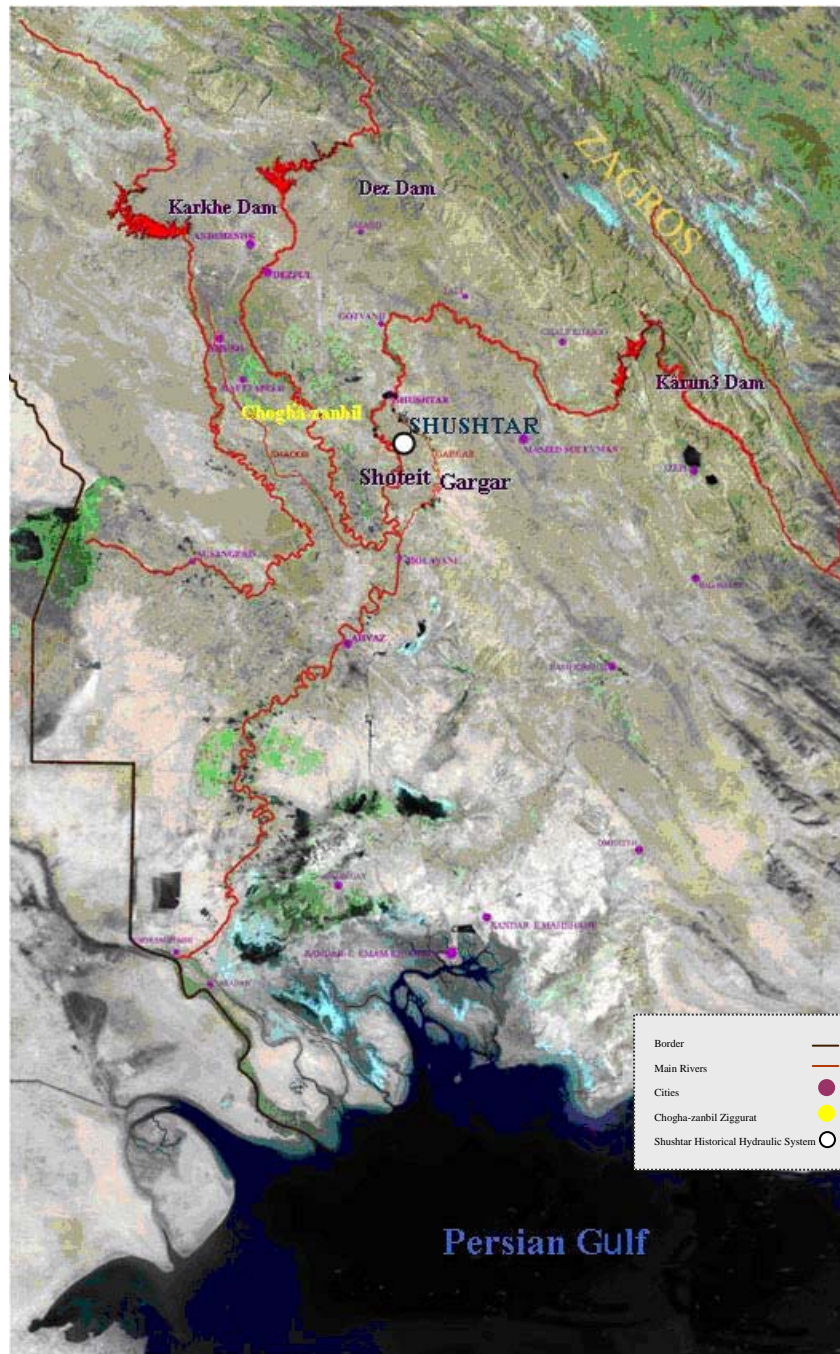


Fig.3. Shushtar Historical Hydraulic System, General landscape

1.d. Geographical coordinates to the nearest second*Geographical coordinates of the main sites within the property:*

No	Site names	Geographical Coordinates	Map ref.
1	Band-e Mizân Dam	N: 32° 03' 1.21" E: 48° 51' 6.33"	III-1
2	Kolâh-Farangi Tower	N: 32° 03' 0.28" E: 48° 51' 4.91"	III -2
3	Gargar Canal (beginning point)	N: 32° 03' 1.21" E: 48° 51' 6.33"	III -3
4	Polband-e Gargar Bridge-dam	N: 32° 02' 7.02" E: 48° 51' 5.09"	III -4
5	Watermills and Waterfalls area	N: 32° 02' 6.35" E: 48° 51' 4.86"	III -5
6	Borj-e 'Ayâr Bridge-dam and Sâbe'in Sanctuary	N: 32° 01' 8.96" E: 48° 51' 1.36"	III -6
7	Mâhi-bâzân (Khodâ-âfarin) Bridge-dam	N: 32° 00' 0.31" E: 48° 51' 4.12"	III -7
8	Salâsel Castle	N: 32° 03' 0.67" E: 48° 51' 1.78"	III -8
9	Dâriun Canal (beginning point)	N: 32° 03' 0.67" E: 48° 51' 1.78"	III -9
10	Polband-e Shâdorvân Bridge-dam	N: 32° 03' 1.18" E: 48° 50' 9.05"	III -10
11	Band-e Khâk Dam	N: 32° 02' 1.39" E: 48° 50' 4.60"	III -11
12	Lashkar Bridge-dam	N: 32° 01' 9.50" E: 48° 50' 4.84"	III -12
13	Band-e Sharâbdâr Dam	N: 32° 01' 7.68" E: 48° 50' 9.23"	III -13

1.e. Maps and plans showing boundaries of the nominated properties and buffer zones

See the maps in the map volume.

No	Site names	Map ref.
1	Landscape, core zone and buffer zone	I
2	Core and buffer zone	II
3	Properties located within the proposed World Heritage core zone	III
4	Band-e Mizân Dam	Map plan: III-1,III-1-1,III-1-2
5	Kolâh-Farangi Tower	III-2
6	Gargar Canal	III-3
7	Polband-e Gargar Bridge-dam	III-4
8	Watermills and Waterfalls area	Site Plan:III-5,III-5-1,III-5-2,III-5-3,III-5-4,III-5-5,III-5-6
9	Borj-e 'Ayâr Bridge-dam and Sâbe'in Sanctuary	III-6, III-6-1, III-6-2
10	Mâhi-bâzân (Khodâ-âfarin) Bridge-dam	III-7, III-7-1, III-7-2, III-7-3
11	Salâsel Castle	III-8, III-8-1, III-8-2, III-8-3, III-8-4, III-8-5, III-8-6
12	Dâriun Canal (beginning point)	III-9, III-9-1, III-9-2
13	Polband-e Shâdorvân Bridge-dam	III-10
14	Band-e Khâk Dam	III-11, III-11-1, III-11-2,
15	Lashkar Bridge-dam Emamzadeh Abdollah shrine Shah-Ali Bridge	III-12, III-12-1, III-12-2, III-12-3, III-12-4, III-12-5 sIII-12-6 III-12-7
16	Band-e Sharâbdâr Dam	III-13, III-13-1

1.f. Area of nominated property(ha.) and proposed buffer zone(ha.)

Shushtar Historical Hydraulic System	Area
Core zone	240.4152 (ha)
Buffer Zone:	
-Build UP Areas	393.9692 (ha)
-Agricultural Areas	1178.2317 (ha)
Total (Buffer Zone)	1572.2009 (ha)
Landscape zone	51043.211 (ha)

Textual description of the boundaries of the nominated property

- Textual description boundaries of the nominated property as follows:

The Summary of Description of Buffer zone

The buffer zone includes all areas which have close connections with SHHS from functional, structural, and visual point of view.

In the north, the buffer zone passes through some built-up areas which have close connections with SHHS. Then, southward, it includes agricultural areas and heights situated in the east of Gargar Canal.

In the south and west, the buffer zone still includes agricultural areas related to the Gargar Canal; moreover, it includes one built-up area called "Gavmish-Abad" as well as the old town.

N.B. Shushtar is situated in UTM zone 39

DESCRIPTION OF THE CORE ZONE

The core zone area begins from point (UTM: X: 298002.2, Y: 3548453.1, Z: 44; N: 32 3 15.3628 E: 48 51 37.4549) in the northern shore of Shoteit, and at a south-east direction

connects to the south-western wall of Seyyed Mohammad Golabi tomb. Then, the core zone line corresponds with the western side of Seyyed Mohammad Golabi street as far as point (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N: 32 3 2.9822). From the eastern corner of a residential building, the direction changes towards north-west as far as point (UTM: X: 298106.8, Y: 3548097.9, Z: 45; E: 48 51 41.7093 N: 32 3 3.9018).

From the very point on, it goes southwards in direction of the eastern side of residential buildings of Dorudgar complex.

From point (UTM: X: 298056.6, Y: 35848011.6, Z: 53.9; E: 48 51 40.8231 N: 32 2 21.0449) (eastern corner of the last building) it is defined on the eastern border of Gargar Canal basin (western edge of Motahari park). Then, from the south western end of that park, point (UTM: X: 297878.1, Y: 3547559, Z: 44; E: 48 51 33.4014 N: 32 2 46.2644) returns towards Valiy-e Asr street (Seyyed Mohammad Golabi), and is defined on the eastern edge of the residential buildings of the town, as map II shows.

At the end of Tahmasebi alley, changes direction on the northern edge of residential blocks and inclines towards the river. Then, at a point in which the core zone line is parallel to Gargar Canal, the line goes south and passes by east of residential blocks, such that the last buildings adjacent to Gargar is always located inside the core zone. At the end of buildings adjacent to the eastern shore of Gargar, point (UTM: X: 297864, Y: 3546960.5, Z: 61.5; E: 48 51 33.3165, N: 32 2 26.8307) the core zone line is again on the eastern edge of Gargar Canal basin and goes southward.

North of Sâbe'in Sanctuary and the Koshtârgah bridge, point (UTM: X: 297237.2, Y: 3546271.5, Z: 29.8; E: 48 51 9.9555 N: 32 2 4.0648) where the river shore widens, the core zone line is upon the eastern side of the farm adjacent to the river.

At point (UTM: X: 297205.7, Y: 3546120.5, Z: 31; E: 48 51 8.8697 N: 32 1 59.1437) the core zone line goes up to point (UTM: X: 297219.1, Y: 3546046.6, Z: 37.4; E: 48 51 9.4363, N: 32 1 56.7539) upon the earth topography. From this point in the east of the bridge, the line is defined again on the natural topographic border with the farms east of Sâbe'in Sanctuary.

At point (UTM: X: 297258.9, Y: 3545879.5, Z: 43; E: 48 51 11.0792, N: 32 1 51.3563) the core zone line lowers in the harmony with topography, while it is located west of the local road and east of the farms on Gargar Canal side. At the end of this road, and above the water way which joins Gargar eastward, the core zone line is defined respectively in the west, north and again in the west of the farms on Gargar Canal side. Then it continues as far as north of Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam area at the end point of farms. From point (UTM: X: 297351, Y: 3543572, Z: 30.4) the core zone is the western side of the heights

adjacent to the Gargar Canal.

At point (UTM: X: 297404.4, Y: 3543096, Z: 44.3; E: 48 51 18.7284, N: 32 0 21.1100) the core zone distances itself from the river so that the heights just adjacent to the river are inside core zone. At point (UTM: X: 297544.1, Y: 3542674, Z: 44.6) located in the north of Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam, where the heights extend and the border between the plain and the mountain moves away from the area, the core zone encircles the peak of heights around the Mâhi-bâzân area projection, so that the peak and its immediate valley are within the core zone. In the south of Mâhi-bâzân area, on the last point of the mentioned heights, the core zone line returns in the North West direction towards the western shore of the river. In the same direction, the core zone passes from north of a farm and in-between two fish breeding pools. Then, it goes northward coinciding with a local road among the farms. After crossing a Y-shaped road, still conforming to local farms access road, the line moves north, east and again north. At point (UTM: X: 297136.5, Y: 3542989.6, Z: 44.3; E: 48 51 8.6050, N: 32 0 17.4840) the core zone line rests on western side of heights adjacent to Gargar. From point (UTM: X: 297002.1, Y: 3543576.3, Z: 38.3; E: 48 51 3.0414, N: 32 0 36.4390) located between the farms and town limits, the core zone is the border between the town and natural basin of the river. From the end of the town limits (UTM: X: 296912.5, Y: 354463.7, Z:-14.6; E: 48 50 58.8245, N: 32 1 10.7969) onwards, the core zone line rests on the border between natural basin of the river and the farms west of Gargar Canal.

This trend goes on as far as south of Raghat stream, where it diverts to an eastern-western direction. As far as point (UTM: X: 296180.9, Y: 3545653, Z: 3.40; E: 48 50 30.1807, N: 32 1 43.3174), the core zone line is the edge of natural basin of the river. Then, the core zone is respectively the north fence of a workshop, the eastern side of Ahwaz road and Shahed square. Above the square, the core zone line rests on the western side of Allameh Shushtari and diverts from above the local access road north of residential blocks leftward as far as 100m off the main street.

From point (UTM: X: 295956.1, Y: 3545930.5, Z: 36.4; E: 48 50 21.4050, N: 32 1 52.1681) the core zone line continues in parallel with the main street northwards. After travelling 155m it turns right in parallel with the workshop.

Opposite the workshop, the core zone line coincides with the western part of Allameh Shushtari boulevard as far as the hydraulic facilities, at point (UTM: X: 296095, Y: 3546538.4, Z: 3, 40.9; E: 48 50 26.2528, N: 32 2 11.9881).

then it turns right as far as point (UTM: X: 296125.9, Y: 3546526.9, Z: 40.6; E: 48 50 27.4198 N: 32 2 11.6346).

This point joins southward point. (UTM: X: 296267.1, Y: 3546299.5 Z: 42.3; E: 48 50 32.9729, N: 32 2 4.3459).

From this point onward, the core zone line conforms with the south and eastern border of residential blocks and from the last point connects point (UTM: X: 296335.4 Y: 3546185.7, Z: 48.9; E: 48 50 35.6617, N: 32 2 0.6968).

Then it encircles the natural cliff known as Tu- Asheghan and rests on the northern edge of Shahid Beheshti Boulevard. From point (UTM: X: 296252.6, Y: 3545937.2, Z: 39), (E: 48 50 32.6963 N:32 1 52.5780) the core zone line turns south and is defined upon the eastern and south border of the residential area of the town as drawn in map II.

From point (UTM: X: 296931.2., Y: 3545731.4, Z: 39; E: 48 50 58.7065, N: 32 1 46.3380) it goes south, and then changes route northwards. So that the core zone rests on in-between Gargar Canal and Raghat stream and is the natural border of their natural basins. It joins again the town area limits at point (UTM: X: 297023.5, Y: 3545740, Z: 42; E: 48 51 2.2165 N: 32 1 46.6768), where goes north and passes respectively the eastern border of residential blocks, the eastern border of Adi-zadeh street, the western border of Fahmideh square, the eastern border of coast road as far as Emam Khomeini street, then it turns eastward, From the end of mentioned street, point (UTM: X: 297688.2, Y: 3546906.9, Z: 62.2; E: 48 51 26.6584, N:32 2 24.9779) the core zone line is defined upon buildings adjacent to Gargar Canal as far as mills square. In this square, the core zone border is the edge of shops and then, as the map shows, is the edge of the buildings adjacent to Gargar.

At the end of the buildings line, north of Shahid Sherafat Street, core zone turns left. In south of Kolâh-Farangi Tower, the line is defined conformed to the eastern edge of Qasemzeyed Street. Following this route southwards, core zone turns direction from point (UTM: X: 297652.4, Y: 3547915, Z: 52.1; E: 48 51 24.5316, N: 32 2 57.6732) to northwest as far as point (UTM: X: 297598.6, Y: 3547970, Z:46; E: 48 51 22.4396, N: 32 2 59.4333) where it changes direction again and goes southwest to join the northernmost edge of town buildings.

From the northern corner of Helale-Ahmar depot, point (UTM: X: 297304.1, Y: 3547996, Z: 47.1; E: 48 51 11.1973, N: 32 3 0.0904) the core zone line is consecutively coinciding with the western edge of that area, the south edge of the sport field, the western edge of the access road ending in Salâsel Castle, and the edge of buildings located south of Shah-safi mosque.

Afterward, it changes direction as far as the end of the residential blocks, point (UTM: X: 297118.2, Y: 3548086, Z: 47.9; E: 48 51 4.0451, N: 32 3 2.8815) where the line diverts towards the eastern edge of Dâriun Canal. Resting on the border of residential blocks, it

continues southward to point (UTM: X: 296945.3, Y: 3548026.8, Z: 48.9; E: 48 50 57.5014, N: 32 3 0.8452) in Bateni square. Then, it links to point (UTM: X: 296908.7, Y: 3548016, Z: 44.6; E: 48 50 56.1149, N: 32 3 0.4710) at the beginning of the street ending in Azadegan bridge; at this point, the core zone connects with points number (UTM: X: 296883.2, Y: 3548032.3, Z: 48; E: 48 50 55.1308, N: 32 3 0.9835), (UTM: X: 296828.2, Y: 3548015.9, Z: 48.8; E: 48 50 53.0473, N: 32 3 0.4156), (UTM: X: 296670.4, Y: 3547929.1, Z: 43.4; E: 48 50 47.1001, N: 32 2 57.4963) and (UTM: X: 296547.1, Y: 3547861.6, Z: 42.6; E: 48 50 42.4529, N: 32 2 55.2257).

Then, according to the map it turns north and is defined upon the inner route of the coastal park. At the end of this path, at (UTM: X: 296409.9, Y: 3548296.9, Z: 39; E: 48 50 36.8932, N: 32 3 9.2645), the core zone goes north as far as the edge of buildings located on the northern shore point (UTM: X: 296416.8, Y: 3548566.1, Z: 56.3; E: 48 50 36.9512, N: 32 3 18.0060).

Then it continues eastwards upon the south fence of these buildings as far as Azadegan square. From the eastern fence of Jahad Keshavarzi building, the core zone rests upon the edge of Azadegan square and then the southern edge of the onset of coastal road, south of Shahenajaf. From the junction of this street, with Khane-sazi Street, the core zone line extends southeast then eastwards coinciding with the local road.

Afterwards from point (UTM: X: 297496.8, Y: 3548355.6, Z: 45.4; E: 48 51 18.2685, N: 32 3 11.8727) located on this path, the core zone passes respectively points number (UTM: X: 297551.3 Y: 3548317.2, Z: 41; E: 48 51 20.37, N: 32 3 10.99) , (UTM: X: 297650.3, Y: 3548308, Z: 41; E: 48 51 24.1542, N: 32 3 10.4268), (UTM: X: 297831.6, Y: 3548317.5, Z: 44; E: 48 51 24.1542, N: 32 3 10.8520) and (UTM: X: 297940.7, Y: 3548370.7, Z: 45.3; E: 48 51 35.1735, N: 32 3 12.6489) Then, the line returns to the start point (UTM: X: 298002.2, Y: 3548453.1, Z: 44),

DESCRIPTION OF THE BUFFER ZONE

The buffer zone of SHHS comprises of two types: the built up area and the agricultural area (see map II). different sets of regulations apply in these two areas that is as follows:

Description of built-up areas in the buffer zone

The built up areas consists of four areas as follows:

I-The area located east of Gargar

II-The area located west of Gargar and south of Shoteit

III-The area located north of Shoteit

IV-The area located south of Shushtar and North West of Mâhi-bâzân bridge-Dam

Each with the following descriptions:

I-The area located east of Gargar

This area begins from north, opposite Band-e Mizân Dam entrance at point (UTM: X: 298194.9, Y: 3548172.7, Z: 48.4; E: 48 51 45.0102, N: 32 3 6.3862) and continues eastward on the northern border of the school as far as point (X: 298310.9, Y: 3548172.2, Z: 54.1; E: 48 51 49.4311, N: 32 3 6.4445). This point joints the northern corner of a building (UTM: X: 298346.1, Y: 3548130, Z: 48.7; E: 48 51 50.8043, N: 32 3 5.0975) and then, coinciding with the western border of residential blocks, the line extends southward to the south edge of Saheb-al-zaman Boulevard. Here afterwards the buffer zone line is the northern edge of the buildings, specified in the map, at the corner of the passageway, it turns again southwards conformed with the edge of residential blocks.

At the southernmost point of the buffer zone and on the border between residential blocks and farmlands, from point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51 40.8231, N: 32 2 21.0449) the core zone rests on the south edge of residential buildings and at the northwestern direction joins point (UTM: X: 297895.5, Y: 3546905.2, Z: 59; E: 48 51 34.5585, N: 32 2 25.0561) on the Gargar side. Here afterwards, the buffer zone is conformed with the core zone line, as previously described which as far as point (UTM: X: 297940.6, Y: 3547533.5, Z: 50.7; E: 48 51 35.8023, N: 32 2 45.4770), situated in the south of Shahid Motahari park and west of Valiy-eAsr avenue (Seyyed Mohammad Golabi). From this point onwards, the buffer zone line is the western edge of Valiy-Asr avenue northwards as far as point (UTM: X: 298194.9, Y: 3548172.7, Z: 48.4; E: 48 51 45.0102 N: 32 3 6.3862).

II-The area located west of Gargar and south of Shoteit

This area begins from point (UTM: X: 296908.7, Y: 3548016, Z: 44.6; E: 48 50 56.1149, N: 32 3 0.4710) the corner of Bateni square (at the beginning of the access road to Azadegan bridge) and turns right conformed with the edge of the square as far as point (UTM: X: 296912.1, Y: 3547984, Z: 45.8; E: 48 50 56.2688, N: 32 2 59.4346). From this point on, the line turns southward and conforming to the western edge of Allame Shushtari Boulevard continues to Gadir square. Then, as shown in the map II, It encircles the western edge of the

mentions square. From point (UTM: X: 29 76 23.2, Y: 35 46 935.8, Z: 48; E: 48 51 24.16, N: 32 02 25.87)

In Gadir square, the buffer zone continues in south-east direction band joins to the NBB point (UTM: X: 29 78 87.7, Y: 35 46 452, Z: 48; E: 48 51 34.60, N: 32 02 10.34) at eastern edge of Emam Khomeini street. Coinciding with the eastern edge of the mentioned street, the line goes southward and joins o point (UTM: X: 29 78 17.4, Y: 35 46 336.8, Z: 48; E: 48 51 32.01, N: 32 02 06.49) and point (UTM: X: 29 78 34.5, Y: 35 46 171.9, Z: 49; E: 48 51 32.29, N: 32 02 01.22). Hereafter, the buffer zone is conformed to the core zone line, so that it first continues to the east, then, after a short diversion to the south, it passes eastward south of the town area. Then, it passes Raghat stream from east and continues to the north following the core zone line.

As previously mentioned the buffer zone continues along western edge of Gargar basin to the north of built-up area. Then following the core zone it turns to the south-east until it joins the beginning point at Bateni square.

III-The area located north of Shoteit

This area begins at its northernmost spot from crossroads of Khanesazi street and the coastal boulevard at point (UTM: X: 297257.6, Y: 3549377.8, Z: 65.2; E: 48 51 8.3775, N: 32 3 44.8942) and continues along northern edge of the latter street eastwards.

From point (UTM: X: 297714.3, Y: 3549287.5, Z: 48.9; E: 48 51 25.8518, N: 32 3 42.2582) the buffer zone line changes direction and goes on overlapping respectively the western and northern edge of Khanesazi street as far as point (UTM: X: 297074.8, Y: 3548626 Z: 46.5; E: 48 51 1.9815, N: 32 3 20.3761). Here, it coincides with the northern border of the core zone line as far as point (UTM: X: 296416.8, Y: 3548566.1, Z: 56.3; E: 48 50 36.9512, N: 32 3 18.0060), where it extends west and then northward. In this way, it passes respectively points (UTM: X: 296417.1, Y: 3548647.4, Z: 52.2; E: 48 50 36.9007, N: 32 3 20.6447), (UTM: X: 296431.3, Y: 3548679.1, Z: 52.3; E: 48 50 37.4177, N: 32 3 21.6828), and (UTM: X: 296424.7, Y: 3548827.5, Z: 57.7; E: 48 50 37.0532, N: 32 3 26.4948) until it reaches to reach point (UTM: X: 296423.7, Y: 3548911.7, Z: 62; E: 48 50 36.9509, N: 32 3 29.2270) on the southern edge of Daneshgah boulevard. Here, on overlapping the southern edge of Daneshgah boulevard, it extends to the east then, after passing south of the square, goes north east as far as point (UTM: X: 296853.4, Y: 3549011.2, Z: 68; E: 48 50 53.2513, N: 32 3 32.7347). Here after, the buffer zone line redirects again eastwards.

After passing points (UTM: X: 297039.6, Y: 3549014.7, Z: 74.9; E: 48 51 0.3448, N:

32 3 32.9687), and (UTM: X: 297160.9, Y: 3549004.2, Z: 60.6; E: 48 51 4.9757, N: 32 3 32.7064), it reaches point (UTM: X: 297174.1, Y: 3548995, Z: 55; E:48 51 5.4857, N: 32 3 32.4163) on the western edge of Khanehsazi street.

From his point on, it changes direction again and it passing along the western edge of Khanehsazi street. Connects with the start point of (UTM: X: 297257.6, Y: 3549377.8, Z: 65.2; E: 48 51 8.3775, N: 32 3 44.8942)

IV-The area located south of Shushtar and northwest of Mâhi-bâzân Dam

This area includes residential region called Gavmishabad (Shahrak-e Andisheh). The buffer zone begins from point (UTM: X: 296912.5, Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N:32 1 10.7969) at the northeastern end of the vary region. they coinciding with the core zone line, if extends southward along Gargar Canal Point (UTM: X: 296952.6, Y: 35436363 Z:-14.2; E: 48 51 1.1107, N: 32 0 38.3446) at the south east of Sharak-e Andisheh , it continues towards south west and passes the farm lines as shown in map. From point (UTM: X: 296791.5, Y: 3543480 Z:12.1; E: 48 50 55.0926, N: 32 0 33.1775), the buffer zone line turns south, then west and afterwards north, while it overlaps the border of Sharak-e Andisheh with farmlands. following this path, it and passes points (UTM: X: 296818.3 Y: 3543384.1, Z: -9.1; E: 48 50 56.1861, N: 32 0 30.0823), (UTM: X: 296382.3, Y: 3543378.8, Z: -12.8; E: 48 50 39.5831, N: 32 0 29.6282) and (UTM: X: 296271.9, Y: 3543484.3, Z:-12.7; E: 48 50 35.2978, N:32 0 32.9808) until it reaches point (UTM: X: 296242, Y: 3544525.5, Z: -12.8; E: 48 50 33.3668, N: 32 1 6.7539) located at the north western end of Gavmish-Abad .From here on it turns west passing points (UTM: X: 296451.5, Y: 3544532.6, Z: -3.8; E: 48 50 41.3421, N: 32 1 7.1201), (UTM: X: 296558.9, Y: 3544600.9, Z: -13; E: 48 50 45.3815, N: 32 1 9.4063), and (UTM: X: 296626.4 Y: 3544601.5 Z: -9.6; E: 48 50 47.9524, N: 32 1 9.4695). Then it conforms with the edge of residential blocks and returns to the starting point of (UTM: X: 296912.5 Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N: 32 1 10.7969).

Description of agricultural areas in the buffer zone

The agricultural areas consist of five areas as follows:

V-The area situated north of Shoteit and Shushtar town

VI-The area located east of Gargar

VII-The area located east of Gargar and south east of Shushtar

VIII-The area located west and south of Shushtar

IX-The area situated south of Shushtar in-between Gargar and Raghat rivers

Each with the following descriptions:

V-The area situated north of Shoteit and Shushtar town

V-The area situated north of Shoteit and Shushtar town

This area starts from point (UTM: X: 297074.8, Y: 3548626, Z: 46.5) on the coastal boulevard and at the intersection of built up area zone and core zone of SHHS. Then it continues northward overlapping respectively the northern and then the western edge of the mentioned boulevard (the buffer zone II) as far as points (UTM: X: 297714.3, Y: 3549287.5, Z: 48.9) and (UTM: X: 297711.8 Y: 3549441.1 Z: 39.1) which are at the shore of Karun river. Here after the buffer zone line crosses the river and joins respectively points (UTM: X: 297806.9, Y: 3549509.9, Z: 63) on the bank, and (UTM: X: 297921, Y: 3549546.4, Z: 45.9) on the fence. Afterwards, as far as point (UTM: X: 298074.6, Y: 3549567.3, Z: 49.5), the line is still on the fence. Then as drawn in map II, it is specified on the edge of a road turning back to Shushtar. In this way the buffer zone extends first in an east to west direction, and then in a north to south direction as far as the intersection of Beinolpharamain with the mentioned road.

At Point: (UTM: X: 298879.3 Y: 3548260.2 Z: 75.1). This point joins another point (UTM: X: 298857.2, Y: 3548122.7, Z: 64). then it continue respectively westward on the edge of the building which are shown In map II, in this course, the buffer zone line crosses points (UTM: X: 298807.8, Y: 3548073.3, Z:68.4), (UTM: X: 298741.7, Y: 3548052.4, Z: 74.5), (UTM: X: 298628.8, Y: 3548202.5, Z: 75.2), (UTM: X: 298516.5, Y:3548131.9, Z:0.5), (UTM:X: 298441.3Y: 3548103.4,Z: 54.3) and (UTM:X:298369.5,Y: 3548119, Z:49.5) until it reaches point (UTM:X: 298346.1,Y: 3548130,Z: 48.7) located on the buffer zone line I. Hereafter it overlaps north borders of buffer zone line III and the core zone. Then after passing north of Band-e Mizân Dam and the northern shore of Shoteit, it rejoins the start point of (UTM: X: 297074.8, Y: 3548626, Z: 46.5) which was described before.

VI-The area located east of Gargar

This area begins from point (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N:32 3 2.9822) on the western edge of Valiy-eAsr avenue (Seyyed Mohammad Golabi) and continues on this line (and the buffer zone line I) as far as point (UTM: X: 297940.6, Y: 3547533.5, Z: 50.7; E: 48 51 35.8023, N:32 2 45.4770) .Hereafter, the line overlaps the core zone line and turns left. As discussed in the description of core zone, hence buffer zone line coincides with the border between the park and Gargar Canal basin. It firstly diverts to the east and secondly to the north as far as point (UTM: X: 298105.9, Y:

3548098.4, Z: 45; E: 48 51 41.6747, N: 32 3 3.9175). Then it changes direction eastwards and rejoins the start point of (UTM: X: 298165.6, Y: 3548068.4, Z: 54.2; E: 48 51 43.9723, N:32 3 2.9822).

VII-The area located west and south of Shushtar

This area starts from point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51 40.8231, N: 32 2 21.0449) east of Gargar and south of residential blocks (on the buffer zone I) then it is coinciding with the western edge of the road passing southward amid farmlands and Bolbol desert, At the East of Mâhi-bâzân it passes point (UTM: X: 297879.3, Y: 3542944.4, Z: 48, N: 32 00 16.5; E: 48 51 36 93) then it turns southeast. At point (UTM: X: 297973.3, Y: 3542862.6, Z: 48; E: 32 00 13.90) it passes from northeast of eastern heights of Mâhi-bâzân area. Then, turns southward and rests on the western and eastern borders of two other heights, until at point C, it reaches a dry waterway and a valley which make the southern end of buffer zone. Following the mentioned directions, The line crosses the Gargar Canal and links to the farmlands crossroad, as it is shown in map II. Hereafter, the buffer zone line change direction to the north and west while it is overlapping the farm borders and reaches the Ahwaz Road. From this point northward, to the one set of Gavmish-Abad (Andisheh) the buffer zone is the eastern edge of Ahwaz road. From here on the buffer zone overlaps the southern access road of the township and the border of buffer zone IV and turns east and rests on the southern edge of buffer zone IV (as discussed earlier) .Then, along Gargar Canal valley and at the intersection of buffer zone IV and the core zone, at point (UTM: X: 296952.6, Y: 3543636, Z:-14.6; N: 32 00 36.52, E: 48 51 16.33) the buffer zone diverts southward conforming to the core zone line mentioned before. Following this trend, the buffer zone goes respectively to the south (upon the core zone line) and circles Mâhi-bâzân area, following the same line along Gargar Canal it returns northward until it reaches south of residential blocks at Gargar side at point (UTM: X: 297895.5, Y: 3546905.2, Z: 59; E: 48 51 34.5585, N: 32 2 25.0561).From this point the buffer zone line 2 overlaps buffer zone line IV and the edge of residential blocks and diverts southeast until it rejoins the start point (UTM: X: 298057.4, Y: 3546778.4, Z: 62.4; E: 48 51 24.37, N: 32 00 07.5)

VIII-The area located west and south of Shushtar.

This area starts from point (UTM: X: 296431.3, Y: 3548679.1, Z: 52.4; E: 48 50 37.4177, N: 32 3 21.6828) on the northern edge of Dezful road. From this point on continues southward coinciding with the western border of buffer zone IV, then the western border of

core zone. After crossing the river is defined upon the inner access road of the park, described earlier.

Afterwards, still upon the core zone line, passes point (UTM: X: 296547.1, Y: 3547861.6, Z: 42.6; E: 48 50 42.4529, N: 32 2 55.2257) and diverts towards northeast and Bateni square until, it reaches point (UTM: X: 296925.5, Y: 3547968.3, Z: 45.6; E: 48 50 56.7913, N: 32 2 58.9337) on the eastern edge of Allameh Shushtari boulevard. From this point the eastern edge of the boulevard is the border of buffer zone line which in a southwest direction extends as far as north of Pasdaran square to point (UTM: X: 296256.4, Y: 3546937, Z: 44.9; E: 48 50 32.0797, N: 32 2 25.0292). Hereafter buffer zone line is the eastern edge of the square as far as point (UTM: X: 296213.4, Y: 3546854.3, Z: 44; E: 48 50 30.5043, N: 32 2 22.3172). Then, in a southeastern direction, the buffer zone line makes the border between farmlands and the building area passing points (UTM: X: 296231.6, Y: 3546828.3, Z: 43.2; E: 48 50 31.2176, N: 32 2 21.4852), (UTM: X: 296334, Y: 3546678.5, Z: 44.5; E: 48 50 35.2333, N: 32 2 16.6898) and (UTM: X: 296405.9, Y: 3546571, Z: 44.5; E: 48 50 38.0546, N: 32 2 13.2475) it joins the north corner of buffer zone II at point (UTM: X: 296508.1, Y: 3546401.7, Z: 45.7; E: 48 50 42.0774, N: 32 2 7.8190). From here on the buffer zone line is still overlapping the buffer zone line II, so that it and first goes south west and then south until reaches Tu- Asheghan cliff at Point (UTM: X: 296455, Y: 3546122.3, Z: 49; E: 48 50 40.2667, N: 32 1 58.7166). Here, the buffer zone conforms the core zone line and after circling the cliff in a north western direction, it crosses south west of residential blocks and north of Khâk Dam area. After reaching Allameh Shushtari boulevard at point (UTM: X: 296095.5, Y: 3546538.4, Z: 40.9; E: 48 50 26.2528, N: 32 2 11.9881), it diverts southward. Then, it passes west of Shah Ali Bridge, its adjacent cliffs and west of Shahed square. Then, still upon the core zone line, it passes south and west of Raghat stream until reaches north of Gavmishabad (Andisheh township) at point (UTM: X: 296912.5, Y: 3544636.7, Z: -14.6; E: 48 50 58.8245, N: 32 1 10.7969). From here the buffer zone line overlaps the north line of core zone and diverts from north of Andisheh township westwards as far as point (UTM: X: 296242, Y: 3544525.5, Z: -12.8) at the northwestern end of the residential area, where it joins point (UTM: X: 296124.3, Y: 3544997.1, Z: 39.9) in the northwestern direction, and coincides with the northern edge of the road, until it reaches point (UTM: X: 294690.7, Y: 3546022, Z: 43.9). Here afterward the buffer zone line diverts northeast and overlaps the western edge of the road, passes east of Karun and extends as far as point (UTM: X: 295940.8, Y: 3547899.5, Z: 42.4) near it. Here the buffer zone line crosses the river again and joins point (UTM: X: 296024.8, Y: 3548671.5, Z: 47.1) on the northern edge of Dezful road.

Afterwards, it returns to the start point of (UTM: X: 296431.3, Y: 3548679.1, Z: 52.4)

IX-The area situated south of Shushtar in-between Gargar and Raghat canals

This area is a small triangular shaped area enclosed at the intersection of Gargar and Raghat canals. Its eastern and western borders overlap the core zone line as reported previously and its northern border (south of the residential area) coincides with the southern line of buffer zone 1: The above area is define by its corners as follows:

North eastern point (UTM: X: 297017.5, Y: 3545731.6, Z: 41)

North western point (UTM: X: 296931.2, Y: 3545731.4, Z: 39)

South eastern point (UTM: X: 296987.7, Y: 3545009.1, Z: 38)

South western point (UTM: X: 296937.5, Y: 3545012.8, Z: 31)

DESCRIPTION OF LANDSCAPE ZONE

The landscape zone starts from point A (UTM: X: 297881.5, Y: 3556297.1) in the north of Shushtar, near Do-Pirun Village and continues in the south-east direction and encircles north and north-east Mountains of Shushtar. Then, it returns to the point B (UTM: X: 305854.1, Y: 354824.4), so that the landscape zone encompasses Fadalak, Zar, Kushkak and Rish-gir mountains. From the last mentioned point, the line changes direction and joins point C (UTM: X: 311182.3, Y: 3544722.0) on the furthestmost of the eastern heights of Shushtar. Afterwards, it continues to the south and from point D (UTM: X: 310238.6, Y: 3539466.9) to point E (UTM: X: 309504.6, Y: 3533027.2), the line coincides with the road which goes southward to Ahwaz.

After passing point E, it turns to the east and connects with point F (UTM: X: 295000, Y: 3530289) on the peak of mountains located on the western side of Karun, Then, it continues toward north-west and passes respectively points G (UTM: X: 288030.8, Y: 3537941.8) and H (UTM: X: 284024.9, Y: 3549241.6) which are also on the peak of mountains overlooking the city on the western side of Karun.

From point H, the line turns towards north-east and joins point I (UTM: X: 287681.4, Y: 355353.4) on a road leading to the city of Dezful. Afterwards, the line conforms to the mentioned road until point J (UTM: X: 287935.7, Y: 3556296.4); then, it turns to the east and joins the first starting point.

2

DESCRIPTION

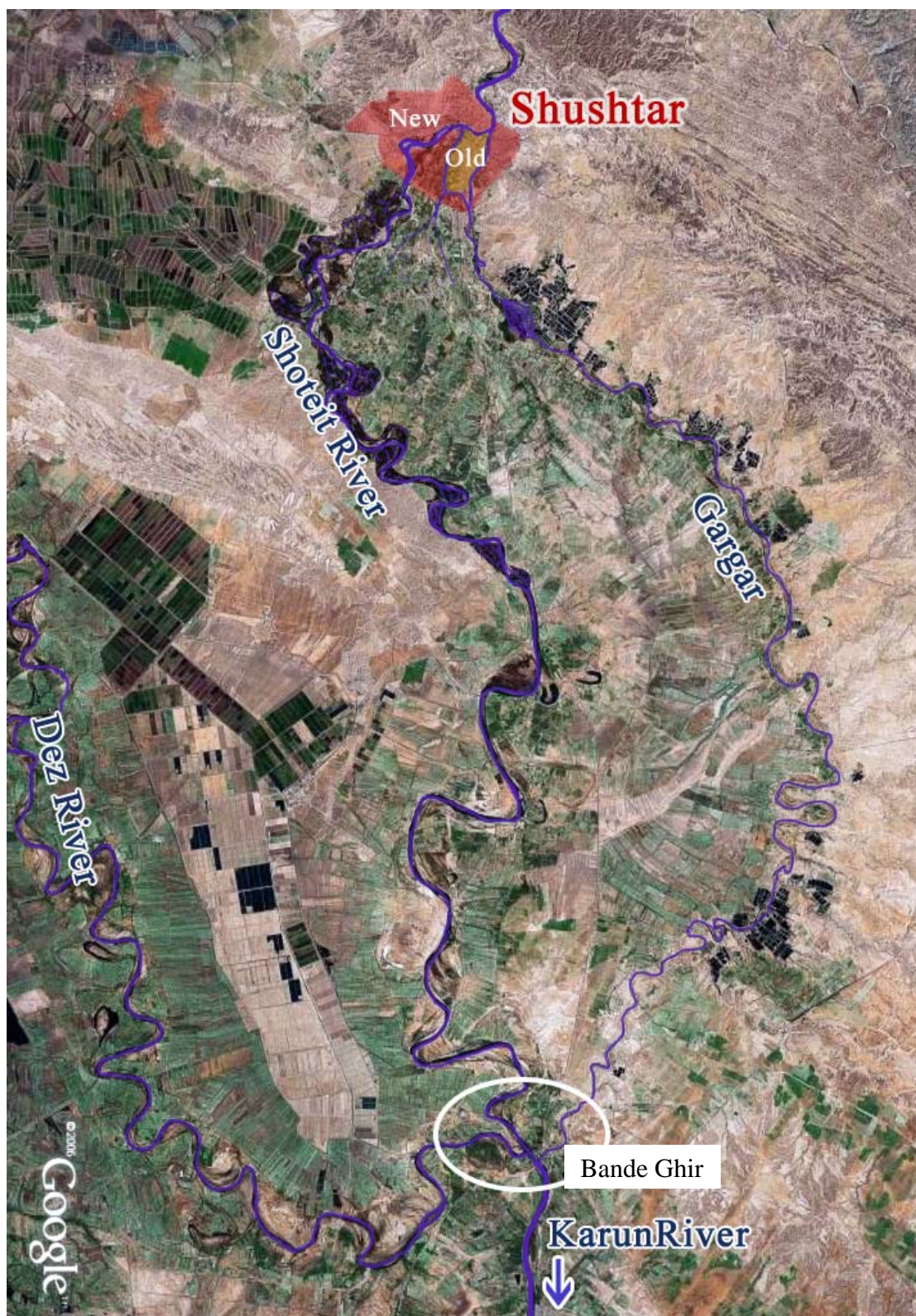


Fig. 4. The location of Shushtar and of the Kârun river with its branches (Gargar and Shoteit) and Their reconnection in Bande Ghir

2.a. Description of Property

Shushtar is a town in south-western Iran, located in the province of Khuzestan (figs. 1-4). The town stands on a cliff to the west of which runs the river Kârun, the middle course of which begins a few kilometres north of the town. This position offers considerable commercial and strategic importance and has made possible the construction of various waterworks for which the town has long been celebrated. The main features of these constructions are: (1) the canal called Ab-e Gargar (or the medieval Mashreqân) which is led from the left bank of the river about 500 m north of the town; it runs southwards along the east side of the cliffs of Shushtar and rejoins the Kârun at Band-e Ghir; (2) the great barrage called Band-e Qaysar (the Dam of Caesar) also known as Band-e Mizân, which is thrown across the principal arm of the river (here called Shoteit) east of the town and is about 350 m long; this barrage supports a bridge that connected the town with the west bank, but now a considerable gap is broken in it; (3) the canal called Miyânâb which begins above the barrage in the form of a tunnel cut out of the rock on the western side of the town; the Miyânâb turns southwards and irrigates the land south of the town. These structures along with other waterworks of Shushtar are described in full below.

The difference of levels between the settlement and the Kârun, flowing more than 10 m lower, persuaded the inhabitants to solve their problems by building waterworks and structures. The main aim of these constructions was to meet the inhabitants' needs for either protecting themselves from floods or irrigating their agricultural lands and making possible passages across the river and canals. Initially, it was a state project supported by kings and local rulers of the region to construct waterworks that resulted in the development of agriculture, which was the major economic asset of the region. The construction of bridges, dams, bridge-Dams, mills, qanâts, reservoirs, tunnels, and canals for the water supply of the town (fig. 6). Most of these structures and buildings were constructed in the Sâssanian period (224-650 A.D.), especially during the reign of Shapur I (r. 240-272 A.D.).

From various constructions related to the use and management of water thirteen have been selected as the most important waterworks of Shushtar for their significant function and architectural aspects.

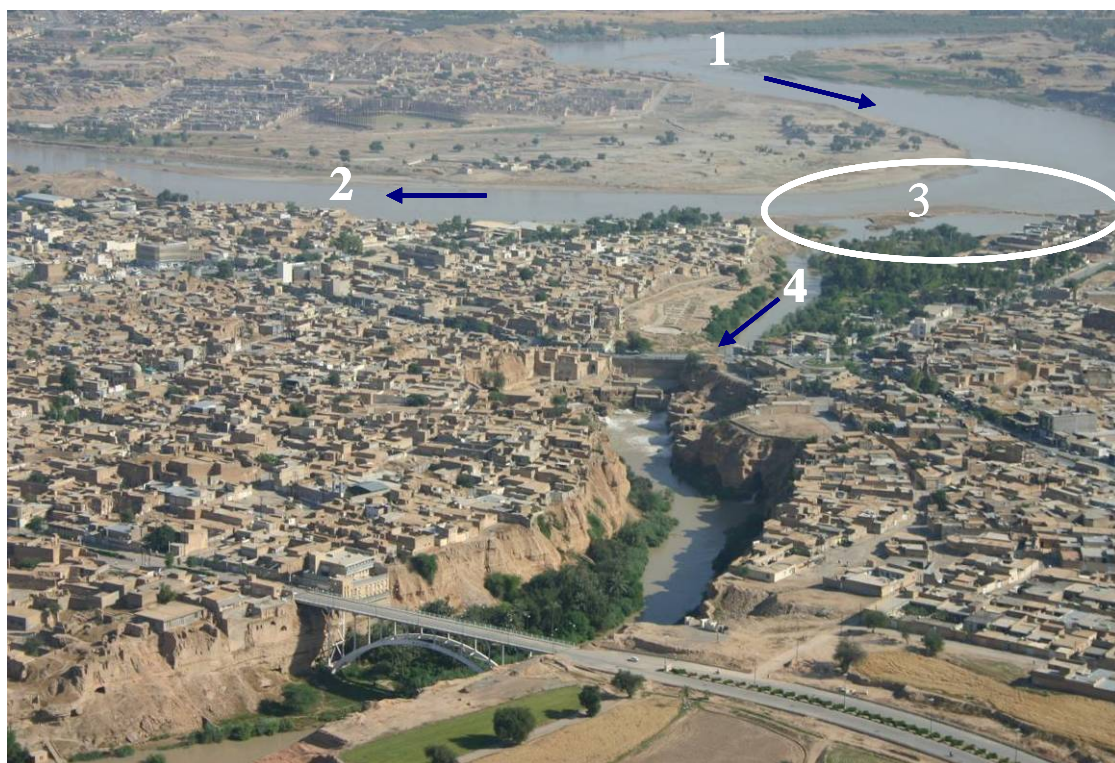


Fig. 5. Air view of Shushtar: 1) the Kârun, 2) the Shoteit, 3) the Mizân dam, 4) the Gargar

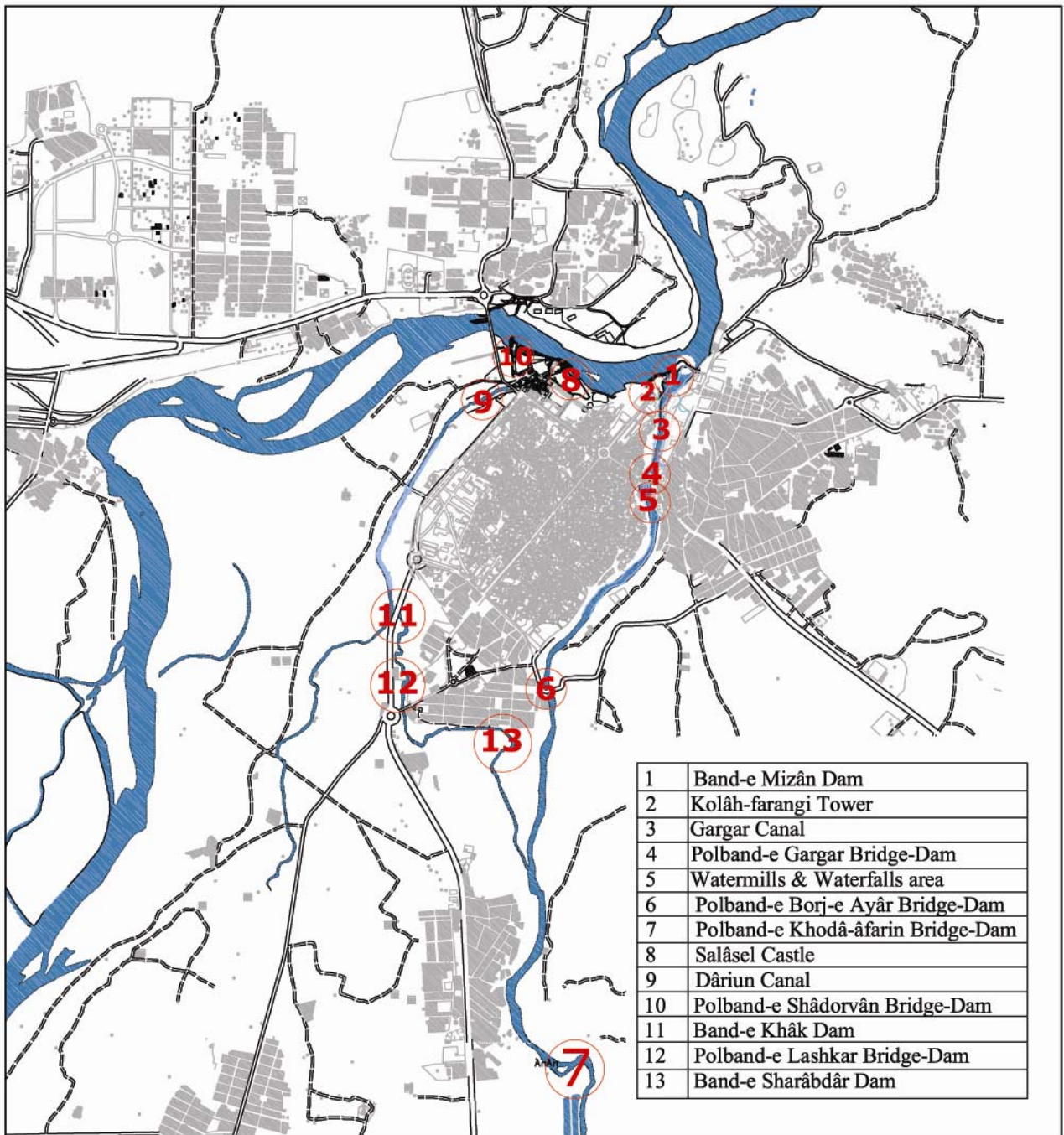


Fig. 6. Map showing the Shushtar and its waterworks

1. Band-e Mizân

Registration number on the National Heritage List: 2331

Band-e Mizân is, in fact, a dam constructed on the Gargar (figs. 4-6). It is one of the most important constructions at Shushtar. The dam is located north of the town in an east-west direction. It divides the Kârun into two branches: the Shoteit and the Gargar with a proportion of 4 to 2.

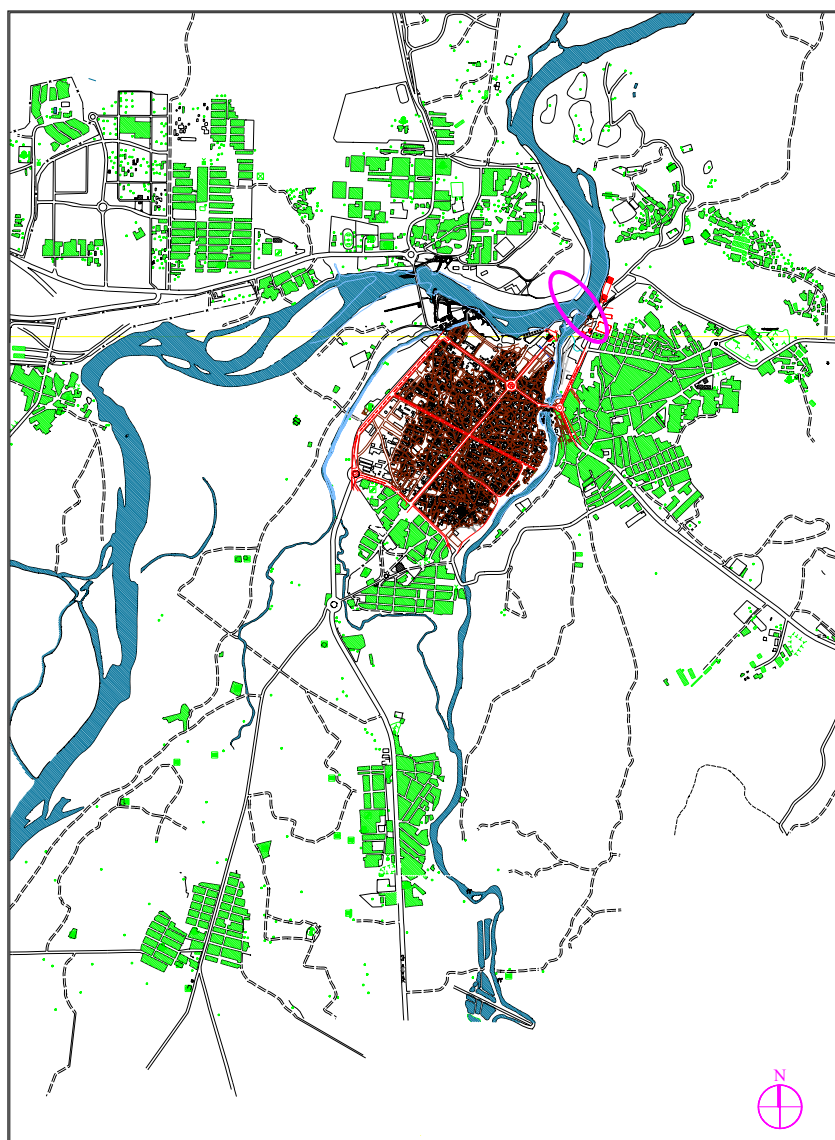


Fig. 7. Location of Band-e Mizân in Shushtar



Fig. 8. Air view of Band-e Mizân

With 390 m length and about 4.50 m height this Dam has been built on the solid rock, which is in the form of diagonal walls belonging to dams functioning by their weight. This structure is like a straight wall and has 9 sluices or mouths of different width, which conduct the water towards the south and the Gargar canal. Each of the sluices has a local name. The widest sluice is 2.85 m and the narrowest is 1.70 m. The mentioned mouths slope down at the south elevation.



Fig. 9. View of the northern section of Band-e Mizân



Fig. 10. View of the southern outlets of Band-e Mizân

After the sluices, at the middle of the Dam, there is a glacis wall over which the water flows. There is also another mouth in western part of the Dam, which draws the water between the Gargar and Shoteit rivers.



Fig. 11. View of the western outlets

There was a 1.20 m high crown throughout this Dam but demolished entirely except a part still existing in west. Also, some walls do exist at the west part of the Dam, which was to be used as a jetty for boats to disembark.



Fig. 12. An ancient harbor point on the western side

Located at the eastern corner of the Dam, leaning vertically to the Dam, the remaining of some short walls represent an old water-mill in that part. The Mizân dam is from eastern and western side accessible. The materials used in this dam are all cut sand stones with mortar. During recent years, concrete cement mortar has been used to cover the surface of dam.

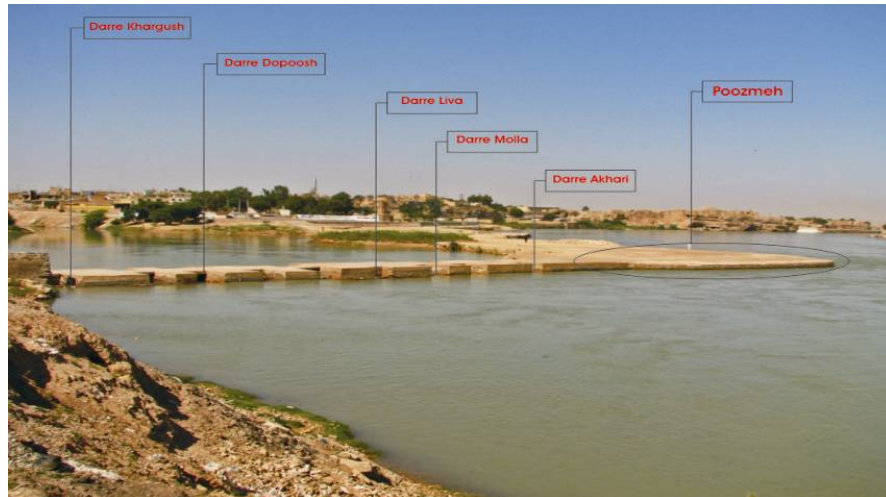


Fig13: View of Band-e Mizân dam

2. Kolâh Farangi Tower

Along the western part of the Dam, at the top of a hill, there is a tower called Kolâh Farangi overlooking to Dam with an octagonal designed plan (fig. 14). According to some historians, it has been made to be used as a monitoring tower on the process of building up the Dam. Some others believe that it is used to measure the height of the water in the river and the others call it a memorial tower. However, it is also said that this tower would have been utilized as a guiding-tower because of closed connection with the Salâsel citadel overlooking to that. Having been made with sand stones, having 3 m diameter and 7.5 m high, the tower is being used as a part of Dam.



Fig. 14. Kolâh-Farangi Tower

3. The Gargar canal

Registration number on the National Heritage List: 17599

The Gargar or the Mashreqân canal is an artificial branch of the Kârun, which is separated from the river north of Shushtar by means of the Dam known as Band-e Mizân Mizân. The

Gargar is one of the largest man-made water courses in Iran which flows some 100 km before re-joining the Kârun. The main reason for digging the Gargar was to irrigate the southern plains of Shushtar. The width of the Gargar varies along its course, between 20 m to 90 m. The Gargar has been dug in a solid rock. After passing Shushtar, it enters a soft-soil plane. The tracks of pickaxe are clearly visible on the stream's rocky walls.

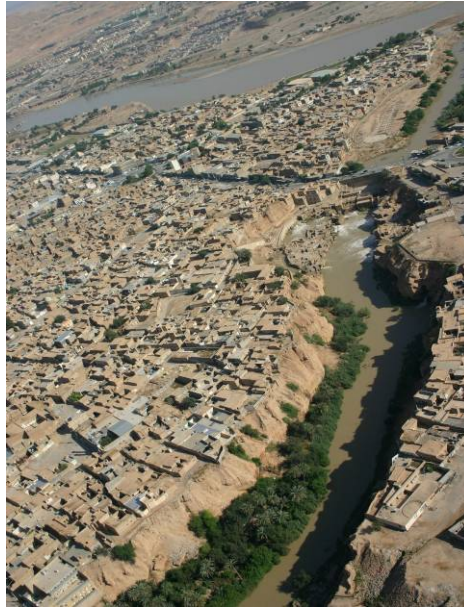


Fig. 15. Air view of the Gargar in Shushtar

The Gargar has been dammed along its 700 m length. The water of the canal is connected to the other side of dam by 3 large tunnels called Boleyti, Se- Kureh, and Dahân-e Shahr. The tunnels mentioned are in different heights, and conduct the water to an open area where there is a System of watermills generated by the canal. The canal's water flows out from the rocks onto the river and generates the mills' wheels. It also makes a nice view, hence the name Abshârhâ or the waterfalls for this particular location in Shushtar.

The Gargar's bed is about 90 m wide and 11 m deep in this area. The canal provides a climate suitable for growing plants in its banks.

One of the most important military settlements of the early Islamic period owed its foundation and prosperity to the existence the Gargar. The settlement named Askar Mokram.

On the Gargar at the different distances there are two Dams called Borj-e Ayâr and Khoâda Afârin (Mahi Bâzân). The Gargar finally joins the Kârun south of Shushtar on the road to Ahwâz after 44 km. in a location called Band-e Ghir.



Fig. 16. Gardens on the bank of the Gargar canal

4. The bridge-Dam of Gargar

Registration number on the National Heritage List: 2914

The bridge-Dam on the Gargar has been built at the north of the waterfalls. This construction is east-west oriented and it has 83 m length, 12 m width, and 6 m high. Functioning as a dam, this structure is one of important Shushtar's gates connecting east to west. The original foundation of the Dam is attributed to the Sâssanians (224-650). The materials used in that are cut sand stones with mortar.



Fig. 17. The Dam on the Gargar in 1935 (The Oriental Institute)



Fig. 18. The Dam on the Gargar as it is today.



Fig. 19. Ground view of the Dam on the Gargar

5. The area of waterfalls and watermills

Registration number on the National Heritage list: 2180

Waterfalls and watermills System is located on the east side of Shushtar, to the south of the Gargar bridge-Dam. This System comprises an area of 5 hectares and makes a huge hydraulic structure with elements e.g. canals, tunnels, and mills using the power of water for industrial purposes in addition to create some artificial unique waterfalls and their views (figs. 20-31).

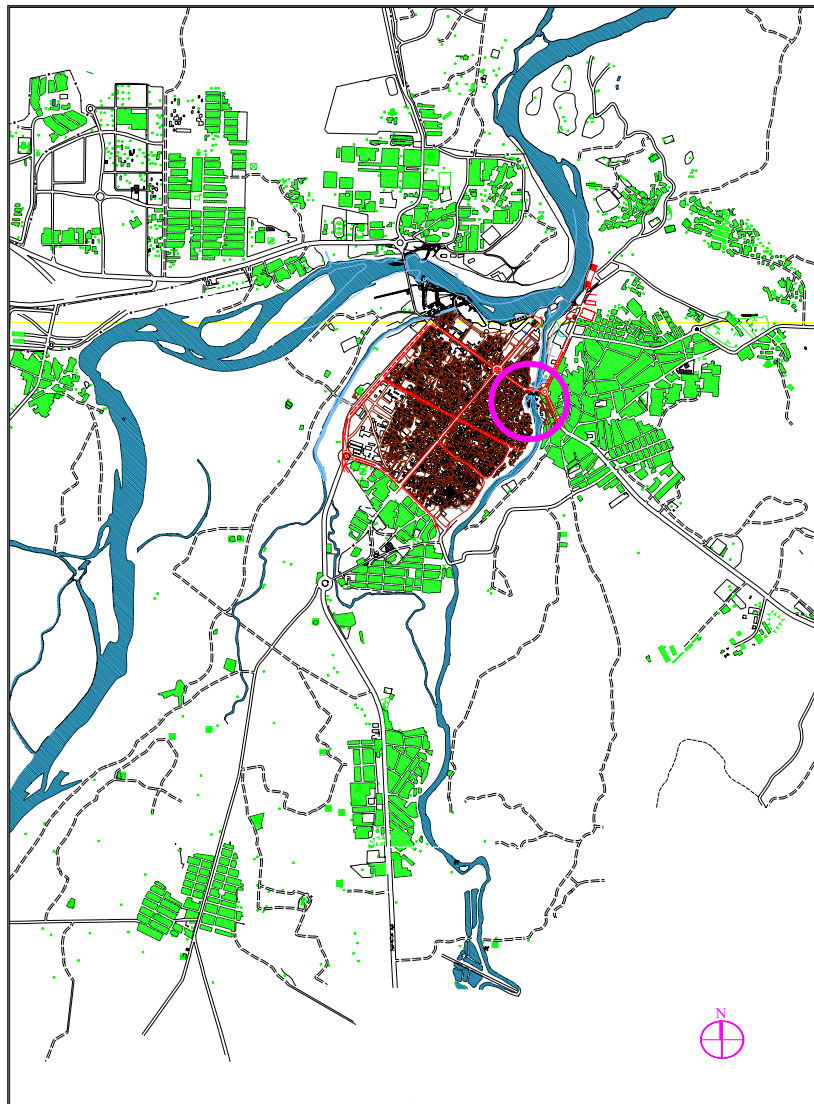


Fig. 20. The location of the Waterfalls in Shushtar

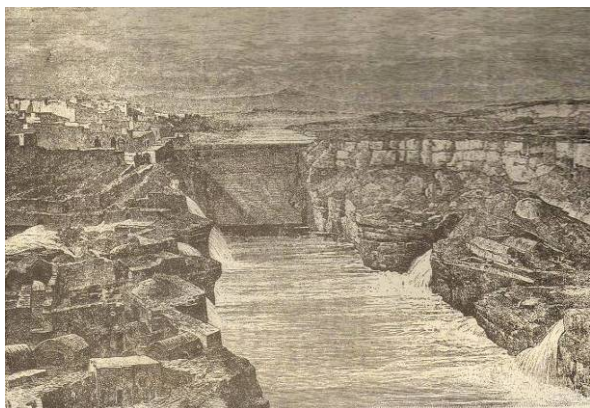


Fig. 21. Waterfalls in the 1880s (after Dieulafoy)



Fig. 22. The Waterfalls in 1980



Fig. 23. The Waterfalls area today

This particular location of the town is known nowadays as the Waterfalls area, which includes 50 watermills generated by the water taken from the Gargar Dam. The water is transferred through 3 tunnels called Boleyti, Dahân-e Shahr, and Se-Kureh being divided into channels.



Fig24 :Aerial photo of the tunnels built inside Polband-e Gargar Bridge-dam

All channels, however, provide water for watermills, and for generating electricity and ice manufacturer. After supplying water for the waterfalls, the rest of the water flow out from the tunnels onto the river and make a pleasant view of waterfalls. Located 20 ms lower than the level of neighborhood, this System includes 3 parts:

The northern part: located under the Dam of Gargar, this part has 6 watermills. In addition to the watermills, this part also consists of the electricity supply station of Mostowfi built in 1941. It is the second electricity supply station in Iran in terms of size and capacity.



Fig. 25. Northern part of the Waterfalls area



Fig. 26. Hydro power station



Fig. 27. The entrance Sâbât



Fig. 28. View from the inside the Sâbât (covered alley)

In the northern part, there is a main entrance in the shape of a ramp for domestic animals to pass through; the ramp has been transformed to steps (figs. 27-28). With 4 m width and 8 m length, this covered entrance called Sâbât Zâbetun was a place in which the government's officials asked the passengers for taxes.

In the north part and under the bridge, meanwhile, there is the remaining of a pump plant installments built in 1950s to supply water for urban area. This pump plant would have pumped the water of Se-Kureh tunnel to the metal pipes to be conducted to the city for inhabitants use. Water for the mills in the northern area is also supplied by Se-Kureh tunnel. The eastern part: there were 12 watermills in the eastern area, of which 8 mills have been renovated and rehabilitated. The mills in this area are in lower level than in other two areas. The access to this segment, in the past, has been possible via a staircase in the eastern wall, which does not exist now. At this part, there was also another staircase called Shâhi (the King) staircase ending toward the power factory. Shâhi staircase was built, during 48 hours, in 1953 for the special visit of Mohammad Reza Pahlavi from the water-use power factory that's why that's name is Shâhi. The water for watermills in this area is provided through Dahâne Shahr (city's mouth) tunnel.



Fig. 29. View from the eastern side of the Waterfalls



Fig. 30 View of the Waterfalls

The western part: in this area, there are traces of nearly 21 watermills generated by the water coming from the Se-Kureh tunnel. In addition to watermills and hand-dug water canals, the most important element formed in the western part is a huge stone-staircase consisting of 115 stairs connecting the old urban fabric to the watermills System. The inhabitants have had access to drinking water via that staircase. The main characteristic of the staircase is the natural foothill's ramp used for constructing that. The materials used for building up the staircase are sand-stone blocks and mixture of clay and lime as mortar.



Fig. 31. 1-View of the western ramp of area
2- view of the *châhâr-tâqi*

Located under the western staircase and above a watermill, which has been built under the staircase, there is a *châhâr tâqi* locally known as Namâz Khâne which was a place for millers to take rest and to pray (fig. 32). It is in stone with three open sides; the structure is 5 m long and 4.50 m wide, and 4.50 m high.



Fig. 32. The *châhâr-tâqi*

The western area of the watermills is located between the Dopolun can (twin bridge canal) and the Gargar (fig. 33). The only way to reach this area is by means of a stone bridge called Dopolun with two arches 3 m wide each; the bridge is 9 m long and 5 m high.



Fig. 33. Dopolun

There has been a *Sâbât* with an entrance and two exits beyond Dopolun in the western watermills neighbourhood. Having been used as a rest area for the mills' customers, the *Sâbât* was demolished with other mills during recent years.

The Shushtar's ice manufacturer was also situated in the western part of the watermills area, but it was demolished. Canals and tunnels are the other important parts of this System. There are three tunnels, forming a System, in different levels which are called Boleyti, Dahâne Shahr, and Se-Kureh.

The Boleyti tunnel (figs. 34-36): this tunnel is called Boleyti because of its route passing under a neighborhood with the same name. Located in upper level than the other tunnels, this

tunnel has, approximately, 360 ms length and 5-7 ms width. The tunnel of Boleyti's function is to conduct the flood water and to provide the water for eastern areas' watermills. Boleyti tunnel is in the upper level than the others, so this difference between their levels causes this tunnel to react as an overflow for the Gargar bridge-dam.



Fig. 34. One of the openings of the Boleyti tunnel



Fig. 35. The entrance of the Boleyti tunnel from Band-e Gargar

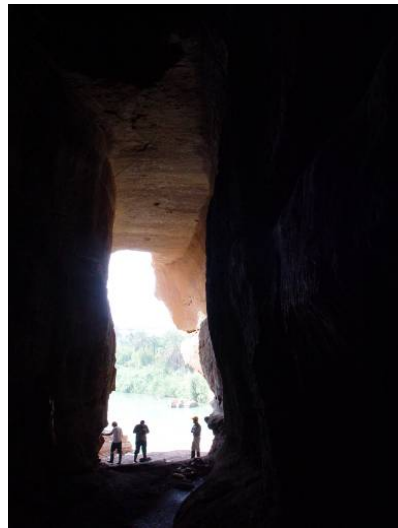


Fig36: Inside the Boleyti tunnel

A number of secondary canals branched out from the Boleyti tunnel; some of them called *neir* were utilized for irrigation and water supply purposes for gardens and residential areas. Some of the other secondary tunnels used to turn the Watermills' wheels at the eastern area. The largest outlet called Tuf - Didi (the major outlet of the Bolyti tunnel is not visible from the side of watermills area, and it is, only, seen in the form of fog made by flowing out the water. So, it's called Tuf - Didi because in the local tongue Didi means "like smoke or dusty") flows out only in the heavy rainfall months of the year which are Âzar, Dey, and Bahman (December, January, and February). The other outlets called Dârâb Khân and Do Barâdarân flow out, also, during other months in which the tunnel of Dahâne Shahr is full of water.

The tunnel of Dahâne Shahr (figs. 37-38): the level of this tunnel is lower than Boleyti tunnel and is higher than Se-Kureh canal. Having about 150 m length and 1.50-2 m width, this canal's route is shorter than the tunnel of Boleyti. Located at the north-eastern part of bridge-Dam, the outlet of Dahâne Shahr tunnel pours the water onto eastern part of the area and provides water for the eastern watermills such as Dahâne Shahr and Haj Mandal, then, its overflow goes out from the outlet canals of Haj Mandal and Dahâne Shahr. This tunnel is full of water, almost, in the whole year, except during the months in which the level of water is very low, because of its level which is topographically down.



Fig. 37. Dahân-e-Shahr tunnel behind Band-e Gargar



Fig. 38. Openings of Dahân-e-Shahr tunnel in the waterfalls area

The tunnel of Se-Kureh: Se Kureh (figs. 39-41) is one of the major tunnels of the town. Located in the north part of Abshârâ (waterfalls) System; Se-Kureh means triple kiln.



Fig. 39. The entrance of the Se-Kureh Tunnel



Fig. 40. Opening of the Se-Kureh tunnel in the Waterfalls area



Fig41. Se-Kureh after entering waterfalls area and feeding Westside watermills

Having approximately 100 m length, this tunnel is usually under the water level during most of the seasons. Located in the western part of the System, the Se-Kureh tunnel conducts water to the northern part of the site with another secondary tunnel under the Gargar bridge-dam. The water of this tunnel is for generating power for the mills in the northern part. The water is flowing in this tunnel during all months of the year because of Located downer the river level. The main exit of that is called Lufa (in the local term the water flowing very fast and making wave is called *luf*, and, in fact, *lufa* is plural form of *luf*). The water of this canal would have supplied required water for 20 watermills in western part. There were many air-bleeds in the tunnel's route, but all of them have been closed by inhabitants except one which is located at Shavadun, a house overlooking at the area.

Watermills

There are two kinds of watermills: *tanoureyi* or *parreyi* made from spokes or paddles, and *shibi* (wheel-made mills). During the recent years, the use of *shibi* watermills declined, but the *tanoureyi* type gained popularity. The main reason behind this is high energy consumption of the *shibi* while the *tanoureyi* type proved to be economic.

The *tanoureyi* watermill (figs. 42-43): a kind of watermill in which the wheel works with the power of water coming from the *tanoureh*. Flowing down from a high position canal, the water goes into a vertical cylinder including a 30-40 cm-diameter valve at the end and flows out the valve then pushes the paddles of the wheel to turn that round a vertical axis. Some of these watermills, however, are inefficient in the loaded-water season because the level of water covers them not being able to work. The main components of this watermill are:

- 1- The canal of Sar-Ab: this canal brings water from the river or mother canal (main canal) to the mill's watercourse. The materials used in this canal are, usually, very resistant e.g. stone blocks and mortar. In some parts of the watermills System one Sar-Ab canal (canal bringing water into the area) supplies the needed water of several watermills, and in low waterfall season, only, the route of one watermill is kept open by some control valves. During high waterfall seasons, the huge amount of water is used for many watermills. However, at the watermills System the attempts are to use the water, flowing in the Sar-Ab canal, efficiently
- 2- *Tanour-e* or Borj-e Ab (tower of water): the water of Sar-Ab canal flows into *tanour-e* which is in the form of a vertical and rounded cylinder. The incoming water flows out from existing hole, with 30-40 cm at the end of cylinder.
- 3- The millstones: a pair of millstones comprises two pieces; a piece of stone at the bottom and other piece on top. The bottom stone is always fixed, and the top one is turned by the spoke's power being transferred to the stone via running axis.
- 4- Metal shaft (Bozan): this shaft is nexus between wooden shaft, the fan belt, and the stone on top. Rotating energy is transferred to the millstone by this shaft. The shaft's diameter is approximately 3-4 cm and its length reaches 40-50 cm.
- 5- Wooden shaft (Maghzi): acts as the chief structure of the energy exchange and carries the metal shaft and the spokes of the wheel.
- 6- Fan or wheel (Par): fan converts the potential energy of the water into rotating power.
- 7- The sharp-tip metal shaft (Bolheshir): that's used for joining the wooden shaft whit Senrou.
- 8- The metal ball (Rou): that is the place in which Bolheshir is put.
- 9- Senrou: it functions for joining two pieces of millstone.
- 10- Senere: this is a mould for Senrou.

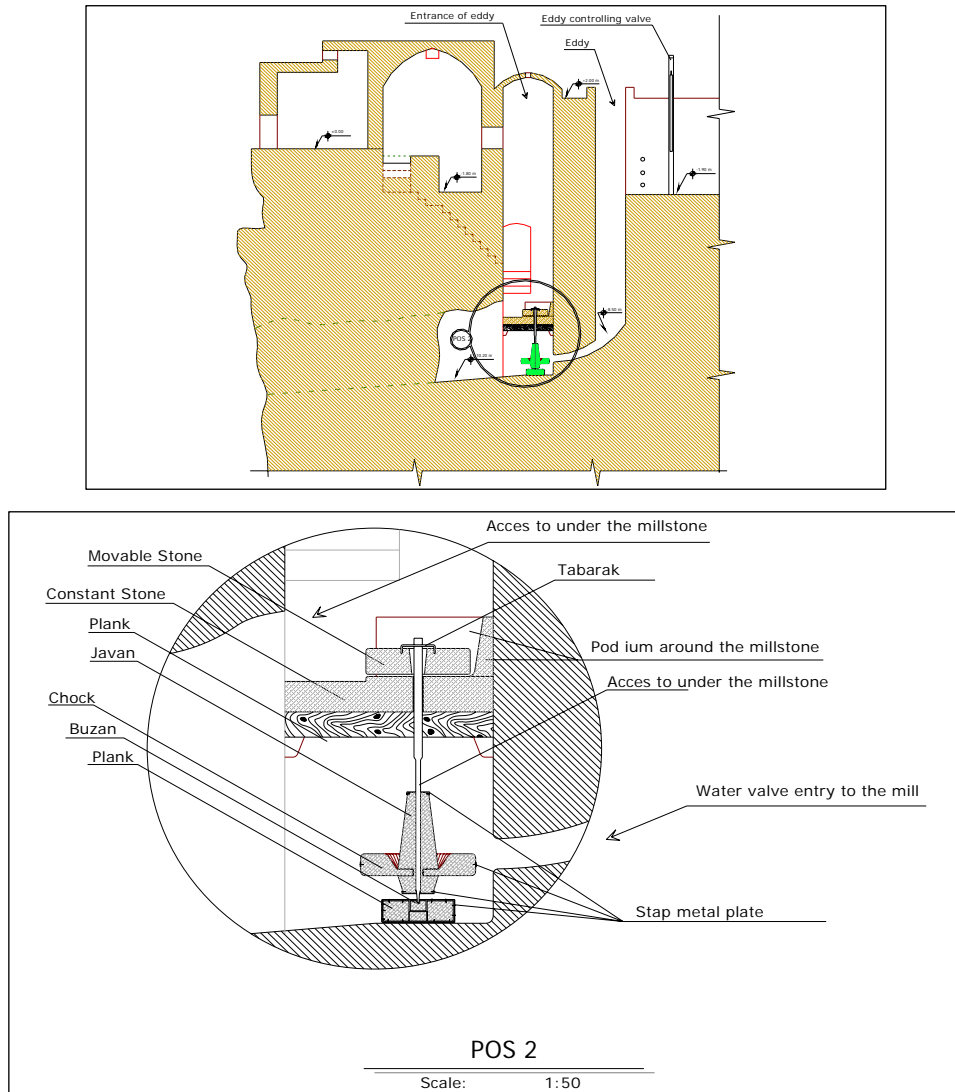


Fig. 42 Sections showing the structure of a mill in Shushtar



Fig. 43. The watermill stone

The structure of watermills in waterfalls area:

The structure of watermills consists of one or two rooms allowing free passage to one another with a dome and arch-thresholds (figs. 44-46). The cut sand stones have been used for constructing these watermills and the bricks used for covering the buildings. There is more than one mill in some of those buildings.



Fig. 44. View of a watermill building



Figs. 44-45. Views from the interior of a watermill structure

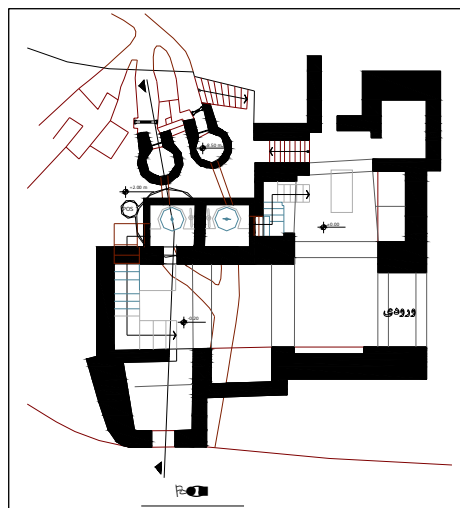


Fig. 46. Plan of one of the watermills

Sika:

Located at the end of the western part of area, Sika and its indoor space are accessible via some hand-dug stairs (figs. 47-49). This building consists of two roofed spaces and an octagonal pond connected with some small canals. The water flows into the pond via a narrow stream coming out from the Sika's wall, and is conducted to outside the Sika via two small canals.

This area would have functioned as water supply canals for the watermills till Qajar era. After Qajar era, during the Mohtasham local governorship, a dam was built there making whole area as it is now. The water, in this place, flows into the octagonal pond and then goes out to the Gargar stream through two canals.

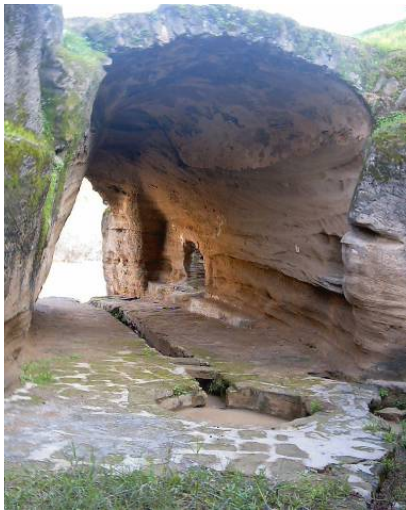


Fig. 47. Inside of Sika



Fig. 48. SIK A entrance steps



Fig. 49. View of water flowing out of Sika

6. The bridge-Dam of Borj-e Ayâr and Sâbein's sanctuary

Registration number on the National Heritage List: 2940

The Dam of Borj-e Ayâr (figs. 50-52) is located at the south-east of Shushtar, on the Gargar, and next to the watermills and waterfalls' area in the east-west axis. This Dam belongs to the Sâssanian period (224-650 A.D.).

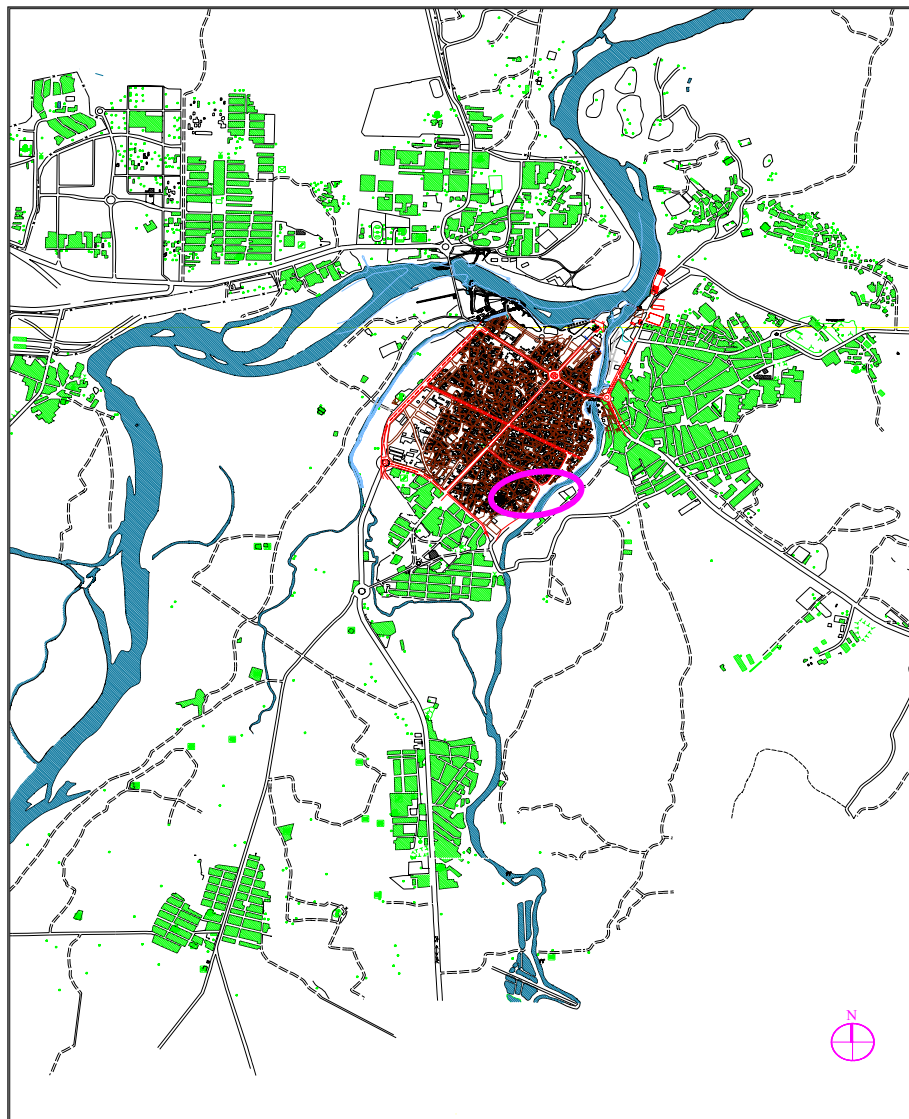


Fig. 50. The location of Borj-e Ayâr Dam in Shushtar

This structure has been built on rocky-bed in order to bring up the water's level and also to change its direction toward the gardens on surroundings. It is 7.30 m long and 3.50 m wide. Many segments of the Borj-e-Ayâr Dam have been demolished due to the interventions and to the deteriorations and, nowadays, the existing parts are in the eastern, centre, and western parts of the stream. With 41 m length and, approximately, 2.50 m breadth, the major body of the eastern part of the Dam is in coast.

The central part of the Dam has been separated from the eastern part due to the new bridge's construction and to the road making. So, only a small remaining part of that exists in the stream and next to the eastern part. The central part, however, is higher than the eastern and western part. There are some sections of staircase, under this part, which seem to be an indicator for measuring the water's height.



Fig. 51. Air view of the Borj-e Ayâr area. 1) Borj-e-Ayâr Dam. 2) Sâbe'in sanctuary



Fig. 52. The Borj-e Ayâr

The other part of the is 10 m long and 1 m wide. The materials used for constructing the Dam are sand block stones and also cut sand stones with mortar. The façade of the Dam has been covered by plaster. The Dam has been covered with river stone (fig. 53).



Fig. 53. A section of the Borj-e Ayâr Dam

There are remaining parts of the so-called Sâbe'in temple beside the eastern part of the Borj-e Ayâr Dam (fig. 54-55). The temple was on the rocky bed coast of the canal, these hand-dug structures consist of canals, pond, and some rooms. These installments, that sound, have been constructed by some inhabitants lived at these coastal areas and were to be used as a place for religious purposes and for baptizing the Sâbe'in or Mandaeid, for their religion was related to the water.

Beside the eastern part of the Borj-e Ayâr Dam, there are tree canals supplying the water from the Dam to the sanctuary. At the mentioned sanctuary, there are some canals and is a cross-form pond created for baptizing. In the same sanctuary, there is also a small room called baptize room having been used for religious ceremonies.



Figs. 54-55. Sections of the Sâbe'in sanctuary

7. The bridge-Dam of Khodâ-Âfarin (Mâhi Bâzân)

Registration number on the National Heritage List: 4207

The Dam of Khodâ-Âfarin is located south of Shushtar on the Gargar, and in the historic site of Dastvâ. This Dam belongs to the Sâssanian period (224-650 A.D.) the same as the other Shushtar's water structures. Located along the southeast-northwest axis, this structure has 500 m length, 2 m width, and about 2 m height and it is known Mâhi Bâzân, Khodâ-Âfarin, and Se Pâyeh (figs. 56-59). The natural rock bed of the area has been used for constructing this Dam. Beautiful traces of the naturally passing water are visible on the Dam's surface made by sand stone.

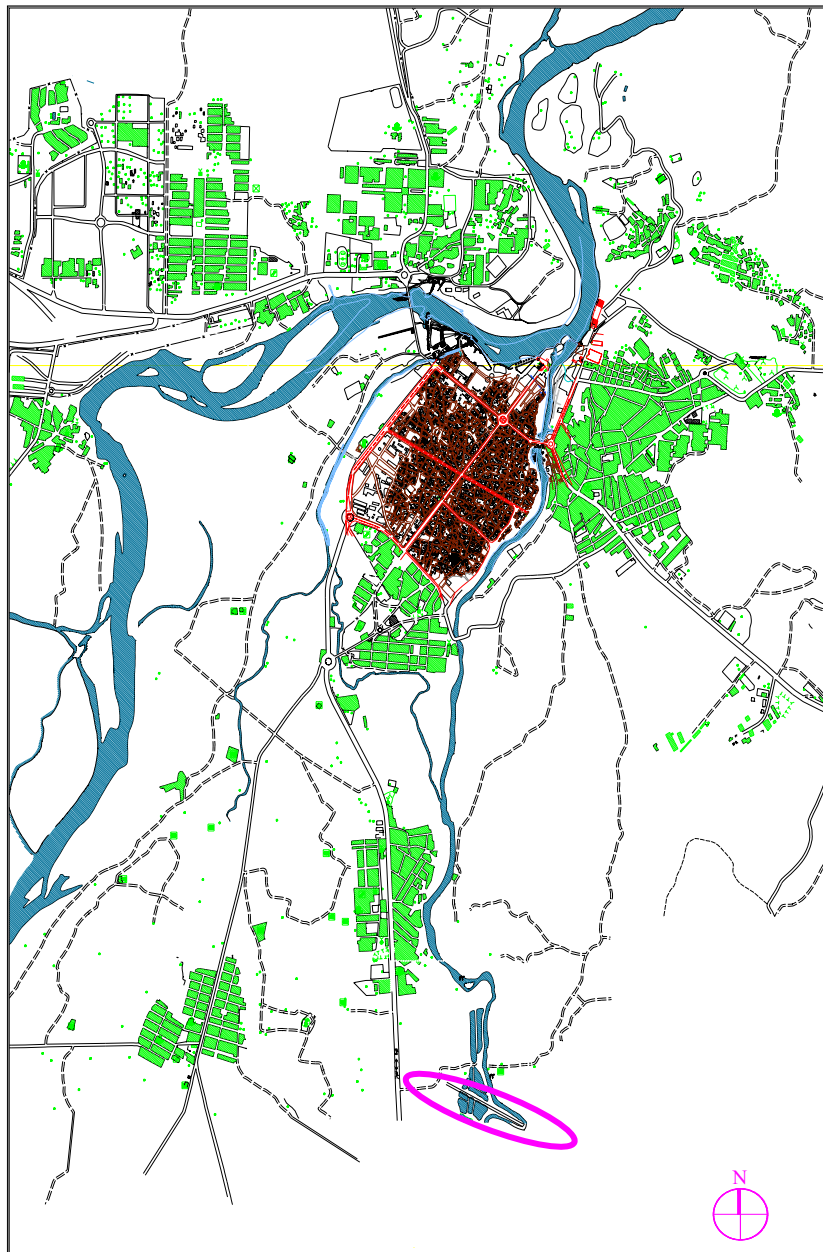


Fig. 56. The location of Mâhi- Bâzân Dam in Shushtar



Fig. 57. Air view of the Mâhi-bâzân Dam in 1935

In the centre of the Dam, there are three remaining piles in sandstone; the piles are 7.50, 7, and 3.50 m high and 2.50 m in diameter (figs. 58-59). The Dam of Mâhi-bâzân has definitely been built to bring up the water's level and its pressure while acting as a bridge to connect the city of Dastovâ with the other side.



Figs. 58-59. Views of Mâhi-bâzân Bridge-Dam

8. The Castle of Salâsel (the old fortress of Shushtar)

Registration number on the National Heritage List: 1117

This citadel is located at the north-west of Shushtar and along the west-east axis. The citadel is in the form of irregular ellipse surrounded, in the past, by the Kârun (the branch of Shoteit) on the north and west sides, and, also, by a moat on the south and east sides. The

citadel's area, today, is approximately 3.5 ha built at the highest part of the town on rocky bed. The Dâriun canal is located to the north of the fortress (figs. 60-62).

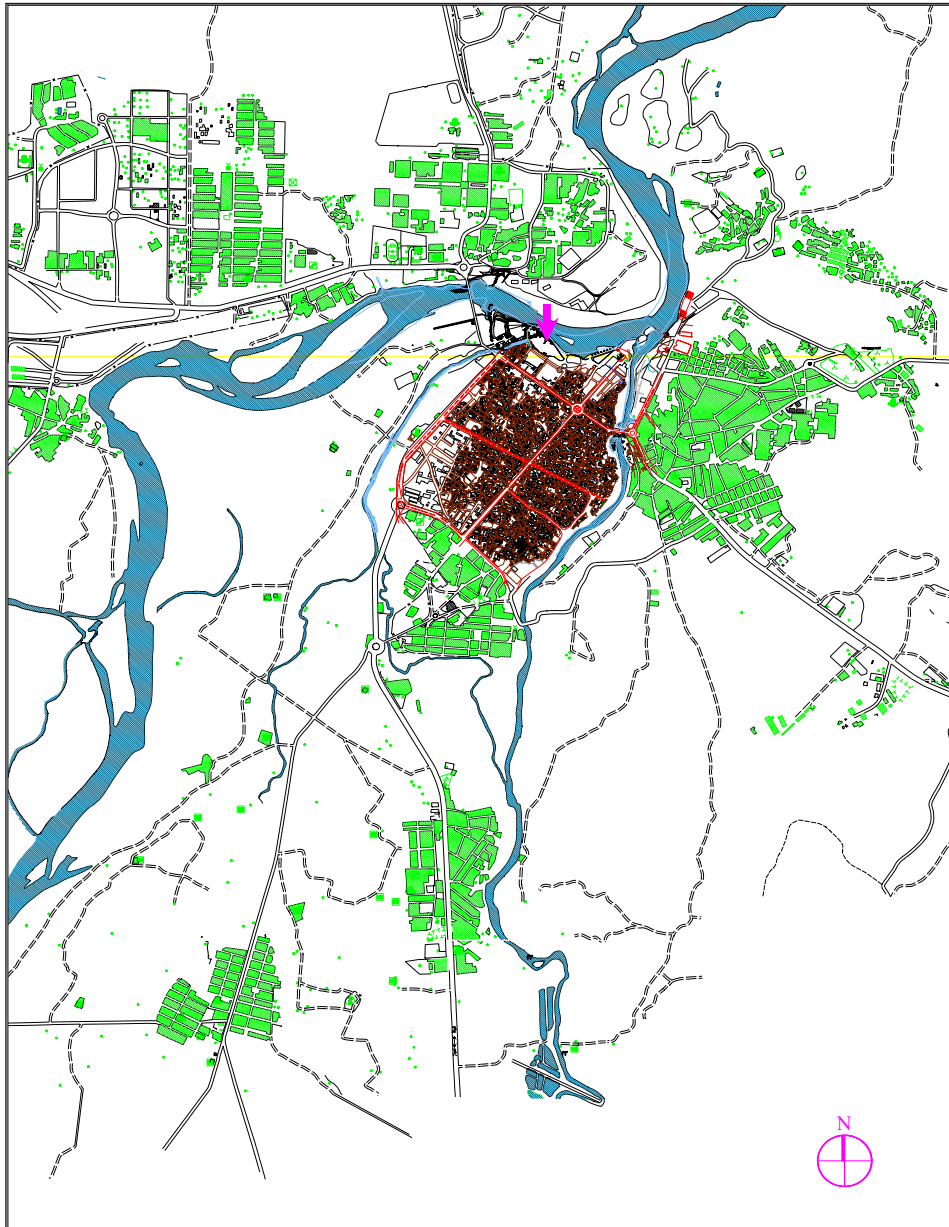


Fig. 60. Map showing the location of the Salâsel castle in Shushtar

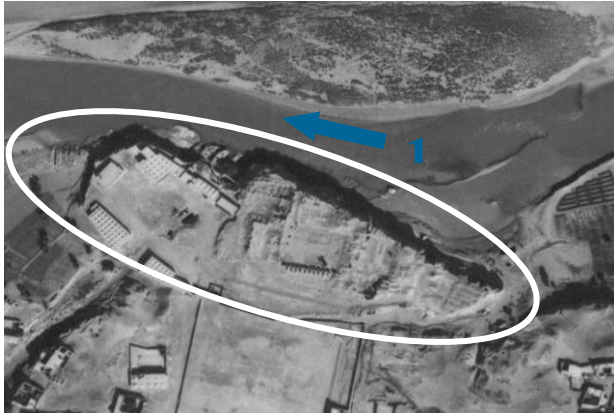


Fig. 61. Air photograph of the Salâsel castle in 1973



Fig. 62. Air view of the Salâsel castle

According to the historians and historical documents, this castle had consisted of various elements and structures, of which only fragments survive today. We are informed by an eminent historian of Shushtar, Imam Shushtari, that there were many parts and spaces e.g. different courtyards, military camps, animal sheds, public bathrooms, courtyards, towers, small gardens, Naghâre Khâne, Haram Khâne, kitchen, various gates, big ponds, castles wall, and the moat which most of them have been demolished (See Imam Shushtari, in Bibliography).

There were also 5 large *Shovadune* in this castle. Each of those *Shovadune* was connected to the other ones throughout the city. In Khuzestan's 50 degree temperature, *Shovadune* produces a cool 25 degree space for people to be comfortable. Having functioned as a military and strategic governorate center, the castle, probably, was a station for monitoring the process of water division and water allocation locally called *kâst-afzud*.

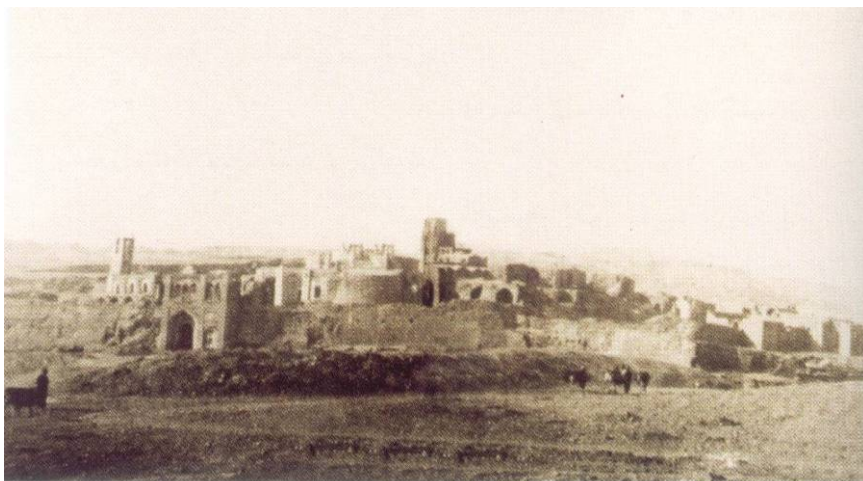


Fig. 63. The Salâsel castle in 1928



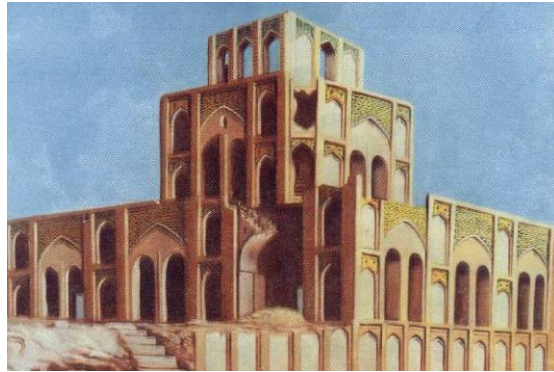
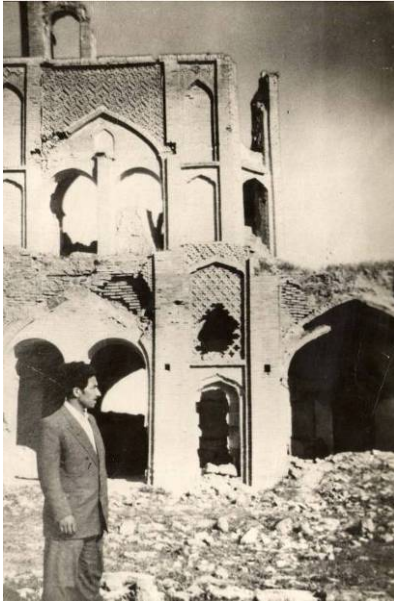
Fig 64: A View of the present condition of Salâsel Castle: Its southern side



Figs. 65-67. Old photographs of the Salâsel Castle taken in 1898

8.6. Kushk or the Governor's Palace

The castle had two to three stories; the most elevated part of the castle was reserved for the governor and its surroundings. Some historians think that Ahmad Shah Qajar (r. 1909-1925) ordered to build the Kushk (figs. 68-70). The building is on a platform, as few steps higher than the surrounding courtyard. Today, the Kushk is covered by rubbles, and only some arches belonging to the mid storey are visible.



Figs. 68-69. Historical views from the Governor's Palace in the Salâsel castle taken in 1933 and 1951.



Fig. 70. The ruins of the Governor's Palace today

8.7. The military area

On the western side of the castle, there have been three *shabestans* (open courtyards) probably used for housing soldiers. Only, one of those structures is remaining which is used as storage. Having consisted of some common courtyards, there has been another part in symmetry with existing structure, but demolished. The third structure, which has had a separated courtyard, has also been demolished.

According to some air photos, those two parts were demolished during 1938-1956. However, some new replacing constructions were made at the western and southern side between 1956-1964.

In addition, according to the historians, travelers, and the existing old photographs, some rooms closed to the castle had been given to the military officers. It is also said that some rooms had been built around the city's wall for lodging soldiers. Functioning as a defensive structure when in the war and having some arrow slits on their structure, those rooms were, also, to be as buttress to hold up the wall. Most of those rooms have been demolished and seem rubbles. The materials used in them are stone, earth (sun-dried brick), and clay mortar.

In the Salâsel castle, there were canons called *Nâder canons* named after Nader Shah Afshâr and the Afshariyeh dynasty (1736-1795). Those canons were used occasionally for announcing an important event like the New Year etc.



Fig. 71. One of the canons in the Salâsel castle, 1953

8.8. The prison

In the north-western part of the castle, some rooms have been made next to one another which have Aahang (a kind of arch) roof which were to be use as prison. Its architectural form demonstrates that its walls, in front of the entrances, were added to the main construction during later periods. In the next eras, some changes have been made trough building up some partitions and windows (fig. 72).



Fig. 72. The Prison

8.9. The Pond

Next to the castle, there are remains of a large brick-made pond. That pond has dimensions of 380 x 270 m with the thickness of 80 cm for its walls made from 21 x 21 cm bricks. There are some traces of 4 pieces of earthen pipes (*tanbusheh*) around the pond's corners (fig. 73). The water, probably, would have been conducted to the other areas via those earthen pipes. The pond's wall are 55 cm high and at the north part of the pond there is a 2.20 x 2.20 m platform built from stone and paved by bricks on the top. The water on the platform's surface, also, would have been moved out via the same earthen pipes.

The water for the pond would have been provided by the Canal of Dâriun. There is remaining of another pond having supplied the water for other places by the same earthen pipes. Those traces are located next to the existing pond opposite to the large *Shavadun's* gate on subsided wall. Interestingly, the first pond is located at the building which has been the place for military officers settling and, that seems, the pond would have functioned as a private bath for those military officers.



Fig. 73. Remains of a pond in the Salâsel castle

8.10. Shavadun

Representing another paradigm of the rich and local climate-adaptive architectural style, Shavadun is another architectural space inside the Salâsel castle (figs. 71-73). For example, one of these Shavadun was found at the north part of the castle. It was cleared in the first phase of archaeological excavation season. The method of construction of this building is very similar to the other parts of the castle e.g. the Dâriun Canal and water tanks which have been made through cutting the rock and then plastering inside that. But, they have used sand stone, brick, and Saruj mortar in building up the staircase and the air inlets (Si-sara). These were constructed with stone foundation on Shavadun and in recent years its rubbles have accumulated inside the Shavadun due to the deterioration. A Shavadun consists of two parts; a large symmetrical space plastered by plaster of Paris and has two Si-sara on that, and the other which is in the form of ambulatory (like a terrace) surrounding the first space. At the end of the Shavadun, there is a hole (this hole is called Kureh in local language) connecting, according to the inhabitants, the castle to the countryside. According to the photos, there has been a wind-catcher on the last si-sareh during 1950s-1960s, which today does not exist any more. This architectural element increases the beauty of the view in the System.



Figs. 74 -76. Views from the shavaduns

8.11. Kat Ha

The word Kat comes from the original verb *katas* which means "to dig" and it refers to the underground irrigating hand-dug canals. Due to the softness of the rocks under the castle and the Karun's coastal rocks which are unstable, the castle's inhabitants have dug some small rooms or holes in the river's coast to have access to the water and to escape from the 40-50 degree temperature in Khuzestan. These places consist of several 3×4 m or 3.50×3.50 m rooms placing the people for taking rest (fig. 77).

In addition to the mentioned architectural elements, the castle of Shushtar comprises various facilities e.g. the bath, the bakers, kitchen, the jail, and military camp which their location have been shown on the map.



Fig. 77. View of kats under the Salâsel castle

9. The Canal of Dâriun

Registration number on the National Heritage List: 4141

The Canal of Dâriun is one of the most famous hydraulic structures recognized on the Miyan Ab plain so far. With 7 cubic meters/s water passing, this Canal would have supplied water for approximately 33,000 Ha agricultural lands surrounded by the Gargar and the Shoteit .

The idea of bypassing canals and the water protection facilities along the Dâriun Canal has decreased the risk of destroying the agricultural lands and the installments around it. The canal of Dâriun passes a north-south route from the major water collectors' opening to a distance of 2 kilometer along the south axis. After the mentioned distance, it had a curve to the east side and again it passes the previous route. The Dâriuns' opening are located in the Karun River's curvature at the north of the city of Shushtar. The location of the opening has been made so that can provide enough speed for the water to flow in Dâriun Canal. A bypassing canal has been built at the Dâriun's bend at a distance of 2 kilometers after the

mouth in order to reroute the canal's water into the Gargar canal if it overflows and if any flood happens.



Fig. 78. The eight intakes under Salâsel castle

The eight water collector of the rock under the Salâsel castle. The height difference between the first and the last collector is 280 cm. the distances between eight collectors due to the 150 m length in the place are seen at the figure.

The mouth of Dâriun Canal originates under the Salâsel castle. The Canal of Dâriun has been dug at the north part of the castle. In the other word, it has been dug at the Karun's coastal rocky forehead and it operates by the eight hand-dug water collectors. Meeting each other at the rocks below the castle after passing a certain distance, the collector number 1 and 2 are located at the northern part. Along those two collectors and in the large area, the collector number 3, 4,5,6,7, and 8 are located. In this area, there are two major water supplier tunnels and also are two secondary water supplier tunnels. All those tunnels are different in distance and in size. The two secondary tunnels function as collectors for the major ones when they overflow. Those tunnels have 3 to 4.50 m breadth.

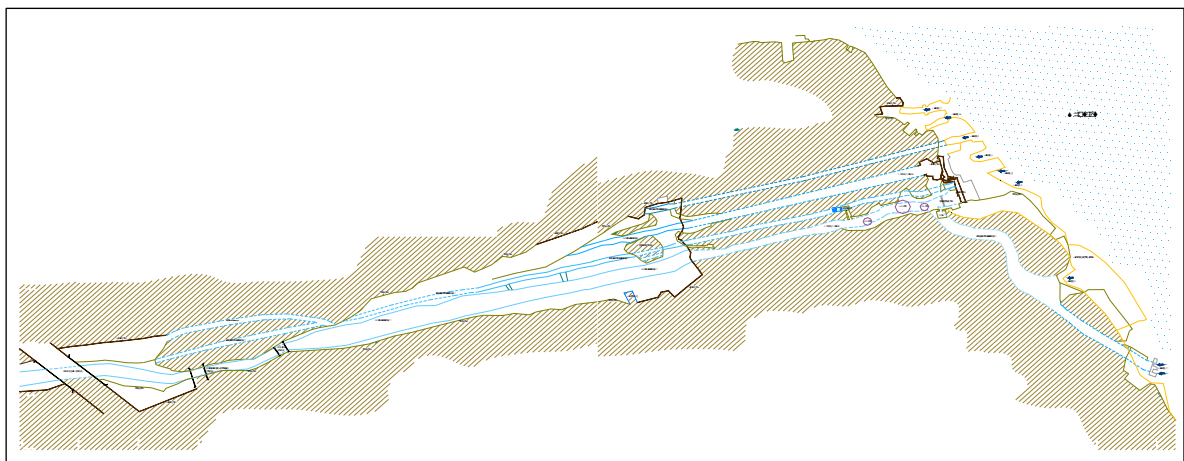


Fig. 79. Plan of the Dâriun canal under the Salâsel castle

It seems that water collector number 7 and number 8 have been closed during recent decades. The collector number 3, 4, and 5 are seen as an open-air Canal at the south of Salâsel castle after passing approximately 100 m distance. This Canal flows as a single canal along 800 m onward, and then it is divided to two smaller branches at the place called Band-e-Khâk Dam. The first branch passes a long distance about 44 kilometers to the west and joins the Shoteit Canal at the place called Band-e-Ghir. The second branch joins the Gargar Canal after flowing under the Lashkar Bridge.

In general, the Canal of Dâriun would have done several tasks:

- Acting as a moat beside the city's wall and making the penetration to the city impossible.
- Supplying the needed water for the castle's inhabitants both in the war and in the peace time.
- Irrigating the Miyânâb plain.



Fig. 80. View of the Dâriun Canal under the Salâsel castle

The Mostofi Bridge:

This Bridge is the first single-opening bridge that has been constructed over the Dâriun Canal in the 19th century (fig. 81). The distance of this bridge, from the Dâriun's intake is about 315 m. This bridge has been constructed at the same time as the house of Mostofi, and it was connecting the Mostofi house with other side of canal. The bridge is in fact one part of the Mostofi System that it is including bath, mosque, and residence (including interior and exterior sections).

This structure has herringbone vault and its material are including sand stone together with brick gypsum-mud mortars.



Fig. 81. The Mostofi Bridge

Sengborun (Bateni) Bridge:

This Bridge is second bridge over the Dâriun Canal in case of eastern to western with 16m length and 6m width; its date is attributed to the 19th century. It is another sing-opening with herringbone shape vault that has been constructed with red bricks called military *nezami* (military) bricks in shape of barrel and roman. Its distance from the Dâriun intake is about 350m and its elemental materials are including sand stone together with brick and gypsum-mud mortars.



Fig. 82 Sengborun Bridge

Haj-Khodai'i Bridge:

Registration number on the National Heritage List: 1159

The Haj-Khodai'i Bridge has been constructed over the Dâriun Canal, between Shushtar south gardens. Distance of this bridge from the Dâriun intake is about 1325 m. The Bridge has been constructed at Second Pahlavi era. By a person named Haj Hasan-e-Khodaii, for this reason its name is Haj-Khodai'i.

This is the third bridge over the Dâriun canal with 26 m length, 7m width, and 8.50 m height, It is a single-opening with herringbone shape vault . Te bridge was constructed for passing workers and farmers and its elemental materials are including sand stone together with brick and gypsum-mud mortars.



Fig. 83. the Haj-Khodai'i Bridge

10. Polband-e Shâdorvân Bridge-dam

Registration number on the National Heritage List: 78

Located in the north-west part of Shushtar, the bridge-Dam of Shâdorvân has been constructed on the main branch of Kârun River (Shoteit) along the northern-southern axis. This bridge-Dam would have also been carried to account one of the most important entrance gates for the city in the past .



Figs. 84-85. Polband-e Shâdorvân

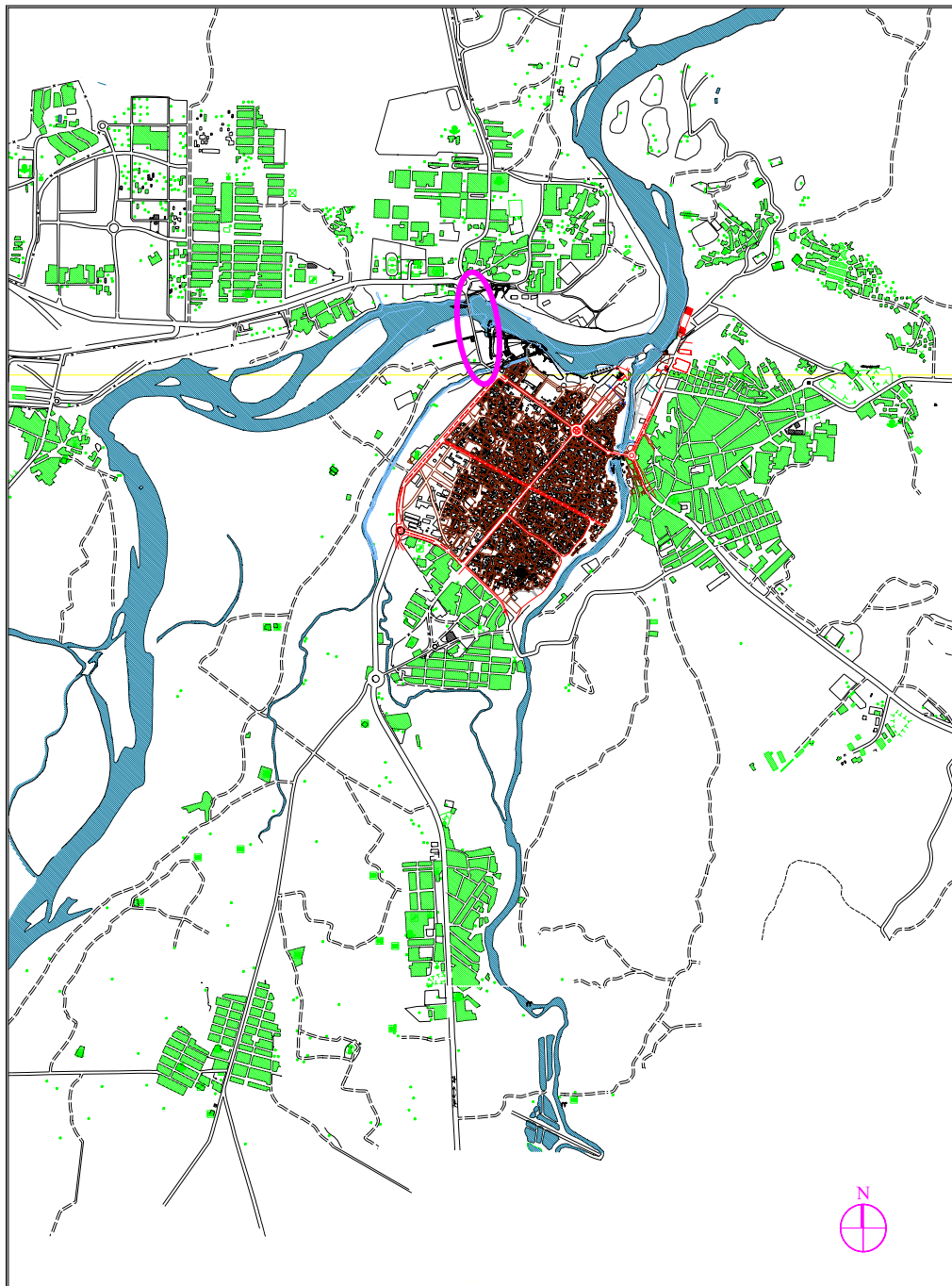


Fig. 86. Map showing the location of Polband-e Shâdorvân in Shushtar



Fig. 87. Air view of the Polband-e Shâdorvân

Some historians believe that the bridge was constructed during the Sâssanian period and with the labor provided by Roman captives. The bridge is approximately 543 m long, 10 to 15 m wide, and 8 m high. There are 44 sluice gates and 43 secondary openings, of which, only 25 gates remain nowadays (figs. 88-90). This bridge has not been built along a straight line, so it is in the form of a curved line. The maximum making use of river's rocky bed is the reason behind that.

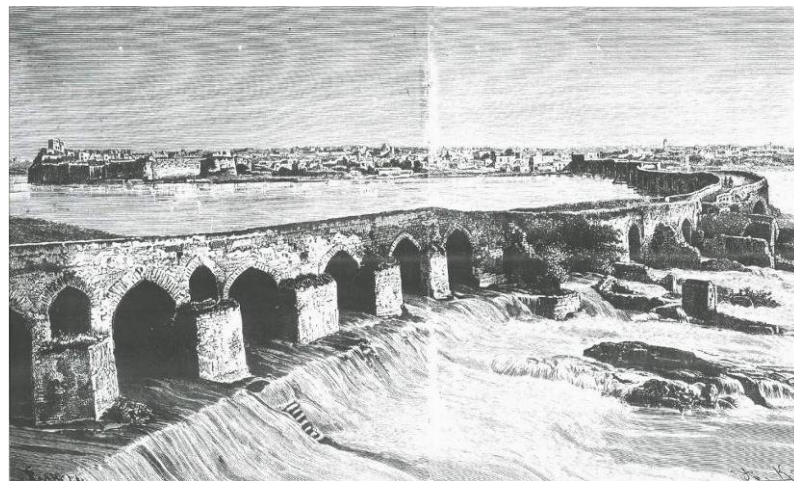


Fig. 88. Engraving showing the Polband- Shâdorvân in the 1880s (after Dieulafova)

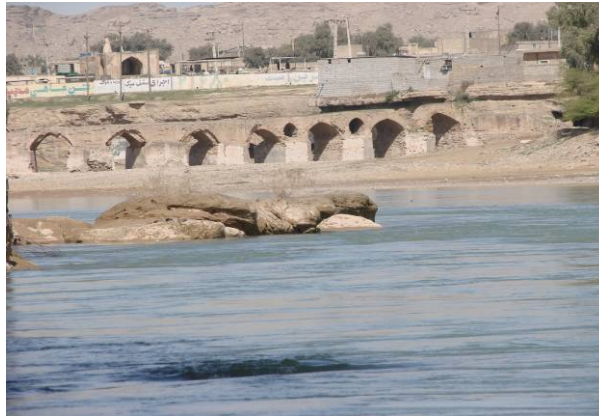


Fig. 89. View of the Polband-e Shâdorvân

In the dam the valves set in both sides of the structure make the construction stronger while conducting the water into the Dam's corners. Meanwhile, the additional water flows out from the distance between the bridge's bases and its surface. This bridge has not been built along a straight line, so it is screwed and twisted. The main reason for that form, maybe, is the setting down the bridge's bases on the river's rocky bed, therefore, that seems for building the construction more rigid they have followed the rocks route of the river basin, so this building seems screwed. Moreover, what makes this construction more unique is large part of the river's bed which has been paved with stone. They have paved the river's bed with stone and mortar in the same level from the Mâfarian mouth to bottom of the bridge. They have also used 40 cm metal braces, covered by lead, to connect those blocks of stones together. However, they started paving the river's bed from somewhere before the Mizân dam to a place after the Polband-e Shâdorvân in order to level the river's bed.

The dam,, itself, has a 200 m crown and is 5 m high from the river basin that lies on the river's width entirely and conduct the water into Dâriun Canal trough increasing the water's level. The materials used in constructing the Dam consist of block of sand stones, with 2 m length and 0.50 m thickness, river stones, mortar, and the metal clamps used for fastening two pieces of stones. They have built the Dam with stone and the Saruj mortar, and they would have made the clay with sheep milk to use. They would also have fastened the huge blocks of stones, which moving them without any crane was impossible, by some iron and lead clamps to use in the structure.

Valves, columns, major and secondary opening, deck (the bridge's surface or its way), and bridge's parapet are the main elements of the construction.



Fig. 90. Location metallic clamps in the pavement of the river bed at Polband-e Shâdorvân

10.2. The bridge of Shâdorvân

The bridge itself consists of tick columns, 44 major openings and 43 secondary openings of which, today, the existing opening are 15 major and 4 secondary opening at the southern part, 2 major and 3 semi-demolished secondary opening at the central part, and only 8 major opening at the northern part. On the bridge's columns, two kinds of different implementations exist which are the results of differences in renovating methods. In the first one, some stones with the same dimensions and same geometrical forms (cut stones) and almost polished have been used. In the second kind, a wall has been implemented round the columns to act as mould, and then it has been filled with submerging mortar and different size cobble stones.

The columns are in the form of rectangular cube. At the eastern elevation, some triangular breakwaters have been built from the bridge's columns into the river. Those breakwaters are recent annexations into the columns and their material mainly is the sand stones. At the western elevation, some buttresses are seen which have almost flat surface.



Figs. 91-92. The Shâdorvân bridge and its remaining piles.

10.3. The stairs

These structural elements are only seen in the 13th mouth at the southern part and in the 1st mouth at the central part, but their functions are not specified that is why it is said that they are used as an indicator for the water's height. These structures have been made by stone and Saruj mortar and been overlaid by mortar. What is interesting is the difference in opening' structures behind stairs structures. For example, the 13th mouth at the southern part with stone walls has been closed in both eastern and western elevations and the 1st mouth at the central part is unusually slope in the water's direction. Some parts at the 2nd mouth of the central area increase the probability of existence of an access from the bridge's surface to this stairs form in addition to proving a period of renovation activities.

10.4. the opening and the canals for the water

"The Polband-e Shâdorvân Bridge-Dam is divided to two species according to level of the water:

- 1) The major opening: the opening in which the level of the water collector is the same as the river's bed.
- 2) The secondary opening: the opening in which the level of the water collector is higher than the level of the major opening (3 ms in average). These opening have been made on the breakwaters to facilitate the water conduction by the time that the river is overflowing or in the water-full seasons to prevent water from duplicating the pressure on the eastern body of the bridge." (Jahangir, 1381: P. 34)

The main frame of the bridge shows that there is a secondary mouth on top of each column and there are two small opening called Kâne Push on both sides of the secondary mouth. The major mouth is located between two columns.

The other point is the existence of some canals and outlets in both southern and northern parts of the bridge in the middle of the opening. Moreover, there are some narrow canals on some opening' floor. However, at the northern Watermills instead of mouth, a wall as a bed has been built, with stone and Saruj mortar, on which two outlets would have conducted the water into the watermill. In these canals, a stone load bearing roof has been constructed.

The models of the vaults used in the bridge are the kind of brick-made roofs with equilateral arches. However, there are some traces showing the existence of the stone vaults which probably were the original vaults of the bridge. The stones used in the vaults have the dimensions of 30×30×15 cm, the bricks used in them have the dimensions of 20*20*4 cm,

24×24×5 cm, and 19×19×4 cm and they are red and green, and green and yellow which have used with the semi-rammed plaster of Paris mortar. The arches are kinds of Salaasi and short equilateral arches.

Having been constructed as manifest and hidden in bridge of Shâdorvân, Kâne Push Ha (orifices made on top of the arches) are the other architectural elements belonging to the opening topic.

The function of Kâne Push Ha (orifices made on top of the arches) is as following:

- 1) Lightening the bridge in order to decrease the weight influencing the walls and the columns.
- 2) Transferring the propulsion power of the arches and vaults to each other properly.
- 3) Filling the empty distance between to vaults to reach to their level.

All Kâne Push, at the southern part of the Shâdorvân bridge-Dam, have been covered by stone or by bricks used in the eastern and the western elevations, whereas, all of them are visible at the northern part's elevation. Kâne Push Ha including all the hidden and the visible kinds have been made along the opening' width and mainly by brick. "Almost all of them have been built between the major and the secondary mouth's vault, and the arch used in majority of them is Tâveei.



Fig. 93. View of the main and ancillary orifices in the Shâdorvân bridge



Figs. 94-95. Types of arches in the Shâdorvân bridge-Dam

10.5. the bridge's surface (deck)

The bridge's surface has been filled with soil and been beveled after building the vaults. There are some gutters at the central part of the bridge to conduct to rain water of the river. The materials used in the bridge's surface (deck) are soil, river stone, and Saruj mortar. Then, they have built a parapet at both east and west side of the bridge.

The parapet's height is 1.50 ms in average and the materials used in that are cut stone, rubble stone, and Saruj mortar. There has also been a room called Navâgheli at the northern side of the bridge.

he function of the Shâdorvân bridge-Dam

- Connecting two sides of the river together and to one of the city's major gates.
- Controlling the Shoteit Canal's water and increasing its level to conduct it into the Dâriun Canal.
- Rotating the Watermills wheels.



Fig. 96. A View of Shâdorvân bridge-Dam

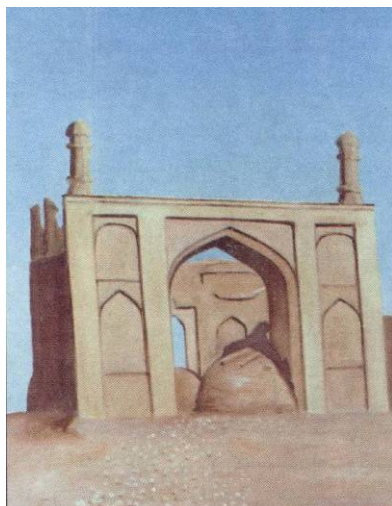


Fig. 97. View from entrance gate of Shâdorvân bridge-Dam

11. The Band-e Khâk Dam

Registration number on the National Heritage List: 10874

Functioning as a distributor of water between the Dâriun and Raghat canals, the Khâk Dam is an important water construction locating at the southwest side of Shushtar beside the Dâriun canal (figs. 98-101).

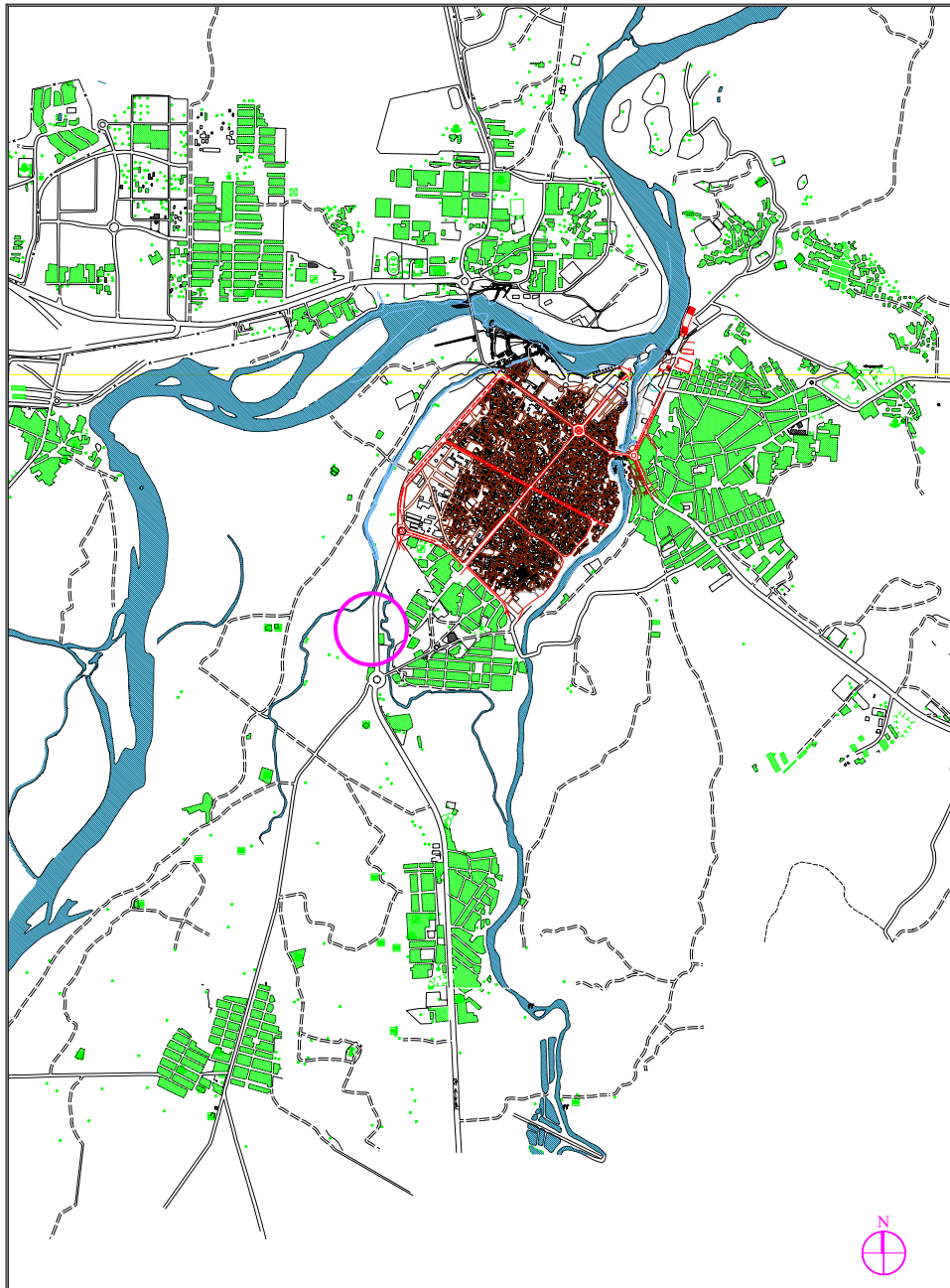


Fig. 98. Location of the Khak Dam in Shushtar

The canal of Dâriun is divided into two branches at the Khâk Dam:

- Going to the south direction, the major branch joins the Shoteit Canal at the Arab Hassan Dam after passing 33 km. the ground's topography between two Canals of Shoteit and of Gargar is as if the route of Dâriun Canal is located at the hills' contour. Therefore, irrigating the agricultural lands between two branches of Karun has been done easily.
- The second branch of Dâriun joins the Gargar Canal after passing from the bottom of the Lashkar bridge-Dam. There is a Dam at the Khâk Dam which keeps the large amount of the Dâriun canal's water inside the major branch. The eastern branch of Dâriun canal has an about 15 ms difference in the level, so that seems the other 3 Dams have been made in its route to control the water's speed.

In the 1360s (1980s), most of the Dam's construction has been demolished due to the ring road making. The structure form of the Dam is like U consisting of two parts and of several opening which one of them is covered and the others are open. There are some other works e.g. Shushtar's old wall, and an Abâreh (another water structure) in adjacent of Khâk Dam.

This Dam consists of two parts; the first part comprises 5 opening, and columns which are 1.33 M. high, and their length is 1.72 M. about 10 steps lower than this place there has been an oblique wall where its traces could be seen till some years ago.

The Dam's major wall is in eastern-western direction. There is an arm branching to the northeast onward from the eastern side of the Dam. A wall, going to north direction, has been made in attachment to this arm. This arm is connected with another arm locating in the west side of that. In fact, these arms with the Dam itself create a huge tank for keeping the water. There are some annexed walls in some parts of the arms and the main Dam especially in their south side. These walls allow the water to exit. There have also been some valves in the walls but they have been demolished. Also there was another valve in addition to those demolished valves. The western side of the main wall of the Dam, which goes along the eastern direction, has been strongly destroyed due to the demolition at the end of its eastern side. The same situation is seen on the other parts of the Dam. In the north and the east side of the Khâk Dam, closed to the Raghat canal, the city's wastewater canals exist.

Moreover, some demolished structures, which cannot be irrelevant to the Dam's constructions, are seen at the edge of these canals. The materials used in the Khâk Dam are mortar, sand stones, and rubble stones. The interior surfaces of the Dam and also some exterior wall's surfaces have been rendered by mortar. The Dam functions, due to its witnesses, as a water keeper through its tank spaces and outlets.



Fig. 99. the Khâk Dam in 1978



Figs. 100-101, Views of the Khâk Dam

12. Lashkar bridge-Dam

Registration number on the National Heritage List: 2359

Located in the south-west of Shushtar, beside the Shushtar – Ahwaz road, the bridge-Dam of Lashkar is in the completely archaic area neighboring with the other monuments e.g. Imamzadeh Abdollah at east, the Khâk Dam and a part of Shushtar's city wall at north, and the bridge of Shah Ali at west. This bridge-Dam has been one of the Shushtar's gates connecting this city to the important city of Askar Mokram, for the word Lashkar is the Persian pronunciation for Askar and because of this connection its name was Lashkar.

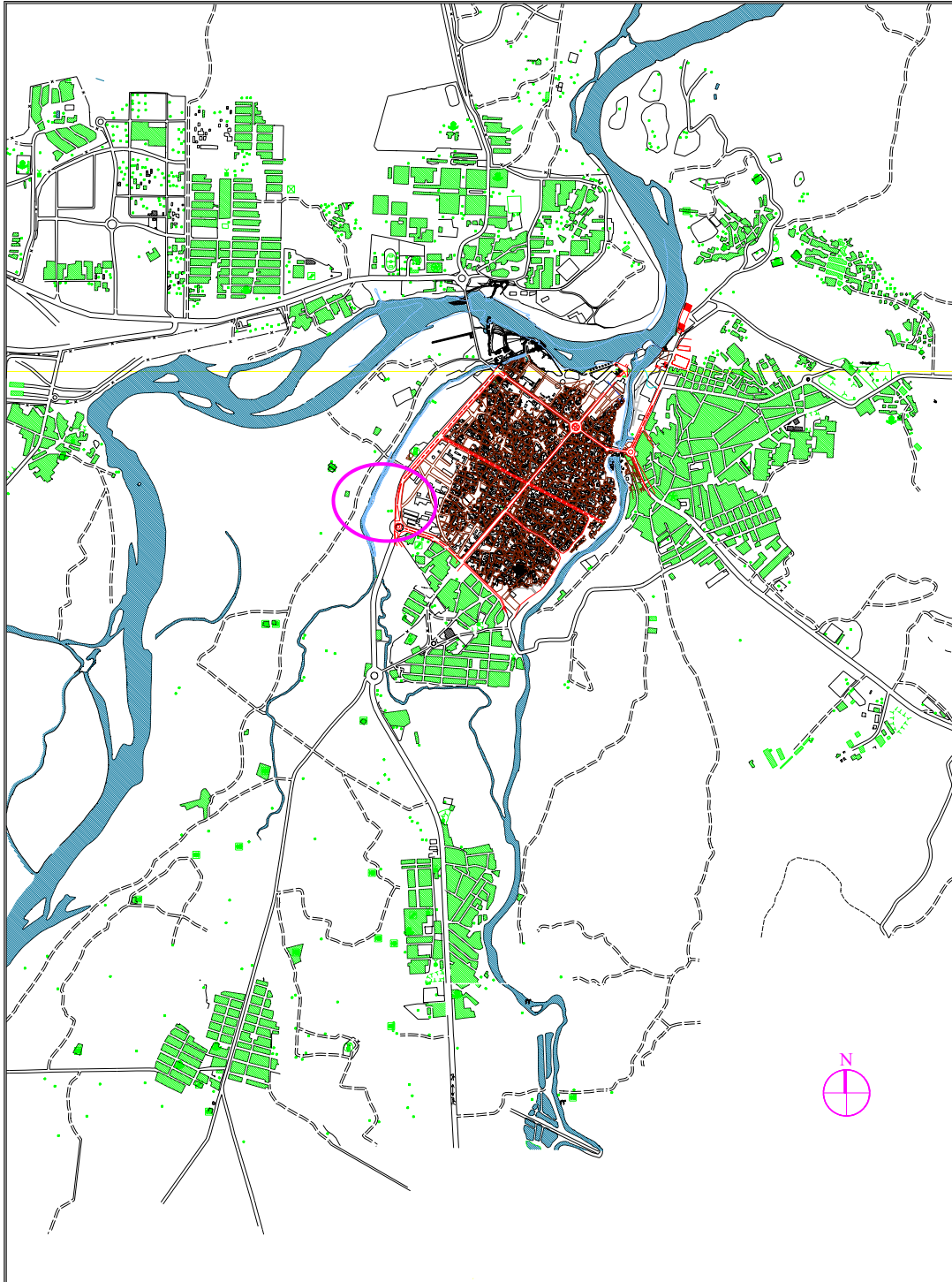


Fig. 102. Location of Lashkar bridge-Dam in Shushtar



Fig. 103. Air view of
1-Lashkar bridge-Dam
2-Emamzadeh Abdollah
3- Shâhali bridge

Having 104 m length and 8 m width, this bridge-Dam has been built on the eastern branch of Dâriun Canal in the direction of east-west, so its length plus to the Nafas Kesh bridge which has been demolished and is, today, under the Shushtar – Ahwaz road is totally 124 Ms. Najm Al-Molk has pointed to 13 opening of the bridge in 1953 during his journey to this area, but today there are 11 opening existing of which two opening probably belong to the remaining of Lashkar bridge-Dam that is Nafas Kesh. The structure of the bridge is curved. Again, the most important factor in finding the place for constructing the bridge is the existence of rock on the river's bed, for the columns need a rigid bed to be used as a base. So, they have built the bridge's columns on the rock and, maybe, the main reason for this curvature is that.



Fig. 104. View of Lashkar bridge-Dam

12.1. The Bridge

Lying on an east-west direction, this bridge has twelve opening of which one is closed nowadays. The materials used in this bridge are sand stone, cobble stone, mortar, plaster of Paris mortar, and brick with the dimensions of 20*20*40 cm.

In the Lashkar Bridge, the columns, due to their location which is Ab Bar or not, have breakwaters at the north side or have buttress at the south side. Meanwhile, the buttresses have been built in the form of integrated platform construction on the columns' bed from column No. 4 to column No. 11 at the south side.

The materials used in the columns (bases) are the cut sand stones in the outer layer, and cobble stones with the Saruj mortar in the inner layers. There are twelve columns known from Lashkar Bridge where the distance between the columns is not the same.

"Lashkar bridge's canals and the opening are divided into two categories:

- 1) Opening which are always Ab Bar (the water flows in them): the level of their water collector is almost as high as the level of river's bed at the north side.
- 2) Opening which are temporarily Ab Bar (the water flows in them): the level of their water collector is a bit higher than the level of river's bed at the north side."

With the exception of mouth No. 11 which is, in fact, a two story mouth where its roof with the stone arch of mouth in the bottom make the floor of mouth on the top, the rest of the opening have only one passage for the water.

The water passage surface of such canals and opening in the bridge have been paved by the more resistant cut stones or rubble stones and also by coarse conglomerate pieces with a Saruj overlay. At the north side of this bridge-Dam, there is a platform where there is a semi-demolished watermill with its System at the east part. The Canal's water is divided to two by that platform in which there are two walls at the northwestern side in both sides of the canal. Those walls come into the canal till middle and its slope is toward the control valve. This valve functions, probably, in the low-water seasons because in the peak-water seasons this platform is under the water. Moreover, due to the eastern side's situation in this bridge-Dam, there has been, probably, another watermill at the western side of that, but it has been demolished.



Fig. 105. View of Lashkar bridge-Dam



Fig. 106. View of the Lashkar bridge-Dam



Fig. 107. View from the Lashkar bridge-Dam

12.2. The Dam

The bridge's columns have been built on the Dam with sand stones and mortar. The inner layers of the Dam have been constructed, probably, by cobble stones and the mortar. The water passage valves of the Dam are located in both sides of the canal which its vault consists of crescent arch. The north part of the Dam's wall, with an especial curvature, is connected to a horseshoe-shape Inn (Mastabeh) on which the watermill has been built, and two canals in both sides of that conduct the water with proper pressure to rotate the mill's wheel. At the northeastern part of the Inn and in both sides of that there is a separating wall which is, likely, the control valve of the water in the low-water season. The breadth of the Dam's wall is about 10 Ms and its height from the water's level in the low-water season is more than 2 m.

An efficient slope has been implemented in all opening to conduct the water from the northern side to the southern. Some opening' passage floor e.g. the mouth No. 3 and No. 9 has been designed in the form of water passage and water conductor canals due to the water transferring from the north side's Watermills to the south side. The opening no. 4, 5, 6, 7, and 8 the water passages on the opening are in the higher level than the others and existence of some small Dams in front of the opening to conduct the water to the Watermills is the main reason behind that. The surplus water in the peak-water seasons were to be conducted to the south side via those opening. During the low-water seasons in which the level of the water has been lower, those water passages floor was dry.

12.3. The Watermill

There is a semi-demolished watermill consisting of tree rooms and one entrance terrace, at the northwestern side of the Lashkar bridge-Dam and linked to the opening no. 3 and 4. This watermill comprises a terrace having 2 columns which are 1.50 m high and 3 vaulted entrances. Those tree entrances are linked to tree room area.

The watermill's plan is in the form of rectangular. The main entrance of this watermill has been on the opening' no. 3 and 4 roofs which nothing remain from that today. According to the remaining traces, the rooms locating at the two parties of the central room have been the place for grinding the wheat into the flour, and the central room is divided into two parts by a thick wall. There has been a mill's wheel in each small room. The western room at the southern side has a staircase going to downstairs. At the western side of the watermill's wall, there is a water canal paved by sand stone. At the northern elevation, the crescent-formed mill's wall has a triangular breakwater and is parallel to the central room's middle wall. In the

both sides of that also there are two water canals to conduct the water into the mill's wheels. The Lashkar bridge-Dam's Watermills are the kind of sloping.



Fig. 108. View from the adjacent water watermills of Lashkar bridge-Dam

12.4. The small room of Navâgheli

Locating above a 2 Ms high conglomerate rock, that room is in the form of quadripartite vault and is 3.50 Ms high. This room has had an entrance in each direction which has been closed later on. The entrances had crescent vaults. Lord Cruzan names that small room Pâsdar Khâne (guards room). That building would have functioned as a place for guardsman looking after the Lashkar's gate having been demolished later.



Fig. 109. View from entrance room of Lashkar bridge-Dam

12-5. EMAMZADEH ABDOLLAH

Registration Number on the National Heritage List: 1942

Emamzadeh Abdollah is one of the most important structures south of Shushtar town which is the tomb of a person called Abdollah-ebn-e Hasan whose lineage reaches back to Imam Sajjad(peace be upon him) the fourth Imam of Shi'ite Moslems.

This holy place is located atop a high cliff near the entrance gate and the fence of the town

beside Lashkar bridge-Dam and since a long time ago has been a popular visiting-place. A stairway provides access to the tomb. Formerly, there was a graveyard near the shrine which has been relocated.



Fig. 110. Emamzadeh Abdullah

Architectural elements of this structure include: nave, entrance porch, porticoes, sanctuary, dome, minarets, grave, architectural decorations and inscriptions which have been restored or reconstructed in different periods. According to historical documents, the construction of the shrine began during the rule of the Abbasid caliph, Al-Mostanser and it went under reconstruction in the 7th century AH(629 lunar year). Its main entrance is located at the northern part of the shrine and its inner decorations include stone inscriptions and stucco works in Seljuk and Safavid styles. A good example of the stucco work is seen at the roof of the entrance veranda and portal.



Fig. 111. The Shrine entrance view, and its inscriptions.

The shrine dome is in staircase-shaped which is indigenous in wet and warm climates comparable to the dome of the mausoleum of Daniel in Susa.



Fig. 112. The shrine, view of the dome

The location of Emamzadeh Abdullah shrine at the town entrance point and atop a cliff overlooking nearby districts as well as in a calm and green environment with a river flowing beside it, makes us ponder about its background. Lashkar bridge-Dam as one of the most ancient town gates of Shushtar, is located at its eastern side and connects it to Askar Mokram town. All of the above-described items were also envisaged during the construction of Anahita goddess temples (the goddess of water and fertility in ancient Persia) in the antiquity.

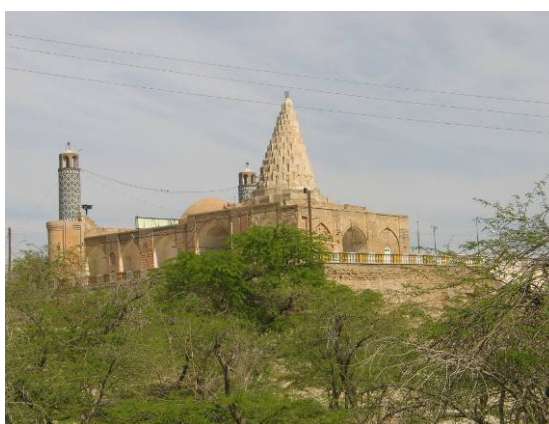


Fig. 113 The Emamzadeh Shrine location, and its landscape.

Among other cases corroborating our hypothesis is the discovery of a small firebox inside the shrine as well as a marble stone which was unfortunately looted many years ago. People believed that if a barren woman sits on this stone and stirs she will become fertile. Without doubt the root of these beliefs goes back to ancient customs connected with Anahita.

Shah-Ali Bridge:

Registration Number on the National Heritage List: 7938

Shah-Ali Bridge has been constructed over, one of the Dâriun Canal's branches called Raghat. in case of north to south with 18m length , 5m width and 3m height, This Bridge has been known as Shah-Ali or Fath-Alishah names.

This Bridge had been connected by a massive stone rock that located in north side of bridge to Lashkar Bridge-Dam and had been located among historical wall around city and Bag-e-Shah wall, the Bridge has 3 openings and its elemental materials are including sand stone together with brick and Saruj and gypsum-mud mortars.

Shah-Ali Bridge was the interconnecting bridge for plying to Askar Mokram old town, agricultural lands and southern hamlets of Shushtar.



Fig. 114. Shah-Ali Bridge

13.) Sharâbdâr Dam

Registration Number on the National Heritage List: 4218

Located in the southern part of Shushtar, the Sharâbdâr Dam has been constructed on one of the Dâriun's branches called Raghat in the direction of east-west. The canal of Raghat, which is one of Dâriun's branches, meets the Lashkar bridge-Dam after passing the Dâriun's water-distributor which is Khâk Dam. Mentioned Canal passes the Lashkar bridge-Dam, and then leaves some other parts to reach the Sharâbdâr Dam. The structure of the Dam is seen between two important water constructions which are the Lashkar bridge-Dam and the Mahi Bazan bridge-Dam. Some parts of the city's rampart are at the south side of the Dam.

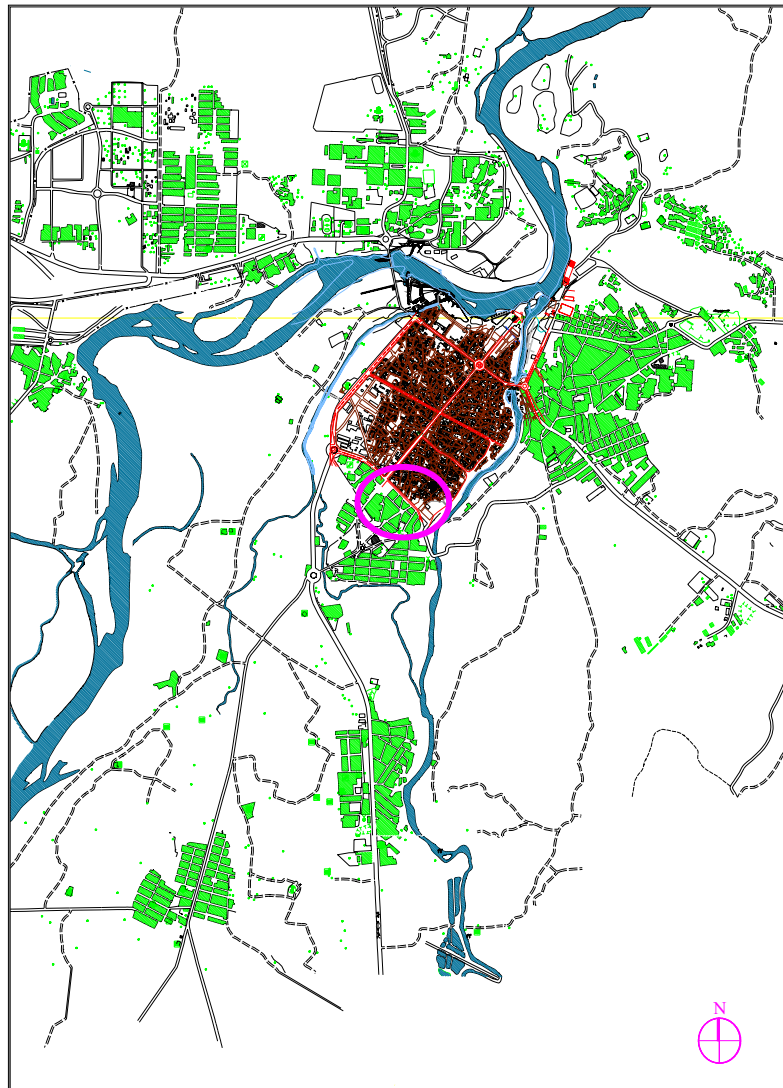


Fig. 115. Location of Sharâbdâr Dam in Shushtar city

Looking like a line with to curvatures at the eastern and the western sides, the Sharâbdâr Dam has 35 Ms length, 2 Ms Width, and 1 M height. Throwing the building's rubbles closed to the Dam has covered some parts of that. The materials used in the Dam are mainly rubble stones and the Saruj mortar. The base structure under the Dam is original sand stone on which the Dam has been built. The Sharâbdâr Dam's physical body has been plastered with mortar having protected the Dam against different deteriorations especially weathering.

Being called Sharâbdâr because of the grape gardens around it, this Dam would have functioned as a water provider for irrigating the agricultural and horticultural lands in the neighborhood through increasing the level of the water in the Canal.



116. View of Sharâbdâr

2.b History and Development

Geographical setting: the land and rivers

The Khuzestan province is located in south-western Iran, covering an area of about 60,000 square kilometres. The region effectively begins at the south-western foothills of the Zagros mountains. Most of this region consists of alluvial plains of large Iranian rivers such as the Karkheh, the Dez, the Karun. It is on these rivers that most of the ancient and modern dams of the country have been built. River runoff is a significant factor in south-western Iran, where the Karun, Iran's longest river, flows in a southwesterly direction out of the central Zagros mountains. Thus streams running down to the Persian Gulf must first breach the very ranges upon which they are born—an initial manifestation of perplexing drainage anomalies which make the Zagros streams some of the world's most interesting from a geomorphological perspective. It is a transverse drainage system in a mountainous zone, contributing to the difficult accessibility of this region. Runoff patterns of rivers in south-western Iran are determined by the precipitation cycle, which is nowadays affected by dam constructions and other forms of human interference. Before these human impacts, the Karun, for instance, had a maximum discharge of 60,000 to 75,000 cu. ft./sec. and a minimum discharge of approximately 7,000 cu. ft./sec. in October. Other river systems follow similar discharge patterns. The westward flowing streams of the central Zagros mountains, having relatively large catchments and being nourished by springs and snowmelt from extensive areas lying between 2000 and 4000 m, maintain significant flows during the dry months.¹

South-western Iran may be characterized as one of country's hydrologic ally favored areas, in spite of the fact that some large tracts of the province of Khuzestan are desert or semi-desert. On the other hand, it must be noted that, while surface runoff, springs, and groundwater extraction are major sources of irrigation developments in the mountain regions themselves, these factors are even more critical in the south-western forelands of the Zagros mountains. Efficient management of water enabled the prosperity of the Persian empires and kingdoms in course of millennia, with a peak in the prosperity of the region in early medieval times; but this phase was followed by a decline in the irrigation systems, water logging, and desertification in medieval and modern times. Only after World War II would a renaissance of irrigated agriculture be witnessed. Large dam projects and canal systems have contributed to

¹ Fisher, Physical geography, *CHI*, pp. 33-38; Oberlander, Hydrography, *CHI*, p. 269.

extensive irrigation schemes between Andimeshk and Shushtar, and in other parts of the province of Khuzestan; they have had a major impact on the traditional hydrology of south-western Persia.

-Karkheh: The source of this river, some 750 long, is in the region of Kermanshah and the eastern mountains of Borujerd in the Luristan valley, where it is named Gamasiab. Then the river becomes Simreh as it flows further south; at the time it reaches northern hilly areas of Khuzestan, it is called Karkheh, and flows into the Hoor-al-azim marshland near the Iran-Iraq border.²

-Dez: The source of this river is located again in the mountains near Aligudarz and Borujerd in the Luristan region. The Dez flows 500 km southwards and joins the Karun river at a historical juncture named Band-e-Ghir to the south of Shushtar. The river now veers first towards the south-east, then back again towards the south; and some 25 km northeast of Dezful it flows out of the mountains into the Khuzestan plain. Here stands the big Dez Dam, completed in 1963. The river flows southward past Dezful, until it flows into the Karun at Band-e Ghir, about 100 km south of Dezful.

With a volume of water measuring between about 140 cu m/sec in the driest months and approximately 610 cu m/sec in the spring, the river has always been the life blood of a region subject to intensive cultivation. According to archeological surveys, it can be supposed that since prehistoric times the waters of the Khuzestan's rivers have been used for irrigation purposes. In the Sâssanian period (224-650 A.D.), however, a dense network of irrigation channels traversed the plain on either side of the river. The starting point of the canals on the eastern bank was the Dezful bridge, which also served as a dam, and the remains of which are still visible. After the Arab conquest the irrigation network was partly abandoned and later destroyed by the Mongols.³

In the Middle Ages the Dez was known as the river of Gundishapur. According to Ibn-e Khurdadbeh and Ibn-e Rosta, its source was thought to be located in the territory of Isfahan. The Dez gets its modern name from the town of Dezful, and the latter was named after a fort that stood by the old bridge of Dezful. Dezful is derived from Dez-e Pol, "bridge-castle."

² Schwartz-Miquel, Karkha, *Encyclopedia of Islam*, pp. 653-654.

³ Lockhart, *Persian Cities*, pp. 155-154; Gaube, Ab-e Dez, *Encyclopedia Iranica*.

From the early 1960's the Dez formed the starting point of a large-scale irrigation development which would include the Karun, Marun rivers; altogether, approximately 1 million hectares of land in the Khuzestan plain would be irrigated. Completion of the multipurpose Dez Dam (203 m high, 3,4 billion cu m storage capacity) was a first step in this direction. The irrigable area of the Dez Irrigation Project covers about 100,000 hectares. The Karun is the longest and most well-watered river of Iran. It rises in the Bakhtiari Mountains west of Isfahan and follows a tortuous course trending basically south-west. The Karun's total length is 830 km, though the distance from its source to the junction with the Shatt al-Arab is only 290 km as the bird's flies. Karun is the only river of Iran which is partially navigable. At the time the Karun passes by the town of Gotvand the river enters onto the flatland, and becomes navigable. Moreover, it changes direction, and its bed takes a north-south direction.

-Karun: The Karun is the longest and most well-watered river of Iran. It rises in the Bakhtiari Mountains west of Isfahan and follows a tortuous course trending basically south-west. The Karun's total length is 830 km, though the distance from its source to the junction with the Shatt al-Arab is only 290 km as the bird's flies. Karun is the only river of Iran which is partially navigable. At the time the Karun passes by the town of Gotvand the river enters onto the flatland, and becomes navigable. Moreover, it changes direction, and its bed takes a north-south direction.⁴

Generally, the rivers in Khuzestan are at a level much lower than their surrounding lands because of their eroded beds. Thus, the use of their water requires particular methods by means of hydraulic structures and equipments. Traces of a number of ancient hydraulic structures have been survived all over the region, especially in the vicinity of the present towns of Shushtar and Dezful. The first major settlement of the plain on the Karun is Shushtar where there are man-made watermills and related structures and installations from the past. Here human activities caused the division of the river into two branches: the first branch, which is the main, natural course of the river, is called Châhârdângêh or Shoteit (little Shatt); it carries almost two-third of the river's water, passing the west side of the town, and continues southwards. The second branch, called Dodângêh or Gargar or Mashreghân (that means easterly), carrying one-third of its water, goes through the town in a north to south direction, and after flowing some 30 kilometres, joins the main course of Karun, i.e. Shoteit, at the historic site of Band-e Ghir. The juncture of the Dez, the other large river of the region,

⁴ Streck, Karun, *Encyclopedia of Islam*, pp. 676-677.

with the Karun lies to the south of Dezful. From that point on, the Karun flows down through Ahwaz, the capital of the province, reaches the port cities of Abadan and Khorramshahr, before flowing into the Persian Gulf.



Fig. 117. Location of Khuzestan's major rivers of Karun, Karkhe and Dez

Archaeological history

Proper exploitation of streams and rivers in Khuzestan has always been an indispensable factor in the settlement pattern of the region. Archaeological investigations in the region point out the presence of relatively sophisticated watering and irrigating systems in this region as early as the fourth millennium B.C. The earliest remains of human settlement in the region has been discovered in a cave named Tang-e Pabda, north-east of Shushtar, in 1949 by the celebrated French archaeologist, Romain Ghirshman. The next step in the history of human occupation in Khuzestan has been known from the important site of Chogha Mish, 35 km north-east of Shushtar. The excavations by an American team from the Oriental Institute of the University of Chicago, revealed remains of a Neolithic settlement going back to the fifth millennium B.C. Among the finds from Chogha Mish is a seal impression depicting a ship on which the figure of a ruler carrying sugar cane is represented.⁵ This representation is considered the earliest evidence of navigation in the region. Another seal from Susa displays the figure of a deity who can be considered as the patron of sailors. The deity stands on a ship that has a fish-like shape and its steer consists of a human bust with a horned crown. On another seal discovered at Susa, small boats are seen which are probably made from solid tree trunks or swollen and tanned animal skins.⁶

water for agricultural lands. The discovery of traces of a sixth millennium water canal near the site of Tulai Tepe, 15 km south of Andimeshk, in archaeological excavations, as well as the presence of a well at the Neolithic site of Choghabanut, 40 km north-east of Shushtar are examples of the efforts of ancient regional settlers to exploit the water resources of the area.⁷

The Khuzestan area is one of the major regions of the Elamite civilization that flourished in the south and south-west of Iran between 3000 and 500 B.C. Though the ancient site of Susa was the centre of the Elamite culture in Khuzestan, a number of scholars believe that today's town of Shushtar should be identified with one of the major Elamite settlements in Khuzestan. In later Middle Iranian ritual texts, such as Avesta, the sacred book of Zoroastrians, Shushtar is mentioned as a person's name in the form of Farr-e Shushtar meaning 'owner of an easy-paced camel' (*Yasna* 28).

The irrigation and drainage systems are mentioned in a number of Middle Elamite inscriptions, going back to the second half of the second millennium B.C. According to these

⁵ Delougaz – Kantor, *Chogha Mish*, p. 146.

⁶ Amiet, *Glyptique susienne*, pl. 18.

⁷ Hole, Village period, pp. 39-40.

inscriptions, when the Elamite king Untash-Napirisha (c. 1275-1240 BC) decided to build his new city of Duruntashi with its great ziggurat at Chogha Zanbil, 30 km south-west of Shushtar, his architects and engineers had to come over problems related to the water supply of the new foundation. It is true that the Dez was only 1500 m away, but the river-bed was about 60 metres lower than the town itself. The springs contained only brackish water, as the French archaeologists discovered to their dismay, and in any case only a depth of 15 metres. The puzzle of how the king solved the problem was given in an astonishing account by Ghirshman, the excavator of the site: Untash-Napirisha diverted good water from the Karkheh along a canal more than 50 km long. Far north of Susa, the canal branched off from the main river, and ran southwards for about 35 km to somewhere near what is now Haft Tepe; there it turned east and straight to Chogha Zanbil.⁸ A considerable portion of this canal has been found at Haft Tepe. The bed of canal was about one and a half metres wide; its banks about seven. Naturally, the canal served to irrigate other fields along its course before reaching the town. Nevertheless, a second problem faced the royal engineers in that the town itself was still some meters above the surface of the canal. Thus, they constructed a large tidal basin, discovered in excellent state of preservation (fig. 118). The fissures in the brick-work of the walls were carefully filled with bitumen, and nine ducts on the bottom of the basin connected it with smaller basin inside the town wall; to feed the basin, the Elamite technicians made extensive use of the principle of communicating tubes. The completion of such a gigantic work has been commemorated in the king's inscriptions.

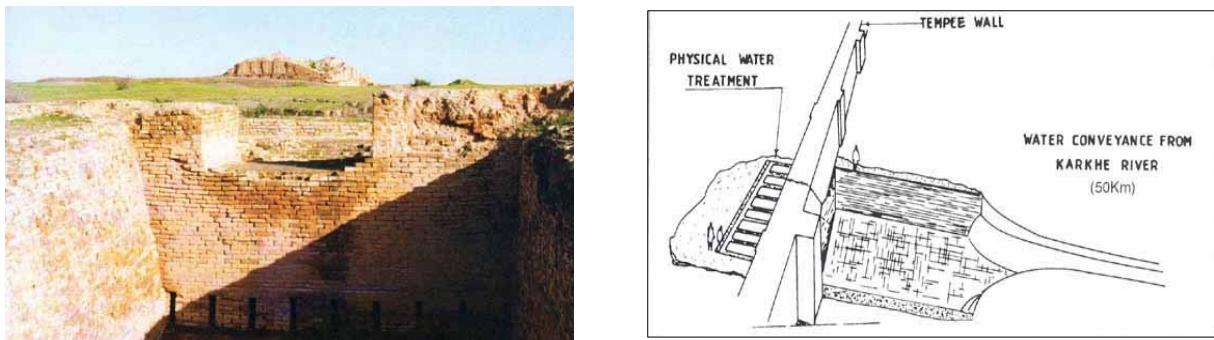


Fig. 118. Chogha Zanbil water reservoir

The importance of irrigation canals and drainage systems in the region has been vigorously maintained after the end of the Elamite civilization, during the Great Iranian empires. The construction and restoration of a canal connecting the Nile to the Red Sea has been recorded on various inscriptions of Darius the Great (r. 522-486 B.C.). Darius also maintained the

⁸ Ghirshman, *l'Elam*, pp. 17-18, folio plate III.

ancient canal of Untash-Napirisha in Khuzestan. In the vicinity of Shushtar, there were canals probably dug during the Achaemenid period (550-330 B.C.), the traces of which have been found in recent archaeological investigations. The earliest waterwork in Shushtar is what is called today Nahr-e Dâriun or Darius' Canal, bringing water from the Karun for agricultural lands. The Dâriun canal is about 2.5 km long, and passes by the western outskirts of the town, and splits into two branches at an area named Band-e Khak. The eastern branch is 3 km long and flows into Gargar, one of the major branches of the Karun. It seems that this branch was created for transferring water surplus from the Dâriun Canal to the Gargar. The western branch of the Dâriun, known as Dastova, is another important stream is crossed by a bridge named Band-e shah-Ali; this branch irrigated all of the farmlands situated to the south of Shushtar. It should be mentioned that the southern outskirts of Shushtar, crossed by a number of streams and canals, has been called Mianâb that means "in the middle of waters".



Fig. 119. The Dâriun Canal going through town

Little is known about the possible measures taken by Parthian kings and Elymaids (local rulers of the region after Alexander's conquest) to maintain and enhance the irrigation canals in the region. It is interesting, however, to note that a few sites of his period such as Gelalak and its hypogeum located near Shushtar, may have been supplied by water courses and canals. In fact, considering the importance of the site of Susa during the later Parthian period (c. 100-200 A.D.), the irrigation systems of the region were certainly well maintained to provide water. Additionally several other subterranean tombs have been discovered to the north of the Mizân dam, and should be regarded as Parthian.

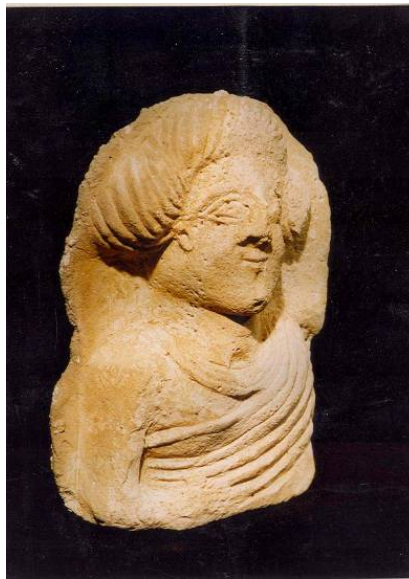


Fig. 120. Bust of the goddess Anahita: water goddess of ancient Persia discovered during excavation in Gelalak region

A number of dams, ducts and constructions in relation to irrigation and exploitation of water have been found in the area of Shushtar. At Payepol, 75 km north-west of Shushtar, two big canals feeding from the Karkheh river, have been identified from this period. Sâssanian remains were also found at archaeological explorations at Dastova only a kilometre south of Shushtar. A large number of ceramics of this period and many Sâssanid ceramics were collected from various areas around Shushtar.

The major construction phase of Shushtar aquatic structures is generally attributed to Shapur I (r. 239-272 A.D.), but there is also an evidence indicating that part of the operations had been initiated before, by his father and founder of the dynasty, Ardashir (r. 224-239 A.D.). Ardashir was also the founder of a series of settlements in Khuzestan, such as the town of Hormuz Ardashir mentioned by medieval historians like Tabari and Yaghut. Some scholars even suggested that man-made stream of Gargar, which was initially called Mashreghan was a distortion of the name "Ardeshirgan" because its foundation goes back to the reign of Ardashir.⁹

Shapur's campaigns against the Romans and his triumphs were commemorated on his rock reliefs and inscriptions, and were recorded in Classical sources. The third and last of his campaigns was the most successful, during which he captured the Roman emperor Valerian himself. The large number of war prisoners were brought to Persia to perform the construction

⁹ Lockhart, *Persian Cities*, pp. 144-145; Kramers-Bosworth, Shushtar, *Encyclopedia of Islam*, pp. 512-513.

of impressive bridges and dams in the area of Shushtar. It should be noted that the celebrated medieval city of Gundi-Shapur (meaning Citadel of Shapur) was also founded around A.D. 271 with the cheap labour that provided Roman prisoners of war.¹⁰

The construction of the main System of Shushtar water structures began in the reign of Shapur I. For realizing different irrigation projects, Shapur's engineers had to divert the course of the Karun, and to dry up its bed and banks by means of a dam. They dug a temporary canal, 2 km long, immediately north of Shushtar (700 m north of the present Band-e Mizân). The canal reaches the main river further south near the Shâdorvân bridge.

The next phase of construction was to excavate the Gargar canal which carries a third of the Karun river water from the north and east sectors of Shushtar. The main purpose of the Gargar was not irrigation but the generation of water power to run watermills which in not-too-distant past still grounded the barley and wheat of into flour. The canal carries water to a dam (the Mizân Dam), where it can used to generate mills. Obviously, it was not necessary to dig this long canal entirely because on the one hand, in some parts of its course the ground was sloping southwards, and on the other hand, the existence of natural grooves and flood traces on the ground surface eased the task. About a hundred years ago a group of inhabitants of Shushtar called Sâbe'in , still lived in the proximity of the dam because of their religious beliefs.¹¹

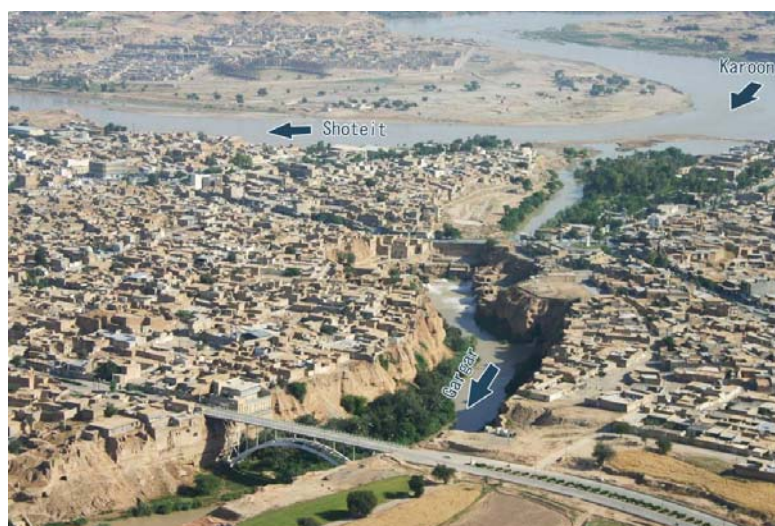


Fig. 121. The Gargar flowing through Shushtar

¹⁰ Christensen, *L'Iran sous les Sâssanids*, pp. 220-221 ; Adams, *Agriculture and urban life*, p. 8; Wenke, *Parthian and Sâssanian Khuzestan*, pp. 133-134.

¹¹ Lockhart, *Persian Cities*, p. 143.

There are a number of bridges and dams across the Gargar, such as Borj-e Ayâr and Khodâ-Âfarin; the latter is also known as Mâhi-bâzân because of it is a favourite location for fishing. Selection of this spot and the cutting of stone slabs in order to level the riverbed has been done with considerable sophistication. The riverbed has been scraped in such a way that a stone string could be maintained across the river bed, then on this natural but scraped stone string, the bridge foundation was laid down. Like other bridges and dams, the Khodâ-Âfarin dam also brought up the water level, additionally it made the passage of people living on the either side of the river possible which at that time corresponded to lands of the Partho-Sâssanian town of Dastova in which water force generated many mills. The construction of the Shâdorvân (fig. 125) is also attributed to the early Sâssanian period, by means of which the communication between Gundi-Shapur and Shushtar was made possible. Then, Shapur's engineers also paved the entire river of the Karun from the Shâdorvân dam to the Band-e Mizân some 1200 m further south, before diverting back the river to its main course. All of the pavement stones were adhered together with strong mortar and iron clamps (fig. 126).



Fig. 122. Air view of the Khodâ-Âfarin bridge known also as Mâhi-bâzân



Fig. 123,124. The Khodâ-Âfarin bridge known also as Mâhi-bâzân



Fig. 125. Polband-e Shâdorvân



Fig. 126. Part of the riverbed stone pavement at Polband-e Shâdorvân

In A.D. 640 Moslem Arabs invaded south-western borders of the Sâssanian empire from Arabia. The capture of Shushtar was not without difficulties for the Arab army. One of the most important reasons for this was the protection offered by the Karun's branches on either side of the town. In the end, Shushtar fell into the hands of the invaders by treason and ruse. The earliest remains the Islamic period in Shushtar is an oval-shaped building, known as Qaleh Salâsel, on top of a cliff overlooking the Shoteit from the north-east. The oldest reference to this fort goes back to the time of Moslem conquest of the Sâssanian empire around A.D. 640.¹² The foundation of the fort may, however, have been dated to the Sâssanian period. Interestingly, the fort had a function of controlling and protecting the

¹² Lockhart, *Persian Cities*, 146.

structures in the area such as dams and bridges. Archaeological soundings inside and outside the fort in 2005 provided data on the history and function of the fort.¹³ There is a tomb to the south of Salâsel fort which is known as the tomb of Bra-e ibn Malek, one of the companions of the prophet Muhammad, who was killed during the capture of Shushtar. About half a century later, during the wars between the Umayyad and a group of dissident Moslems called Khawarej (694-698 AD), Shushtar became the refuge place of the latter. As a result the Umayyad governor of Khuzestan ordered the destruction of parts of Shâdorvân bridge. There is no precise account of the severity of such destruction but this was the first recorded intentional damage to the Shushtar's structures. The only route for the inhabitants to go to the north-west and to the city of Gondi Shapur was interrupted, and people had to resort to travel on boats in order to reach the other side of the Shoteit.

A number of buildings from the Abbasid period in Shushtar were still in place until about a hundred years ago. Coins belonging to this period, including those minted under caliph Moghtader (908-932 A.D) were found near the Gargar. A number of conflicts and battles occurred in this area in the 9th century, as well as the uprising of the Zangis (black slaves) and Forudastan (the poor people) at this period. These events damaged furthermore the water structures at Shushtar. It should be noted that the prevailing language of the time was Arabic, but the Persian name of Shâdorvân was recorded in Istakhri's *Masal-ik al-Mamalik*, written around A.D. 950.

According to Ibn-e Howqal, the oldest known map referring to the Gargar as Mashreqan, which is the Arabicized version of the word Mashreq, is a map drawn circa 969 A.D. During Ibn-e Hawqal's visit of Shushtar, its water occasionally rose as far as the Shâdorvân bridge gate. Maqdisi, another geographer who visited Shushtar in 983 A.D, wrote about streams whirling around the town; he mentioned Shushtar as "the Paradise of Khuzestan". He was astonished by the qanâts flowing under the town and by its cool water even during hot summers. These qanâts were supplied with abundant water from the Gargar. At this time Shâdorvân bridge was still used to cross the Shoteit.¹⁴

Apparently the earthquake of 1052 and the flood of 1085 caused damages at water structures but there is no detailed account of these events. The rule of the Abbasid caliph, Nassereddin-allah in the year 1193, probably brought order into the town and made the reconstruction of at least some structures possible.¹⁵

¹³ Derakhshi, *Report on the soundings at Qal'eh Salâsel*.

¹⁴ Lockhart, *Persian Cities*, p. 147.

¹⁵ Ibn-e Athir, *Al-Kamel fi tarikh*, XXIV, p. 116.,

The onset of the 13th century, which coincides with the widespread invasion of Iran by the Mongols, accounts for the deplorable state of the structures at Shushtar. Nevertheless, the inhabitants of Shushtar signed a peace treaty with Beikteymur, the Mongol envoy, and it seems that no significant damage was made to water structures of Shushtar by the Mongol army marching over the region.¹⁶

In the second half of the 13th century, we are informed by Rashideddin Fazlollah, the Iranian minister of Mongol rulers, a few restoration works were in progress at the town. But, frequent handing over of the town to different rulers in the course of the 14th and early 15th centuries worsened the state of preservation of water structures. A number of battles were fought in the region; during one of these fights around, the Salâsel fort and its surrounding ditch were mentioned. The ditch was filled with water at the time of wars by the enemies to the fort and traces of it still is observable at three sides of the fort.

According to a report dating back to the late 14th century, due to the overflowing of the Shoteit river, Shah Shoja was not able to enter the town. Additionally, this account shows the Shâdorvân bridge still had not been restored after its partial destruction by the order of Hajjaj-e Saqafi in the 7th century, and apparently people still used boats to reach the western gate of Shushtar. Based on another report from this period, the Salâsel castle was still intact, formidable and usable. The final years of that century coincides with conquering and looting of Shushtar by the army of Timur.¹⁷

In the early 15th century, battles of Moshashaeen (a local dynasty in Khuzestan) must have devastated the region. At the time of Shah Abbas (1587-1629), the Salâsel fort was still strong enough to allow some of the people to take refuge in it as a sign of protest against the new governor of Shushtar. The six-year long rule of Mehdi Qoli Khan in Shushtar is one of those periods in which actions were taken to repair damages done to Shushtar's water structures. The tomb of Malek, close to the Salâsel fort was also repaired at this time. The dome of this tomb with colourful tileworks prevailing in Safavid times still remains intact despite severe damages done to this building by rocket attacks of the enemy during the eight-year Iran-Iraq war.

Mehdi Qoli Khan was also active in repairing the Salâsel castle. But his most significant contribution to the restoration of the water structures was to dig a canal for bringing water from the Gargar to the market at Shushtar. This location was exactly at the middle of the base

¹⁶ Blochet, *Introduction à l'Histoire des Mongols*, pp. 118-122 ; Lockhart, *Persian Cities*, p. 147.

¹⁷ Lockhart, *Persian Cities*, p. 148.

of a triangle with its apex as the Karun and Band-e Mizân in the north, and its left side at the D stream in the west and its right side the Gargar river in the east. This bazaar is still operating. It is said that at this time (1593), Ostad Jammal Banna had been restoring the interior of the Salâsel fort. After Mehdi Qoli Khan, Shushtar rule was handed over to Ali Soltan for some time, to whom the construction, or at least reconstruction, of the Shah Ali dam bridge on D stream is attributed. Shah Ali dam bridge was finished in 1621, and has twelve sluice gates with a diagonal curvature in two arches which have been built in an east-west direction in such a way that each gate on the bridge pile has a prop (dastak) which adds to the strength of the bridge foundation. Once there were watermills around this bridge, traces of which are still visible at its northern front. Another name for this dam bridge is Lashkar because in order to reach the important city of Askar Mokram (honourable army) people took this route and after passing the gate, went southwards and reached Askar Mokram at Band-e Ghir. At this time all plains south of the town were called the Askar plain.

During the three-year old rule of Shah Tahmaseb, the Gargar dam bridge was reconstructed with the help of a dervish called Molla Hosein, before which the communication of the inhabitants with eastern plains of Shushtar was very difficult. Of this structure only the residues of the pile and part of the beginning of its eastern vault remain. With the exception of this route, limited crossing of inhabitants to the other side of the Gargar was possible via Band-e Mizân. Interestingly, the pillar of the great vault of the bridge was put inside a cliff cut in ancient times which must have been the terminal segment of one of the main water canals of Boleyti tunnel. Seemingly, water spillage from this tunnel due to its nearness to the rock body and water structures caused great losses and for this reason by filling and obstructing this exit route at that period of time, the Gargar bridge pile was erected upon it so that Boleyti tunnel water went out via waterfalls further south like Tuf Didi and Dobrarun waterfalls.

During the 17th and 18th centuries, the Safavid governor of Shushtar named Wakhshu Khan, engaged in the restoration and reconstruction of a number of monuments including Shâdorvân bridge, Shah Ali bridge and Gargar dam bridge. His son, Fathali Khan, who ruled Shushtar from 1669 until 1694, repaired the Shâdorvân bridge, after many years of negligence, to transform it for transportation and agricultural use, but apparently made a big mistake. As mentioned before, the Shâdorvân bridge was built on the Shoteit river that is the most well-watered river in Iran, for this reason in order to decrease the water pressure under the damaged sluice gates of the bridge, he ordered to make holes and cracks in the gates of the Mizân dam so as the workers could repair bridge pillars with no trouble, this action caused more water flowing in that course (Gargar man-made branch) and decreased the water volume

in the Karun's natural bed that was the Shoteit. But in 1694, he was unexpectedly summoned to the capital in order to take the new post of Qollar Aqasi which was offered to him after the death of Shah Soleyman (1667-1694) and the coronation of Shah Soltan Hosein (1694-1722). Consequently he had no chance to complete his half-finished work. Meanwhile a horrendous flood that usually happens during winters or early springs widened the abandoned holes and cracks made by his order in the Mizân dam, so that it suffered a serious damage which also included waterfalls installations, therefore the ratio of one-third to two-third from respectively the Gargar and Shoteit rivers was disrupted resulting in more water going through Gargar man-made branch which ultimately led to the lowering of water level in the Shoteit and the blockage of water penetration into D stream and its gradual drying up. As a consequence, farmlands on either side of D (Mianab or Mino) became barren and were abandoned which had such a negative effect on the social and economic life of Shushtar that the author of *Shushtar Tazkareh* at the time, considered it as the main factor which brought about the means of the annihilation of Shushtar and the misery of its people.¹⁸

As mentioned before since times unknown, Shushtar residents had built platforms beside underground qanâts in order to avoid the hot weather of summer. A report about one of these qanâts in 983 A.D. from a visitor from Jerusalem shows his incredibility at seeing cool water in hot summer. The water of these qanâts had been diverted from the Gargar or D, and brought under Shushtar homes. Apparently by the Safavid rule digging of deep cellars known as *Shavadun* had replaced this method. After the fall of the Safavids by invading dissident Afghans (1722-29), Esfandyâr Beik became the governor of Shushtar for a while but despite his development actions no evidence is available about any plans for Shushtar water structures. When serving as the commander of Iranian army in its battle against the opposition, Nâder Qoli Beik Afshâr came to Shushtar in 1725, later he became the king and founded Afshâr dynasty. Upon his arrival Shushtar residents complained to him that despite a thirty year lapse after the breakage of Mizân dam nothing had been done to repair it, therefore Nâder ordered to cover the anticipated expenses from Kashan tax revenues, then with the help of Shushtar architects began to repair the dam which was finished after one year in 1726 leading to the revival of local agricultural activities. Another benefit of this operation was making possible the transportation of people over the dam and their going out of the town and into the adjacent plains of the Gargar. But very soon and apparently due to the next heavy flood, Mizân dam was destructed once again and as a result of excessive water output from

¹⁸ Imam Shushtari, *Tazkireyeh Shushtar*, p. 63.

the Gargar, the Dariun canal dried up again and all farmlands in the fertile plain of Mianab which took their water from this stream suddenly became barren and arid.¹⁹

Until the reign of Nader Shah Afshâr, the Salâsel fort was the permanent place for the residency of Shushtar governor nevertheless it seems that during the unexpected fire of *qurkhaneh* (ammunition store) in 1747, it suffered some damages which together with other factors resulted in the change of governor's residence to the town and consequently led to more negligence and intensification of damages in the Salâsel fort.

Apparently disorders after the assassination of Nâder during Zandieh rule made Shushtar water structures including the Gargar gate, Mizân dam and specially the mills and dam bridges System sustain heavy losses. Repeated droughts and the outbreak of plague in 1772 and afterwards, further damage and breakage of the Mizân dam and other dams of the System which were made to control floods and to direct waters for agricultural purposes worsened the already grave economical and social condition of Shushtar .

In the early 19th century, Fathali Shah (1797-1834) the second Qajar king, appointed Mohammadali Mirza Dolat Shâh, his own son, as the governor of Shushtar and its vicinity who arrived in Shushtar in 1806. The problems of the Mizân dam breakage, diversion of Karun water into the Gargar, lack of water in D stream as well as the drying up of the Mianab farmlands were immediately reported to the new governor.²⁰

Nearly eighty years had passed since the last breakage of Mizân dam. Dolatshah's first action was to repair and restore this dam which took three years (1806-1809). This achievement was so significant that the year was called "Shushtar Development". But the rehabilitation of the dam did not last; three years later after a heavy flood from Bakhtiari mountains reached Shushtar, Band-e Mizân broke again in 1812. Nevertheless Dolat Shâh was a determined person who was not disappointed and tried to repair and reconstruct the dam again, this time considering all previous problems and weak points. Finally he succeeded in repairing and revitalizing the Mizân dam after four years in 1815 which was so comprehensive that even today other names for this dam are Mohammad Ali Mirza or Khaghani both referring to Dolat Shâh. But the plague in 1831 which lasted more than five months during early years of Mohammad Shah Qajar rule (1834-48) killed many people and also led to additional damages.²¹

¹⁹ Ibid.

²⁰ Kasravi, *Chehel Maqaleh*, pp. 149-151.

²¹ Nezam al-Saltaneh, *Khâterat va asnad*, p. 152; Kasravi, *Chehel Maqaleh*, pp. 156-158.

In 1841, during Manuchehr Khan-e Motameddowleh' rule in Shushtar, several gates and vaults of the Shâdorvân dam were destroyed, but in 1850 when Khanlar Mirza Heshmatoldoleh came to power, seven middle gates and vaults of the Shâdorvân bridge were restored which made the transit of people over the bridge possible again.²² During Naserolddin Shah, Qajar's monarchy (1848-1895) more vaults collapsed. According to some writings, Haj Sheikh Jafar directed the Shoteit water toward the middle part of the river so as to be able to repair the collapsed vaults but despite this, the high pressure of the water flowing in this section of the river, deepened the middle riverbed of the Shoteit and caused heavy damage to the stone paved bed of Shâdorvân bridge, therefore about two metres of the mid-bridge foundation was destroyed by the river current. During Naserolddin Shah Qajar's monarchy, the Salâsel fort still had enough capacity, facilities and significance to be chosen by Sheikh Haddad the new governor as his base.

The oldest picture available of the Salâsel fort dates back to 1872 which shows almost all of the annexed buildings of the fort and can provide useful information to researchers regarding the reconstruction of this ancient fort. The rise of water level after the 1882 flood, the outbreak of cholera which coincided with floods of 1889 as well as the earthquake and flood of two years later in 1891,altogether incurred heavy damages to Shushtar and its water structures.

During the last years of Naserolddin Shah's reign, the governance of Shushtar was ceded to Hosein Qoli Khan Nezamolsaltaneh for about two years (1893-95). According to his writings about the actions and observations made in this period, a substantial number of operations went underway for restoring some Shushtar buildings. Nezamolsaltaneh repaired the Salâsel fort which had already suffered serious damages with stone, gate and lime construction materials in addition the barracks, stables, artillery and ammunition store-room were reconstructed also the fort pavilion (aside the tower pavilion) which had been built by Khanlar Mirza Ehteshamolsaltaneh in 1850, was repaired.

Additionally he built a large stable at the western part of the fort attached to the terminal body of its wall, also a new gate or entrance was built as the barrack corridor and artillery stable. Both fort gates were also equipped with facades and the fort door which was made of wild willow of Karun riverside was restored and renovated. Basins, platforms and Gawchahs (main wells) of the fort were also repaired and filled with water. In addition, 38 steps of Shovadune castle which ended in the Dariun canal under the fort were repaired.

²² Kasravi, *Chehel Maqaleh*, pp. 166-178.

Near the end of Qajar rule and in the early years of Pahlavi monarchy, Reza Khan accompanied by Sheikh Khaz'al visited Khuzestan and Shushtar in 1923 and some photographs were taken from Band-e Mizân and Salâsel castle. The southern view of the Salâsel fort can give vital information to researchers regarding reconstruction of the facade of this ancient fort. In regard to the Shâdorvan bridge, the photograph shows the fallen part of the bridge. In 1935, Erich Schmidt took the first aerial photograph from the waterfalls and the Gargar.



Fig. 127. View of the Shushtar tunnel built inside the Gargar Bridge-dam



Fig. 128. Air view: The position of some water structure in relation to each other, 1- Band-e Mizân dam; 2- Polband-e Gargar Bridge-dam and Watermills and Waterfalls area; 3- Salâsel Castle; 4- Polband-e-Shâdorvân Bridge-dam

3

JUSTIFICATION FOR INSCRIPTION

3.a- Criteria under which inscription is proposed (and justification for inscription under these criteria)

The *Shushtar Historical Hydraulic System* including bridges, dams, canals, buildings and watermills dating at least from the 3rd century A.D. to the Modern Times would meet the **criteria I, II and V** for the assessment of its outstanding universal value. The propriety is proposed to be inscribed on the World Heritage List as **a *single nomination***.

Criterion I: “Represent a masterpiece of human creative genius”

The outstanding universal value of Shushtar hydraulic system as a masterpiece of human creative genius transcending national boundaries has long been recognized. Indeed, the site has been qualified as a “*world wonder*” not only by the Persians themselves,¹ but also already a thousand years ago by the Muslim elite.² The qualification was not a vain word when used by the Arabo-Muslim connoisseurs as they had a vast knowledge of the known world of their epoch. In those days Classical Islamic Civilization was at its zenith. Islamic lands stretched from Spain to Central Asia and the Muslim travelers and merchants had reached its outermost eastern Chinese limits and the Pacific Ocean. The general admiration for the Shushtar site resulted often from the direct observation of that graceful ensemble and the ingenuity as well as technical wizardry which had presided, in close relation with the natural environment, over the taming of a large river. A harmonious and most useful *system* was thus created in which impressive dams and canals conveyed water to the town of Shushtar, powered dozens of watermills and irrigated hundreds of thousands of hectares of agricultural lands while remarkable bridges linked together local and international destinations. In those classical days, the Shushtar “world marvel” was still functioning after eight hundred years as it does today. The twice millenary functional permanency of this water engineering network and its dependencies do indeed seem if not unique at least exceptional.

For further development, argumentations and references see below: section 3.b- Statement of Outstanding Universal Value, Criterion I.

Criterion II: “Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on development in architecture or technology, monumental arts, town-planning or landscape design.”

The Shushtar Historical Hydraulic System exhibits an outstanding example of development over about two millenaries in technology, irrigation and town planning which

¹ Anonymous, *The Compendium of Histories and Narratives (Mojmal al-tavârikh va'l qesas)*, written in 520 / 1126, Malek-o'Sho'arâ Bahâr ed., Tehran, 1318/1039, p. 63.

² G. Le Strange, *The Lands of the Eastern Caliphate, Mesopotamia, Persia, and Central Asia from the Moslem conquest to the time of Timur*, Cambridge and London, reprint 1966, p. 235.

results in a unique harmonious landscape design. The elements of the ensemble are all consonant among themselves and with the environment forming altogether one single unique entity, an astoundingly beautiful scenery.

Western and Eastern civilizations have produced outstanding water engineering masterpieces, but none of them can truly be compared as an *ensemble* and in their *layouts* with the Shushtar Historical Hydraulic System. This affirmation does not imply that the Shushtar water engineering network is superior to magnificent examples found in other lands; what is significant is that the specimen at Shushtar is different: Here, for the last two thousand years, nearly all mechanisms known in old water engineering science have been applied in a harmonious way within a limited geographical space; and by taking advantage of the landscape, ingenious solutions have been found for the taming of the waters of a large river. An astonishing landscape is the result of this interaction between men and nature.

For further development, argumentations and references see below: 3.b- Statement of Outstanding Universal Value, criterion II.

Criterion V: *“Be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.”*

Shushtar Historical Hydraulic System stands as an *ensemble* if not unique but at least as an exceptional example of a human settlement and land-use representative not only of Iran, but also Mesopotamia and, in a way, the multi-facet civilization of the Roman Empire. The war and peace periods between the Achaemenids / Parthians / Sassanids versus the Greek / Roman power resulted in a multinational and multicultural exchanges which continued during the Islamic epoch. Shushtar’s hydraulic ensemble bears testimony to these intercultural relations that, in the case of Shushtar, are closely in interaction with the natural environment.

Contrary to many other old sites related to water engineering technology, the system in Shushtar is alive and still functioning after about two thousand years: It runs through an active town and then irrigates hundreds of thousands of good agricultural lands. The fact that the system is alive and dynamic is indeed a most astonishing positive point, but it also constitutes the challenge of the future: how to keep the system functioning in this restless changing hi-tech world without irremediably altering its characteristics which makes it unique.

For further development, argumentations and references see the following entry: section 3.b- Statement of Outstanding Universal Value, Criterion V.

3.b- Statement of Outstanding Universal Value

Criterion I: The outstanding universal value of Shushtar's hydraulic system, symbolized by "*the Great Weir*" as the Arab writers of the Classical Period named its heart (Shâdorvân), resulted from the ingenuity and the impressive technical achievements reached in the creation of that complex in perfect harmony with its natural environment. Far from harming the environment, as it so often happens in our times, the "world wonder" has greatly enhanced the natural beauty of the site; in a way it has created it, showing a perfect example of interaction between man and nature. There are no single elements: bridges and dams, canals, built areas or gardens, but only one *ensemble*. The bridge-dam (Pol-band-e Shâdorvân), the water regulator dam (Band-e Mizân) and the mouth of the Gargar Canal fuse all together with the waters of the Kârûn River while the Gargar waterway cuts deep into the rocks and dashes towards a second dam (Band-e Gargar). Next to this structure, the roaring waters gush out of the tunnels bored into the vertical cliffs of the canal, run the mills and roll down stream to irrigate first the idyllic orchards on both side of the canal and then the fields. Nearly the whole system still functions as it did nearly two thousand years ago. These achievements were the cause of a consensus on considering the Shushtar hydraulic system, symbolized by Shâdorvan or "*the Great Weir*", as a "world wonder".

Indeed, at least for the last thousand years, the site of Shushtar has been recognized as a "world wonder".³ The fact was already stated nearly a century ago by the British scholar Guy Le Strange, the most eminent academic in the field of historical geography of the Classical Muslim World. A period during which the Arabo-Muslim civilization was at its zenith and the Islamic lands began in Spain to end in Central Asia. Muslim intelligentsia and connoisseurs were perfectly acquainted with the state of the world as it was then known: their fellow travelers and merchants had reached the outermost eastern Chinese limits and the Pacific Ocean. In fact their information was not only based on their own observations, but also on western classical depictions of the world. The relevant sources were available to them since the time of the famous Abbasside Caliph Harun al-Rashid (the contemporary to Charlemagne / Carolus Magnus, emperor of the Romans from 800 to 814) who seems to have

³ This was also certainly the case in the pre-Islamic area (before the 7th century A.D.), but records from that period are very scarce compared to more recent times; however, the judgements of the Arabo-Muslim writers often reflect with admiration, especially in connection with buildings and sites, the opinion held previously by their predecessors. See the following lines in this section.

been the first to have ordered the translations of Greek and Latin sources; the activity was pursued under his successors. The Pehlevi sources were translated too and, later, it is al-Biruni who went to India learned Sanskrit and produced a magisterial book on the state of India as it was nearly a thousand years ago, a book still being considered as a major source for old Indian studies. Thus, when qualifying Shushtar as a “wonder of the world”, the judgment of the Arab erudition of those days is based on all that quasi universal knowledge at its height; a verdict all the more interesting as the two entities - the Arabs and the Persians – did not always have the friendly relations: the Sassanian Persian Empire had fallen to attacks of the Muslim Arabs and the East Roman Empire was in the throes of dislocation under their pressure. Here follows Le Strange’s statement on that point as reported in his reference study entitled *The Lands of the Eastern Caliphate* first published a century ago and up to now often reprinted:

In the year 260 A.D. the Roman Emperor Valerian fell a prisoner into the hands of Ring Shapur (Sapor 1), the second monarch of the Sassanian dynasty, and during his seven years’ captivity, according to the Persian historians, had been employed to build the Great Weir (Shâdhurvân) across the Dujayl [i.e. the Kârûn River] immediately below Tustar [i.e. Shushtar]. ***This was held by the Arabs to be one of the wonders of the world***, and the remains of it still exist at the present day. The bed of the stream to the west of Tustar was paved, and the weir held back the water, enabling a part of the full river to be diverted above Tustar into an artificial channel [i.e. Gargar] turning off eastwards, which rejoined the Dujayl river many miles lower down after irrigating the lands through which it passed.⁴

Naturally, the Persian historiography looked also to the masterpiece as one of the world’s wonder. The anonymous writer of the *Compendium of Histories and Narratives* who wrote his book in A.D. 1126 and had access to many sources now unavailable wrote that:

[the Emperor Shapur (A.D. 240-70), son of Artaxerxes the Sassanian] was as, his father, greatly dedicated to establish justice and rightfulness as well as to bring prosperity to the universe. **He constructed Shâdzurvân in Shushtar which is one of the world’s wonders.** He also founded cities ... such as Beh-az-Andiv-Shâbur... which means

⁴ G. Le Strange, *The Lands of the Eastern Caliphate*, *op. cit.*, p. 235.

Superior to Antioch and he built it similar to a chessboard as it had eight by eight intersected streets...⁵

In pursuing these works, the Sassanians were continuing a long tradition dating back at least to the Elamites when they built the canals that irrigates the nearby site of Chogha Zanbil (its ziggurat is the largest and best preserved in the world and the monument, built by the Elamite king Untash-Napirisha in the middle of the 13th century B.C., was one of the first monuments to be inscribed on the World Heritage List). Later, Darius the Great, the Achaemenid king (521-485 B.C.), repaired these canals, and the foundation of the present Dâriun Canal in the west side of Shushtar is attributed to him. In fact it is thought that even the name of that canal derives from his name; the discovery of Achaemenid shards in the neighbourhood of that canal gives weight to such an assumption (see above, 2.b. History and Development). It is only by precaution that we have abstained from mentioning this early date in the subtitle of the present dossier as the considerable amount of water engineering works carried out by this great king is undeniable. Indeed, one must remember also that beside the tasks already mentioned, Darius is the one who finished the first “Suez” Canal. He did it, but by linking the Nile to the Red Sea through the Bitter Lakes, and not the Mediterranean to the Red Sea. Herodotus’ account is explicit on the issue as he wrote in the fifth century B.C.:

“The son of Psammetichus was Necos, and he too became the king of Egypt, and he was the first to attempt to dig a canal into the Red Sea; Darius the Persian was the second to dig it.”⁶ In 1866, Ferdinand de Leseps, during his preliminary reconnaissance for the construction of the Suez Canal, found this canal and then discovered the 1st of the four stela of granite on which Darius describes his deeds: “The king Darius declares: I am a Persian... I ordered this canal to be dug ... therefore this canal was dug ... and boats go from Egypt, by this canal, towards Persia...”⁷.

⁵ Anonymous, *The Compendium of Histories and Narratives*, *op. cit.*, p. 63.

⁶ Herodotus, *The History*, book II, 158.

⁷ Inscription on the stele of Shalouf, see P. Lecoq, *Les inscriptions de la Perse achéménide*, Paris, 1997, chapter 3. See also Pierre-Louis Viollet, *L’hydraulique dans les Civilisations anciennes*, Paris, 2000 (reedited in 2005) which has just been translated into English and published (*Water Engineering in Ancient Civilizations, 5000 Years of History*, tr. F. M. Holly, pub. by the International Association of Hydraulic Engineering and Research (IAHR), Madrid, Spain, 2007, pp. 69-73). He is, however, wrong on the origins of the *qanâts*, see the next references.

It is also under the Achaemenids that the *qanâts* (deep underground irrigation tunnels where the water moves by gravity in order to emerge) are introduced in Egypt. Bam, another WHS in Iran, shows some of the earliest examples of the usage of that technique.⁸

Criterion II: The *ensemble* of Shushtar Historical Hydraulic System exhibits an outstanding example of development over about two millenaries in technology, irrigation and town planning which results in a unique landscape design. It is perhaps not that much the individual elements in that ensemble, as significant and impressive as some of them are, that makes the *system* in Shushtar matchless, but *the combination of these numerous elements in a one single useful and harmonious entity*.

Western and Eastern civilizations have produced outstanding water engineering masterpieces, but none of them can truly be compared as an *ensemble* and in its *layout* with the Shushtar hydraulic system.⁹ Brief assessment and examination of some exceptional examples shed light on that point.

In China gigantic hydraulic works have been undertaken, for instance on the Yellow River, since the 7th century B.C. These impressive chef-d'oeuvres constructed and maintained over centuries were/are however basically canals interconnecting or irrigating waste regions over thousands of kilometers (see below 3.c- Comparative analysis, 4-5: China, figs.161-164 and the related text),¹⁰ they are not as in Shushtar a single unit presenting all the hydraulic, urban and landscaping elements in a single nucleus conceived under a single project.

On the other side of the world, in Spain, three dams, Alcantarilla, Prosperina and Cornalvo are roughly contemporaneous with dams in Shushtar, and surprisingly enough, two of them (Prosperina and Cornalvo, *circa* 100-130 A.D.) still function as those in the Persian town.¹¹ But, even in these cases, these marvels are far from the local town which is Merida

⁸ See A. Mousavi, "Qanats in Eraly Irrigation System in West Asia" and C. Adle in "Qanats of Bam: An Archaeological Perspective. Irrigation system in Bam, its birth and evolution from the Prehistoric Period up to Modern Times", both articles published in *Qanats of Bam, A Multidisciplinary Approach*, eds. M. Honari, A. Salamat *et al.*, pub. UNESCO Tehran Cluster Office, Tehran, 2006, pp. 33-85 and 87-97.

⁹ We are only referring to the layout, landscape and composition, not to the *quality* of the work which may be subjective and/or contestable. The lines which follow do not intend to show *superiority* or *inferiority*, but to underline the *differences*.

¹⁰ It is no easy task to deal, or even to furnish, an adequate bibliography on this matter, but one can get a general picture of Chinese water engineering in consulting J. Needham and W. Ling, *Science and Civilization in China*, vol. IV, part II (Mechanical Engineering), Cambridge University Press, 1965 and N. J. Schnitter, *A History of Dams – The useful pyramids*, Balkema, 1994. As always, Pierre-Louis Viollet's study, *L'hydraulique dans les Civilisations anciennes (Engineering in Ancient Civilizations, 5000 Years of History)*, already cited above in this section, provides many drawings, pictures and plans on this matter; see pp. 222-257 in the English translation.

¹¹ Alcantarilla, Prosperina and Cornalvo are the three largest Roman dams in Spain. The oldest is thought to be that of Alcantarilla, situated at the head of 50km long aqueduct that supplies the city of Toledo; its history reaches back to the 2nd century B.C. Prosperina dam (probably dating from around 100-110 A.D., from Trajan's period's) is situated 6km north of Merida and Cornalvo, situated 13km NE of Merida, is thought to date from the period of Hadrian, around 120 or 130 A.D. For an abridged description, history and drawings see Viollet,

and none of them form a single landscape with that settlement as the Persian ones do in Shushtar. As to the Roman dame of the Gorge of Peyrou (Baume valley near Saint Rémy de Provence in France), the structure is no more extant as it has been buried under a new one built in 1891. The fine and ingenious Roman or Gallo-Roman aqueducts, in spite of the fact that they include bridges, tunnels, reservoirs *etc.*, remain nevertheless truly different from the Shushtar specimen (see below 3.c- Comparative analysis, 1-4: Aqueduct and the Pont du Gard, fig. 150 and the related text). Indeed these works do offer some specific comparative points with the Persian ensemble (for instance common constructors as Shâdorvân is supposed to have been built by the Romaine prisoners), but not a global one. The network of the distribution of water inside the old town of Shushtar in its turn may have had some resemblance with those partly in existence in Pompeii (buried under the ashes of Vesuvius in 79 A.D) or in the castellum of Nîmes (constructed under the emperor Claudius in the middle of the 1st century A.D, but it is hard to evaluate them as, unfortunately in this case, the Shushtar network has also greatly suffered, not from the ashes and the destruction of the town, but from the introduction of contemporary new water distribution technology.

On the contrary, Petra, the Capital of the Nabateans in the Negev (now in Jordan), offers a few points of comparison, but not enough to consider the two sites related: Petra's famous rock monuments have no connection at all with the buildings in Shushtar, and, being in the desert, Petra is waterless and had no watermills while Shushtar commands a large River whose water had given birth to a sort of watermill town. The vague common point lays in the fact that, probably at the beginning of the 1st century A.D., the Nabatians started to build in the rocky gorges of their land a dam (43m long, 14m high) on the Wâdi Musâ to divert its flush waters from their natural course to another wadi (Wâdi al-Mudhhim) through a tunnel (9m high, 6m wide and 88m long).¹² The dam and the tunnel do offer in a way some resemblances with the Gargar dam (Pol-band-e Gargar / Darvâzeh Gargar) and its water diverting tunnel (Boleyti: about 4 to 8m large and 365m long), but that is all; the other

Water Engineering in Ancient Civilizations, op. cit., pp. 167-170, figs. 6.28 and 6.29. For detailed descriptions see N. A. F. Smith, *The Heritage of Spanish Dams*, pub. The Spanish National Committee on Large Dams, Colegio de Ingenieros de Caminas, Canales y Puertos, 1992; N. J. Schnitter, *A History of Dams, op. cit.*; J. A. Fernandez Ordonez, *Catalogo de noventa presas y azudes espanoles anteriores a 1900*, Madrid, 1984.

Here it must be stressed that these dams are not in their turn the oldest ones in the world: for instance the dam reservoir No IV at Jawa (100km NE of Amman, Jordan) is datable to the end of the IVth millennium B.C.; it seems to be the oldest one in the world (S. Helms, "Jawa, site chalcolithique", *Les dossiers d'histoire et archéologie*, no 118, July 1987, pp. 92-94 and *idem*, "Paleo-Beduin and Transmigrant Urbanism", *Studies in the History and Archaeology of Jordan*, vol. I, Amman, 1987, pp. 97-113. See brief description and drawings in Viollet, *Water Engineering in Ancient Civilizations, op. cit.*, pp. 31-36. It goes the same for the canals: the Mesopotamian ones are much older and the Chinese constructions gigantic.

¹² For a concise description, plans and pictures see Viollet, *Water Engineering in Ancient Civilizations, op. cit.*, pp. 120-123.

elements present in Shushtar are missing in Petra, which is dead while Shushtar is alive (see below 3.c- Comparative analysis, 4-2: Petra, figs. 155-159 and the related text).

In the Greek Classical world, the Lakissa canal which diverts the water from Kofini dam built on the Lakissa River, bears some distant resemblance to Band-e Mizân and the Gargar Canal¹³ while the astonishing Eupalinos Tunnel in the Samos island may remind of the Boleyti Tunnel.¹⁴ The other elements from Shushtar are different or not present in the Greek examples. A more than millenary admiration for the Eupalinos Tunnel and the Shushtar hydraulic system seems to be the only true common points between these accomplishments: Herodotus considered the Eupalinos Tunnel, which is in ruin but still partially extant, as one of the marvels of the Hellenistic World.¹⁵

Closer to Iran, the irrigation network in ancient Urartu, in eastern Anatolia, was once supposed to have served as a model to the Iranian *qanât* irrigation system, but the related theory in this matter put forward by H. Goblot¹⁶ is now discarded due to the emergence of new archaeological discoveries proving that the *qanâts* of Bam (a WH site), or those excavated on the southern shores of the Persian Gulf in the United Arab Emirates and in Oman, are older than the Urartian waterworks.¹⁷

Last, but not least, as far back as the IVth millennium B.C, there were the extensive networks of water distribution in Mesopotamia conceived by the Sumerians, Assyrians or the Babylonians, but these waterworks have mostly disappeared and only traces of the old beds of these extensive canals have been thrown into light thanks to the studies carried out by Robert McCormick Adams in the 1960s and 1970s.¹⁸ The Shushtar network, also different, can

¹³ J. M., Balcer, "The Mycenaean Dam at Tiryns", *American Journal of Archaeology*, vol. 78, 1974, pp. 142-149 and concise information, plan and pictures in N. J. Schnitter, *A History of Dams, op. cit.* and Viollet, *Water Engineering in Ancient Civilizations, op. cit.* pp.92-95.

¹⁴ J. Bonnin, *L'eau dans l'antiquité, l'hydraulique avant notre ère*, Eyrolles, 1984, Chapitre 9. Eupalinos was a nearly strait tunnel more than a kilometer long and large enough for the people in charge to circulate while Boleyti is a winding tunnel 365m long, 4 to 13m large and 6 to 15m high. The main difference is that in the Eupalinos Tunnel, the water supply conduit (a pipeline) was laid at the bottom of a narrow trench dug into the sideline of the floor of the tunnel; while the Boleyti Tunnel is provided, in its well preserved sections, with sidewalks on both side of a large canal in form of U dug into the floor of its gallery. In the Eupalinos Tunnel, its gallery remained nearly horizontal, while its trench sloped down gently so the water could move by gravity in its pipeline; but, in the Boleyti Tunnel, the whole structure (the gallery and the U canal) went downwards together. Compare the drawings in Viollet, *Water Engineering in Ancient Civilizations, op. cit.*, pp.95-96 with our sections and plans in map III-5-6.

¹⁵ Herodotus, III, 60.

¹⁶ H. Goblot, *Les qanât: une technique d'acquisition de l'eau*, Paris – La Haye – New York, 1979.

¹⁷ See C. Adle in "Qanats of Bam: An Archaeological Perspective. Irrigation system in Bam, its birth and evolution from the Prehistoric Period up to Modern Times", *op. cit.*, pp. 33-85. For the *qanâts* on the southern shores of the Persian Gulf see R. Boucharlat, "Les Galeries de captage dans la péninsule d'Oman au premier millénaire avant J.-C.", *Irrigation et drainage dans l'Antiquité, qanâts et canalisation souterraines en Iran, en Egypte et en Grèce*, ed. P. Briant, Paris, 2001, pp. 156-180.

¹⁸ Robert McCormick Adams, *The Uruk Countryside*, Chicago, 1972.

nevertheless be considered as a live reminiscence of these first signs of human civilization as the Elamite, which flourished in Susa - Choghâ-Zanbil, and the Mesopotamian cultures were very close and sometimes identical. The natural environment is similar too: the vast plains of Khuzestan, where Shushtar is, and the neighboring Mesopotamia can be considered as one and the Kârûn River joins Tigris and Euphrates before the new gigantic watercourse thus formed joins the Persian Gulf.

Criterion V: Shushtar Historical Hydraulic System indeed stands as the flagship of an *ensemble* truly exceptional as a human settlement and land-use representative not only of Iran, but also in many ways of Mesopotamia. Both have of course their own millenary individualities which in some cases reflect also characteristics of other great civilizations; be it the Roman in the old world or the Islamic in more recent times. This situation was the result of the alternating war and peace periods in this region crossed by some of the most important national as well as international roads of communication between the West and the East, including the southern branch of the highway known in our time as the “Silk Road”. Men were in communication and exchanged ideas or goods, though with less intensity, even during the worse periods of economical upheaval or social disorder. The Achaemenid, Parthian and then the Sassanid empires versus the Greek dominion followed by the Roman Empire, first led by Rome and then by Constantinople, saw multinational and multicultural exchanges which continued during the Islamic epoch. In close interaction with its natural environment, Shushtar’s hydraulic complex bears testimony to these intercultural relations.

Reports points out that Shapur, the Sassanian emperor, used Roman labor force and engineering to built parts of Shushtar’s hydraulic ensemble.¹⁹ The presence of the site of “Cesar Throne” (Takht-e Qeysar) on the northern rocky shore of the Kârûn River still bears testimony to that fact. It has even been reported about a thousand years ago that a Roman architect, whose name has been persianified as Andimeshk, was the builder of the Shâdorvân bridge.²⁰ The interrelation and interaction, either forced or voluntary, had a long history: Cyrus the Great, the Persian monarch, repaired after his bloodless entry into Babylon in 539 B.C. the embankment of Euphrates built previously by a local king. On the clay cylinder called “the Cylinder of Babylon” he reports: “I added to ... the banks protected by bricks, in the low-lying areas of the city, that a previous king had begun to build”.²¹ (for a fictive view

¹⁹ See here just above, 2b, the justification for criterion I.

²⁰ Anonymous, *The Compendium of Histories and Narratives*, written in 520 / 1126, *op. cit.*, p. 63. Some have suggested that Andimeshk was responsible for the building of the bridge in the neighboring town of Dezful, not the one in Shushtar. It has also been reported that the nearby town of Andimeshk still perpetuate his name.

²¹ See P. Lecoq, *Les inscriptions de la Perse achéménide*, *op. cit.*, chapter 3.

of Babylon see below 3.c- Comparative analysis, 1.1, Mesopotamia, fig. 148). Darius works to finish the first “Suez Canal”, started by an Egyptian pharaoh, has already been mentioned here above. While these masterpieces of bygone eras exist no more, Shushtar’s hydraulic system still bears testimony to an intense intercultural relation which in the case of Shushtar is, in addition, closely in interaction with the natural environment.

A primary characteristic of the Shushtar ensemble is that, contrary to many other old sites related to water engineering technology, the system is in this case alive and still largely functioning after about two thousand years. The water network shapes harmoniously a landscape composed of dams, bridges, watermills, built-up areas and orchards before running down to irrigates hundreds of thousands of agricultural lands.²² The fact that after such a longtime the system is on the whole still alive and dynamic is indeed a most astonishing positive point, but that dynamic also constitutes the main challenge of the future. Even though the *ensemble* has become vulnerable under the impact of irreversible changes imposed by our technological world, the essential aim remains to keep the system functioning without fundamentally altering its characteristics which makes it unique.

3.c. Comparative analysis (including state of conservation of similar properties):

As the Shushtar water structures form a ensemble consisted of various but interconnected components; one way to increase our knowledge about it is the comparative study of the entire system with similar structures outside and inside Iran. If this comparison is performed in terms of each structural segment of the system, it will be even more useful. The entire Shushtar water structure can be studied in the framework of the following concepts:

1-bridge-dams

1-towers

3-dams and tunnels

4-waterfalls and mills

5-castles

²² Muqaddasi, the famous traveller from Jerusalem, wrote a thousand years ago that Tustar (the Arab name of Shushtar) was surrounded by gardens, where grapes, oranges, and dates grew abundantly; adding that no town of Khuzistan was more beautiful or pleasanter to live in, though he admits that the heat was extreme in summer. He also reports that the markets of Tustar were abundantly supplied; brocades, with embroidered cotton stuffs of all kinds were made there, the brocade (*Dibâj*) of Tustar being most famous. Muqaddasi [Maqdisi], *Ahsan al-taqâsim fi ma' refat al-aqâlim*, ed. De Goeje, Leiden, 1877, pp. 406, 410; pp. 234-235; G. Le Strange, *The Lands of the Eastern Caliphate*, *op. cit.*, pp. 234-235.

6-handmade stream, canals and qanāts

All the above items will be compared with Iranian and foreign monuments in this article.

REGIONS INSIDE IRAN

1. The Khuzestan Province:

The Sassanians, whose economy depended largely on agricultural lands, developed irrigation systems in Iran and southern Mesopotamia. Examples of waterworks of the Sasanian period (224-650), especially bridges and dams, can be seen in Khuzestan and Fars provinces. During the Sassanian period, the construction of bridges was mostly done in Khuzestan and Fars. It is true that the geography of Khuzestan, with its rivers, created a favourable setting for such an endeavour. One of the problems encountered was the occasional depth of valleys or rivers which made construction works difficult. The bridges could also be used as passages for crossing those rivers. The road construction activities were also related to the improvement and exploitation of water courses in the region.

The Sassanian kings such as Ardashir, his son, Shapur and Khosrow I undertook significant projects in this regard. Roman prisoners' contribution to these projects is also noteworthy. Most of these structures like canals, tunnels or mills are in the Khuzestan province, with a focal centre as Shushtar. In this respect, Shushtar, where a number of waterworks are still operating, has a unique place in the world. The Shâdorvân bridge-dam which according to many historians is one of the wonders of the World, is in this town. There is general agreement among Islamic historians that Shâdorvân is a Sasanian bridge-dam built by the order of Shapur. Apparently he forced Roman prisoners of war to build or restore this bridge. Ferdowsi, the celebrated poet of Iran in the early 11th century, mentions a Roman engineer named Branush who participated in the construction of this bridge. The Shâdorvân bridge-dam, aside from its function in irrigation and flood control, was also a city gate connecting Shushtar to other towns like Dezful. Generally, other significant structures in the Khuzestan province comparable with Shushtar are:

- 1-The Jarreh dam located 45 km from Ramhormoz on the Zard river, a Sasanian structure.
- 2-The Dezful waterworks on the Dez River built during the Sasanian period.
- 3-The Payepol water structure complex, on the Kharkkeh River near Susa, another Sasanian monument.
- 4-The Arjan bridge-dam on the Maroon River 15 km west of Behbahan, another Sasanian monument.

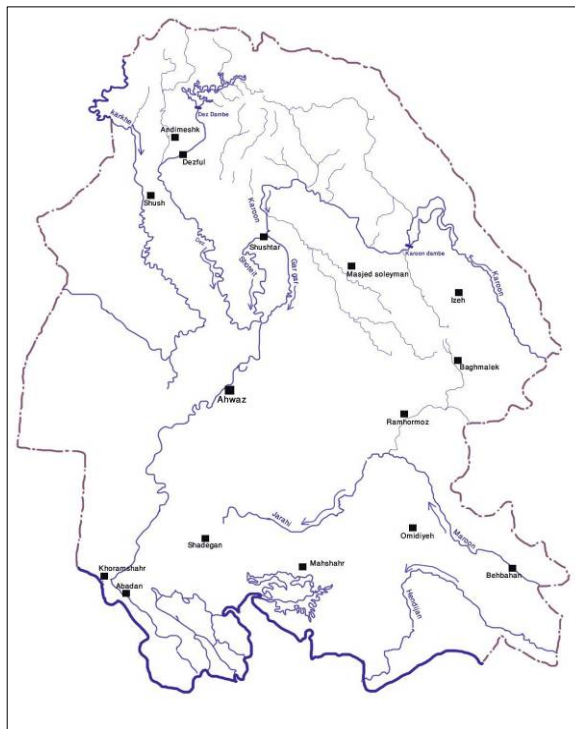


Fig. 129. Khuzestan

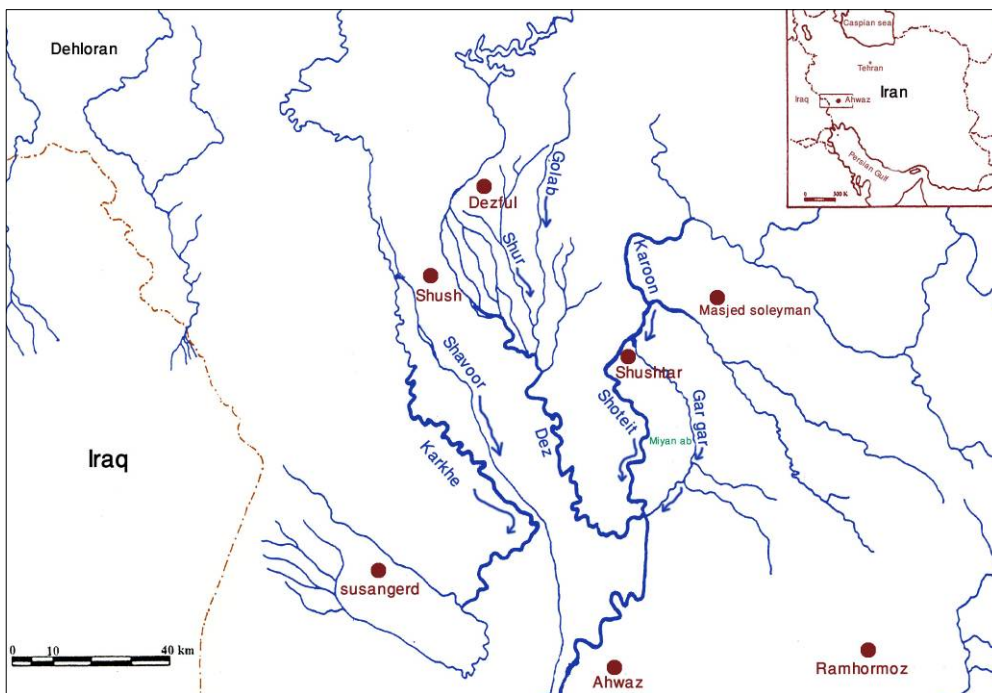


Fig. 130. The Khuzestan Rivers

2-The Fars Province

Waterworks of Fars also represent the endeavours of ancient Iranian people in building water structures. The Sasanian paid special attention to this district and built several of these structures in it. Dam building in Fars dates back to the Achaemenid period (550-330 B.C.). Dams were built on the Karkheh River in order to irrigate lands around Persepolis. Despite the lack of evidence about all dams built during the Achaemenid period, some of the dams on Karkheh have Achaemenid piles. Among monuments belonging to this period are Dorudzan dam, Darius's historical dam and Bahman dam which show the long tradition of dam building in Iran. Many dams were built on the Kor River, the most well-watered river of Fars which originates in north-western heights of this province, in order to direct water to farmlands. After the Sasanian rule, a local dynasty called Buyid came to power in the ninth century BC having deeply felt love for Khuzestan. They built more water structures on Kor which are still standing consisting of bridges, canals and mills including: Band-e-amir historical complex with its canals and mills, Band-e Feizabad historical complex, Tilkan, Mowan, Hasanabad, Jahanabad dams as well as Abraj and Khan bridges which are comparable with Shushtar monuments. In our discussion the following cases were treated:

1-Bandeamir water structure complex 15 km south of Persepolis at a distance of 40 km from Shiraz, capital of Fars province, which was constructed on Kor river by Azadodowleh Deylami, a mighty Buyid ruler in the tenth century.

2-Other structures on the Kor, which were also built in the tenth century A.D.

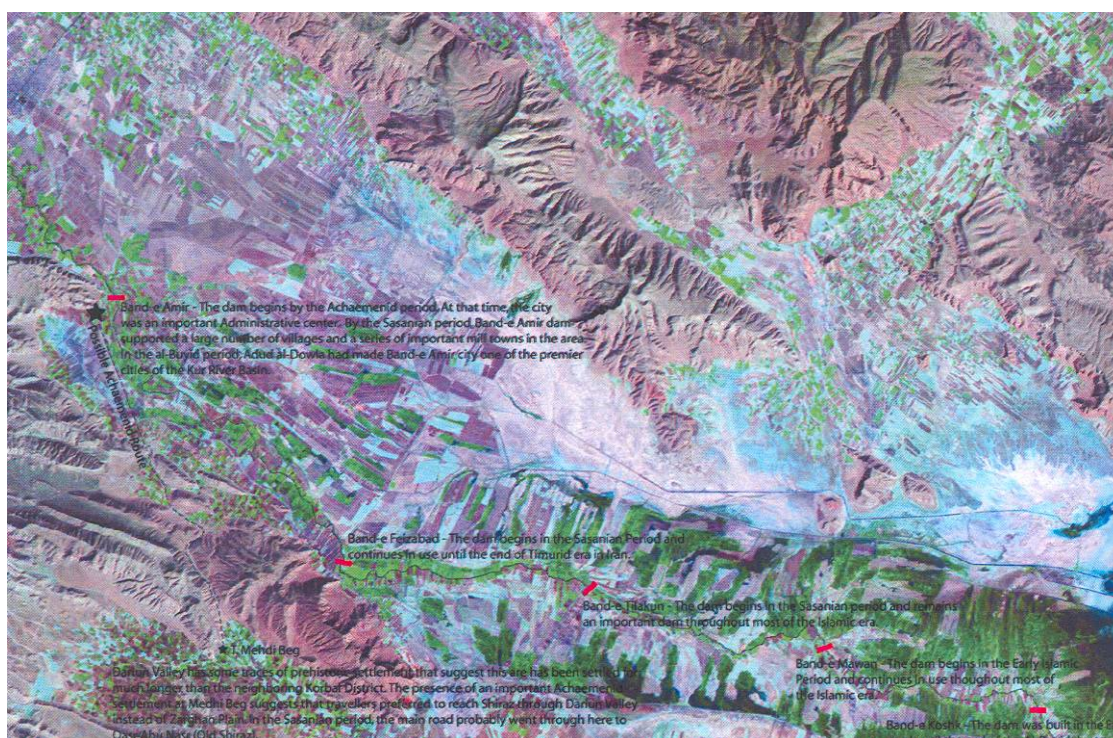


Fig. 131. The ancient dams in southern plain of the Kor River in Fars.

3- The Isfahan Province

In addition to Fars and Khuzestan, in this province many waterworks were built on the Zayandeh Rud. Apparently, Ardashir Babakan distributed the water from the Zayandeh Rud in the city and its fields. Probably, the construction of the so-called "Madees" was also in the Sasanian era. "Madees were brooks branched off Zayandeh Rud from its source as far as its estuary." (Ibn-e-Rosta)

Due to the importance and centrality of Isfahan during the Safavid period, the majority of its monuments belong to this period. Magnificent monuments like the bridges of Khajoo, Siosepol, Jey, Marnan, Shahrestan, Baba Mahmood and Choom are among the water structures of this province but only the following structures are treated in our investigation:

- 1-Niasar mill and *chahartaqi* located 35 km south-west of Kashan are also Sasanian.
- 2-Khajoo, Siosepol, Shahrestan bridges in Isfahan city from 10-16th century AD.

REGIONS OUTSIDE IRAN

Aside from Iran, many other countries developed water structures in their territory suitable to their condition and capabilities, and there is no doubt that the pioneering countries have influenced other ones which is revealed by similarities found in various studies. Political battles and trade were among the most influential factors involved e.g. the Silk Road which caused the construction of several water structures. Egypt stands as the earliest country that developed waterworks depending on the Nile and its regime during the year.

Mesopotamia was another important area possessing a widespread irrigation network since long ago due to the flowing of the Tigris and Euphrates rivers. Senakherib, king of Assyria, built a huge irrigation network throughout his realm. The remains of an aqueduct at Jerwan are among the waterworks of his reign. At the same time Elamites of Iran gained similar experiences in Khuzestan. The Urartians were another government building water structures diligently. But the Romans were the best in this regard even in Iran, Roman engineers built several water structures. China was another major country active in this field.

Cultural relations between these lands and the common function of structures led to the construction of water structures, which despite the variety of climates resulted in similar services. Indeed, constructing dams, bridges, tunnels, canals and mills was developed in different regions, but cultural ties also played a major role in adopting each other's technical experiences. In this article some structures of these lands are introduced and compared with their Iranian counterparts:

1-Mesopotamia 2-Urartu 3-Jordan 4-Roman Empire 5-Spain 6-China

1-Mesopotamia

Mesopotamia is among areas in which constructing irrigation networks and water structures has a long history. Mesopotamia is located between Tigris and Euphrates rivers and covers the entire land of present Iraq, parts of Syria and even Iran.

"Tigris and Euphrates originate in Armenian mountains and enter Mesopotamia wide apart. After irrigating Mesopotamia both rivers flow southwards and near Baghdad they come to a 30 km distance from each other but again go apart as far as Qorneh in lower Mesopotamia. At this spot they join together and form the Arvandrud. North of Baghdad, the Diala, Khabur and Zab rivers bring economical development in central Mesopotamia.

Due to the lower level of these rivers in contrast with surrounding lands, the need for irrigation networks was always felt in this region. Therefore, the use of waterworks facilitated the exploitation of water courses in a naturally barren region. Mesopotamia has a high standing place in the world history and has always had cultural ties with the adjacent plain of Khuzestan in Iran. These cultural relations manifested in migration of peoples, conquests, and influences in architecture and art.

The Mianab plain in Shushtar resembles to Mesopotamian plains in which due to the different levels of land and river, irrigation networks have expanded. The Parthian city of Dastowa was developed because of the presence of the Dāriun and the Gargar Canals. A similar situation is found in Mesopotamia where the Nahrawan canal constructed during the Parthian period.

2-URARTU

After the establishment of Urartu as a kingdom in the first millennium B.C. in north-west of Iran, in east Anatolia and parts of Caucasia, significant changes occurred in water management and several irrigation structures were built based on the techniques available at that time. The Urartian kingdom became known as the greatest hydraulic civilization of the ancient world.

3-JORDAN

Jordan is one of the Southwest Asian countries active in building water structures with masterpieces such as Siq strait water structure.

The Nabateans came to this land in the fifth century B.C. and chose southern Palestine

to settle down. Their civilization is actually a blend of the Ancient East culture with Hellenistic aspect due to transactions with Seleucids, until A.D. 106 during which they were absorbed in the Roman empire by the order of Trajan and their land was renamed as the Arabian Peninsula State. Nabatean progress was in skills and techniques which enabled them to farm in deserts, but their main problem in turning barren lands to agricultural fields was the rocky lands of Negev desert. In the end, they succeeded in transforming Negev into a vast farmland containing numerous fruit gardens with villages having roads and large water mills in which cities like Oboda (present Advat) as well as Mamphis (modern Kurnu) appeared.

4. Rome:

The Romans were among civilizations superior in water technology of which exceptional examples of historical irrigation networks and water structures remain. Their achievements are also seen in eastern countries like Iran specially in Shushtar proving their supremacy in this regard.

After the defeat of Valerian and his captivity by Shapur, the Persian emperor forced Roman architects and other prisoners to construct water structures in Khuzestan specially in Shushtar which led to the building and reconstructing of many water structures in this part of Iran. Even today plenty of these structures are still known by the name of Qeysar meaning the Roman Kaiser e.g. Qeysar bridge-dam or Shâdorvân bridge-dam and Qeysar or Mizan dam. Moreover, the *Epic of Kings* by Ferdowsi mentions a Roman engineer named Branush who participated in that project. Without doubt water structure construction in Iran dates back to earlier times because many Achaemenid monuments canal still be seen here and in other regions like Fars. Dâriun canal in Susa and Suez canal in Egypt are among them. Despite Roman workforce and tact, many differences can be seen between monuments of these two countries. Actually their resemblance is more cultural than physical.

The Sasanian bridge building was never an imitation of Roman construction methods because Iranian styles and methods prevailed but Roman bridge building techniques were brought to Iran after the defeat of Valerian by Shapur. In fact, a political defeat, hundreds of years ago led to a great architectural influence in the victorious country which is still evident grossly in terms of structural and functional aspects.

It must be pointed out that Romans had a specific program to expand irrigation networks in their town planning. In the early years of the fourth century BC, the city of Rome decided to build several viaducts in which water was delivered to the city by canals having a declining slope. These canals were constructed from the resource of the river which

occasionally reached a length of 75 km. Remains of these Roman waterworks can still be seen in many Roman cities inside Italy or in the former provinces of the Empire. One of the most beautiful samples of Roman craftsmanship is the Pont du Gard viaduct near Nîmes in southern France.

5-SPAIN

Spain was partly a region under the control of the Carthaginians, and after the Pontic wars in 202 BC. Romans settled rapidly in the southern parts of this country. The mixture of Roman shelters added to the economic growth of western provinces of Spain and fierce competition in dam building industry led to the construction of several dams in that region.

6-CHINA

Another Asian country widely active in constructing water structures is China which possesses many irrigation networks. Examples of which are dams and canals built on the Yellow river.

1-BRIDGE-DAMS

A: Bridges in Iran

1-1: Dezful Dams

The Dezful bridge-dam was built inside this town in northern Khuzestan and apparently is a Sasanian monument. Ibn-e Serapion, the ninth century geographer, called it the Roman bridge in his *Description of Mesopotamia*. This bridge is very similar to Shâdorvân bridge-dam in Shushtar both in function and materials and is the linking chain of this region to Gondishapur, an important Sasanian city in which many Romans were settled by Shapur. The bridge-dam in Dezful, much the same as in Shushtar, was also the principal gate to the town. Materials used in this bridge-dam are sandstone, rubble stone, bricks and waterproofed mortar, scraped stones have been tied together with metal clamps and strengthened with a leaden layer. All of these materials were also used in Shâdorvân bridge-dam and according to Rogen, the Dutch engineer who studied Iranian irrigation systems, its construction technique is also identical to Shâdorvân bridge-dam i.e. The river bed was dried up in order to construct the dam wall, then the water was flown into a diversion canal, afterwards construction operation progressed in a multi-staged procedure by building temporary dams. Vaults, arches, major and minor mouths as well as piles having triangular-shaped breakers, largely resemble

each other.

Additionally, in the piles structure of both bridges, sandstone and rubble stone, has been used, both piles are made of approximately 2 m long sandstones and are cubed-shaped, but tied with metal braces and seamed with waterproofed mortar. Another similarity between them is their triple function, which are: working as the connecting link between the two river sides and their role in irrigation and floods control. The Dez old bridge-dam operates independently but the Shâdorvân bridge-dam in Shushtar functions as a structure depending on other waterworks of the town.

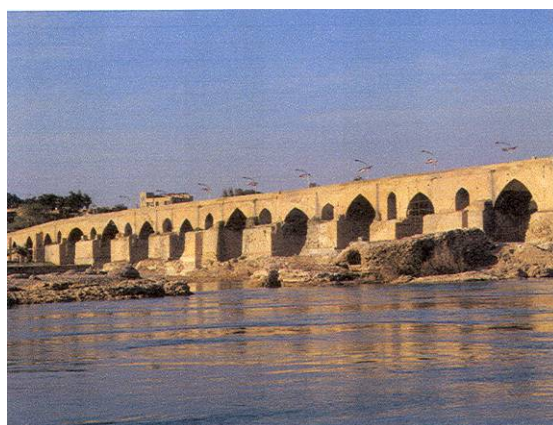
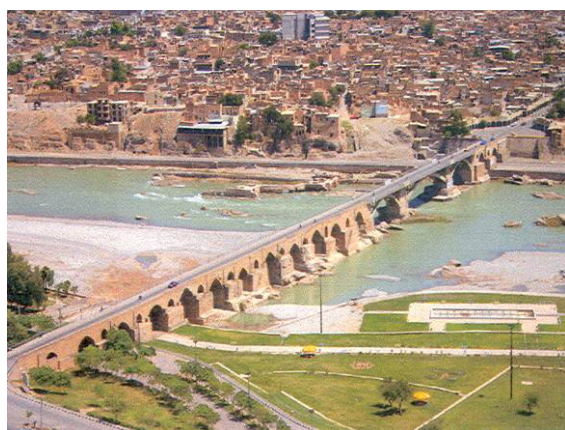


Fig. 132. The Dezful old bridge-dam

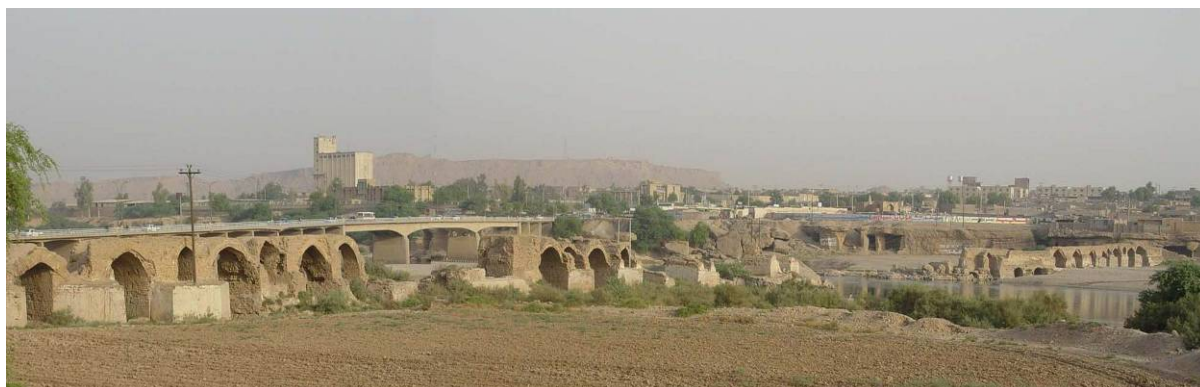


Fig. 133. Shushtar, the Shâdorvân bridge-dam

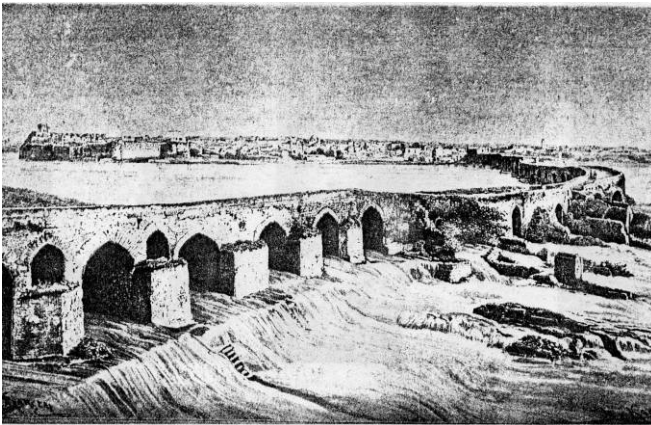


Fig. 134. The Shâdorvân and Dezful old bridge-dams in the 1880s (after Dieu Lafoie)

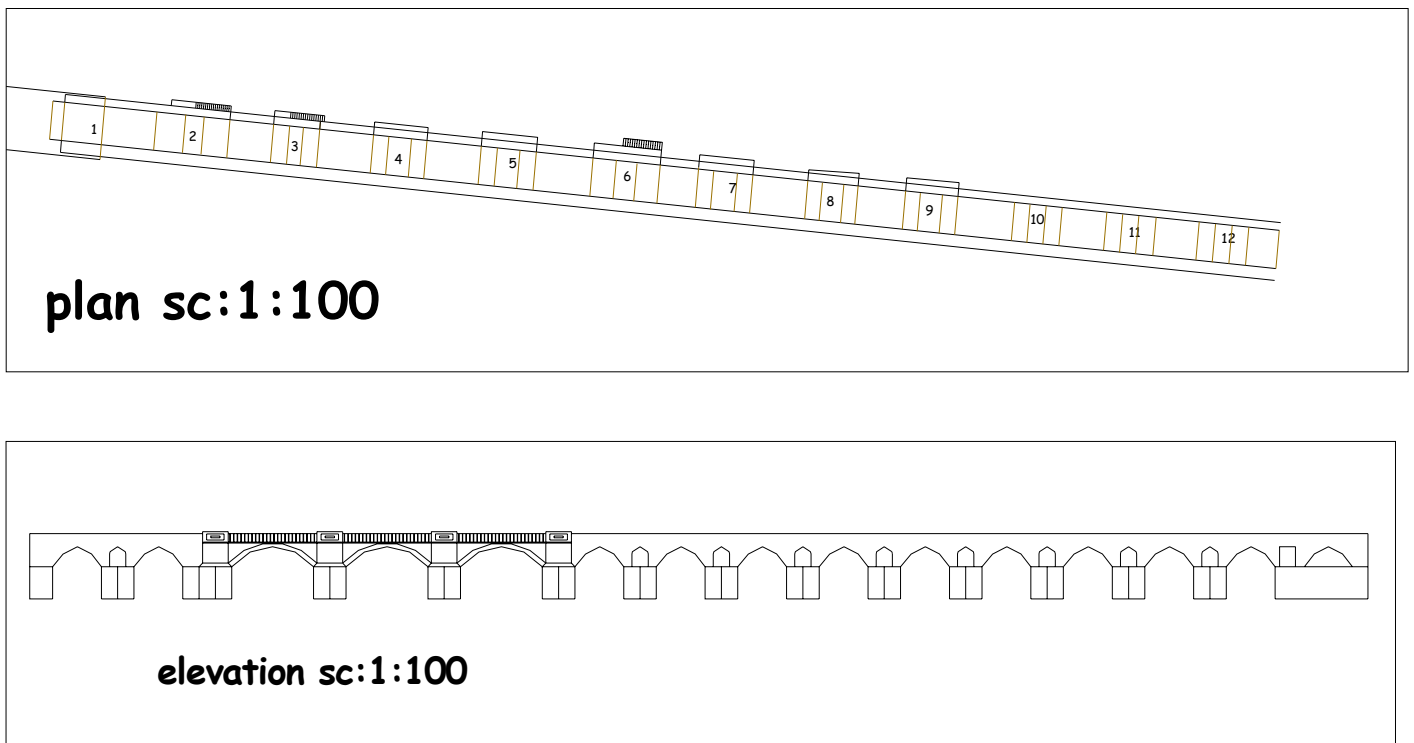


Fig. 135. Plan and elevation of the Dezful old bridge-dam

1-2: The KARKHEH - PAYEPOL BRIDGE-DAM

Not much of this impressive constriction survives today. It was built in a west-east direction on the Karkheh river in the Sasanian period. Its remains display affinities with the Sasanian monument at Ivan-e Karkheh but like the old bridges in Dezful and Shushtar, this bridge-dam had a dual function: a bridge-dam and the entrance gate to Ivan-e Karkheh monumental compound.

On the left bank, the height of the piles estimated between 80 cm to 3 m; on the right bank, two other piles are still in place. This bridge-dam was 4 m higher than the lowest level of the water; at present, only some remains of it can be seen on the left side of the river. Materials used in this bridge-dam are exactly the same as used for Shâdorvân bridge-dam which includes the usage of metal braces. Karkheh Payepol bridge-dam is about 640m long in a direct line which is longer than Shâdorvân with a length of 543 m the bridge's piles have hexagonal plans and triangular shaped breakers on both sides. All the above-mentioned cases are comparable with the Shâdorvân of Shushtar. The Payepol on the Karkheh not only supplied water for Ivan-e Karkheh but also functioned as a communicating link.

Najmolmalek mentions 32 remaining bridge piles in his 1882 visit of the region. Ghirshman writes the resemblance between the Bishapur bridge and the above-mentioned bridges.

1-3: The ARJAN BRIDGE-DAM

Today only few fragments of northern and central sections of this dam survive. The dam was built on a span of 39 m. It's façade is in scraped stone pieces built with waterproofed mortar. According to Ahmad bin Muhammad Salabi, the tenth century historian, Shapur captured Valerian in 257 A.D., and had the emperor's soldiers constructed or repaired the following structures as a compensation to damages inflicted by the Romans army.

Today the remains of six bridge piles on the river bed are still visible. Based on the reconstructed map, it seems that the bridge was about 125m long with 14 mouths and 13 piles in the middle. Piles had triangular breakers at the current and counter-current directions. Maximum height of the bridge from the dam was approximately 7m and the distance between the main piles was about 5m. Piles facades were made of cubic shaped scraped stones. Amid the remains of the dam and its lateral rocks, traces of canals and holes are seen which were probably used to deliver river water to the mills and surrounding fields."(Mollazadeh, 1379 AH:112-113)

The weight of the Arjan dam is high. During the construction of this dam, a naturally

projecting rock beside the river was used as its foundation. In this respect, the structure is like Shushtar bridge-dams eg: Borj-e Ayyâr, Khoda-Afarin or Mahibâzan bridge-dams.

Similarities between this structure and the Shâdorvân bridge are:

- Construction technique in its piles is round-laying of sandstones with an inner filling of rubble-stone which is comparable with other Sasanian bridge piles in Shushtar, Dezful and Payepol.
- Materials used are also like the Sasanian bridge-dams in Khuzestan eg: sandstone, rubble-stone, waterproofed mortar and brick.
- Construction technique of this bridge-dam is based on diverting water via qanats beside Maroon riverside or via diversion canals which led to the drying up of the river bed like other Sasanian bridge-dams.
- Triple function of this structure (acting as a connecting link, performing farmlands irrigation and running the mills) is like other Sasanian bridge-dams e.g. Shushtar and Dezful ones.
- Complete similarity between the shape of some of its piles which were hexagonal"(Esmaeeli Jelodar,1383 AH:10)
- Constructing triangular-shaped breakers on both sides of the piles.
- The dam form is of weighted type like Shâdorvân and Payepol.
- Presence of a Qadamgah called Emam Reza, upstream of the bridge which correspondence to Qadamgah of Hazrat-e-Ali known as Shah-e-Najaf sanctuary on a rocky bed.



Fig. 136. The remains of the bridge-dam at Arrajan

1-4: The DOROODZAN BRIDGE-DAM

This structure had a dual function and was built on the Kor River; it is also known under the name of Canal of Darius, and goes back to the Achaemenid period (550-330 B.C.).

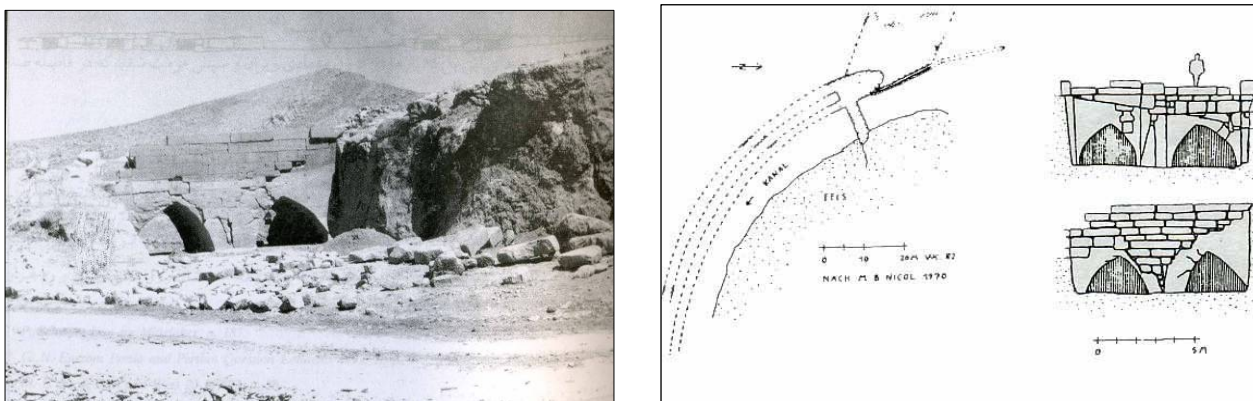


Fig. 137. Remains of the Doroodzan bridge-dam in Fars.

This blend of dam and bridge also has a triple function: elevating river water and directing it to the surrounding lands for irrigation, moving mills wheels and working as a connecting link. Apparently it was built by Azdadodowleh Deylami, a Buyid ruler. In this structure scraped stones, metal braces and waterproofed mortar were used. Not only functionally but also structurally it is comparable with Shushtar water structures. Their similarities are: having diversion canals on both sides, river bed stone-pavement (bouldering) and mills beside the dam.

The original length of the dam was approximately 105 m, its crown width about 7.5m and its foundation width around 20m. This complex had 25-30 mills but traces of only 25 mills still remain. The resting pool (stilling basin) of the dam with stone-pavement and waterproofed mortar has a width of more than 20m along its southern section. The bridge constructed on the dam consists of 13 forked vaults with mouths varying between 4.15-5.30m and Pataghs with varying width of 3.40-3.95m as well as mouth heights varying between 3.70-4.10m. Other mouths set along the bridge were built on Gawshir canal and on the diversion course of water to south-eastern mills.

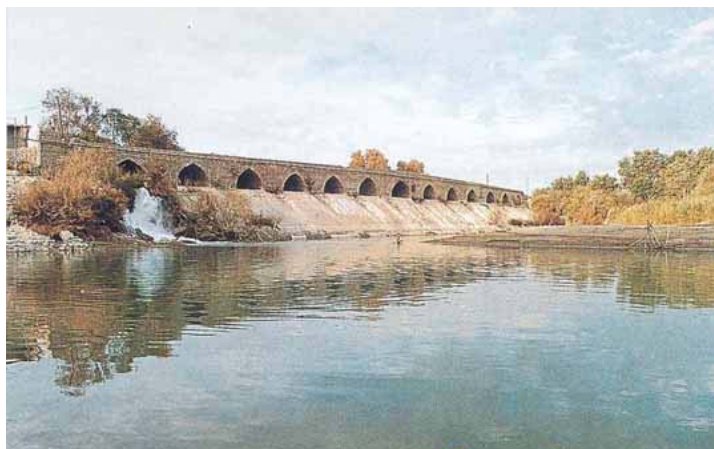


Fig. 138. The Amir bridge-dam in Fars.

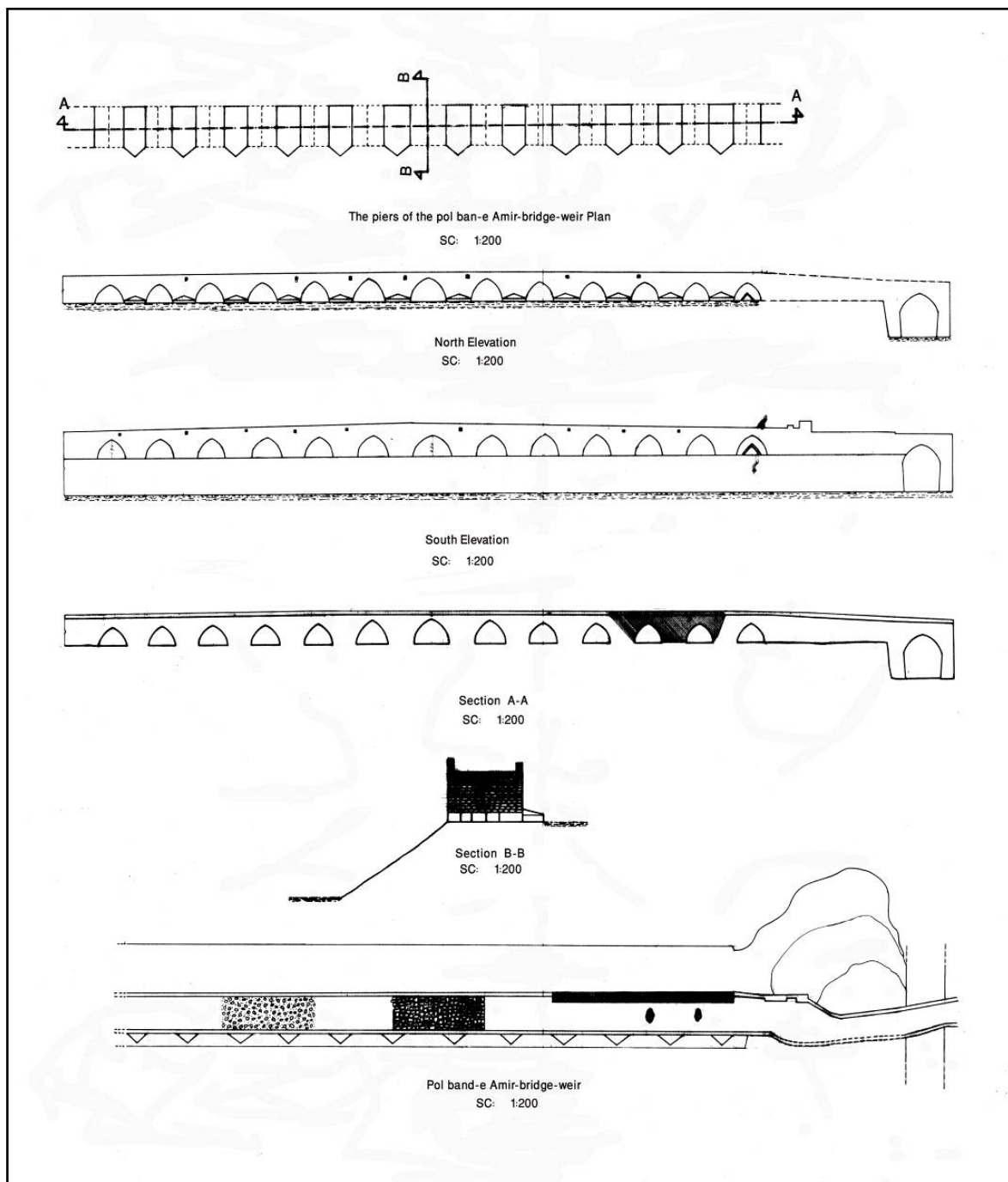


Fig. 139. The Amir bridge-dam in Fars

1-6: The TILKAN BRIDGE-DAM

This bridge-dam is at a distance of 37 km from Amir dam on the Kor river with a dam length of approximately 162 m, crown width of 7.5 m, a dam width at foundation of approximately 16 m and a dam height of about 6 m. Remains of 8 mills are seen around the dam. Materials used in the construction of the bridge-dam are scraped and rubble stones with waterproofed mortar.



Fig. 140. The Tilakan bridge-dam in Fars.

1-7: FEIZABAD BRIDGE-DAM

This dam was constructed on Kor river with a width of approximately 5-12 m, a length of 222 m and a height of about 3-4m made of stones and waterproofed mortar. There were 22 mills surrounding the dam of which the remains of only two are still available.

1-8: BARDEH BOREEDEH HISTORICAL MONUMENTS

This Achaemenid monument was built on the Kor at a distance of 10 km from Darius dam. Stone and waterproofed mortar are its construction materials and its gates are crescent-shaped.



Fig. 141. Remains of the Bardeh Borideh structure

1-9: the MEHR NERSEH BRIDGE in FIRUZABAD

Another bridge comparable with Shushtar bridge is the Mehr Nerseh bridge in Firuzabad in Fars, which has a major and some minor mouths of which only the remains of one pile can still be seen at the middle of the strait made of scraped stones at the outer facade and rubble-or river stones at its inner core plus waterproofed mortar. Metal braces tie scraped stones together at the outer facade of this structure. Piles were constructed at the counter-current direction in the shape of triangular breakers having a thickness of approximately 6m and a length of a little more.

Materials and metal braces used as well as breakers and piles construction methods are comparable with the structures in Shushtar. Other Sasanian bridges in the region include: Kwar, Tanghab, Mored and Pirin bridge which are not at all comparable with Shushtar structures in terms of function and magnificence.

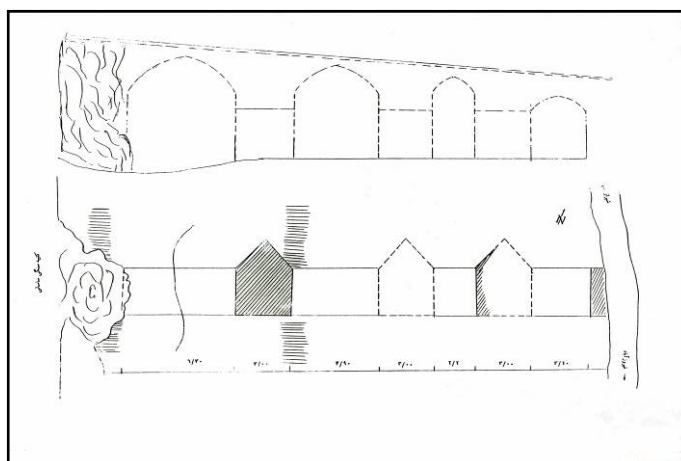


Fig. 142. The Mehr-Nerseh bridge in Firuzabad

1-10: The KHAN BRIDGE

This bridge was built at a distance of 4 km from the Marvdasht-Shiraz road in the early 16th century, and consists of two major and three minor arches with forked vaults and triangular breakers. Materials used in its piles are stones, with waterproofed mortar, and in its body and vault are bricks and mortar. The Kor watershed has a vast irrigation network consisting of several bridges, dams, canals and mills comparable with the Shushtar irrigation system but at a less complicated and less extensive scale, although the segments of the entire complex are functionally inter-dependant.

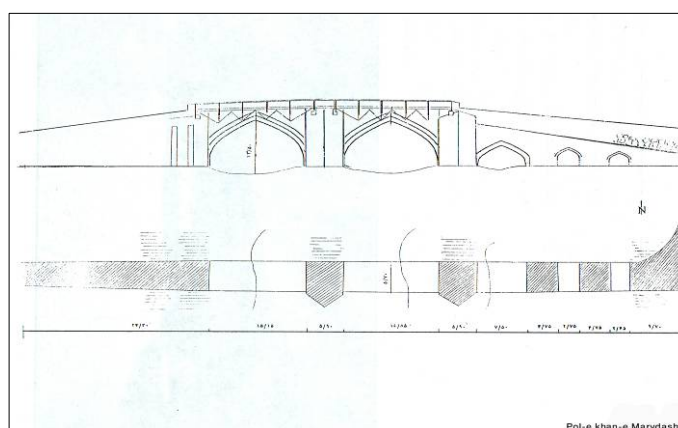
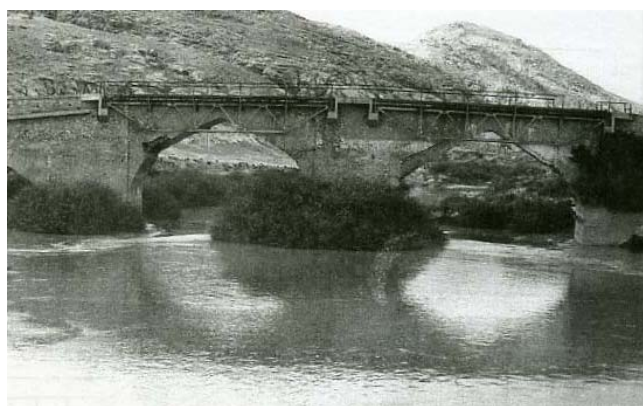


Fig. 143. The Khan bridge, picture and map

1-11: The SHAHRESTAN BRIDGE

This bridge is the oldest bridge on the Zayandehrud, and was built in the Sasanian period. Additions from the Buyids and Salaukids in the 10th and 11th centuries constitute its upper sections. Its piles were put on natural river bed stones. The Shahrestan bridge is at a distance of 9 km from Khajoo bridge and is very similar to Sasanian bridges of Khuzestan

e.g.: the Shushtar Shâdorvân and Dezful bridges.

Materials used in its construction are scraped- and rubble stones, brick vaults and waterproofed mortar. It has 11 mouths with crescent vaults and 12 large stone piles. Its two side mouths are connected to streams branched off the river. At the northern side of the bridge, there is a structure built of brick and mud brick with a collapsed roof. It has a small room arches with a width of 16.1 m and a height of 93 cm and is known as the customs house.

The length of Shahrestan bridge is approximately 105m with a width of about 5m. Its direction is northern-southern with a slight curve which begins from a distance of 40m in the south. Its base is not level but has a mild slope from the middle part. The bridge was built on the rocky bed of the river just like Shushtar bridge-dam.

Isfahan has two other bridges also built initially on rocky river beds, probably in the late Sasanian period. These are the Marnan and Khajoo bridges, the latter being entirely reconstructed during the Safavids. But both are also essentially Sasanian. The customs house (Navagholi) on the Shahrestan bridge is comparable with a corresponding structure at the entrance of the Lashkar or Shâdorvân bridge-dam.

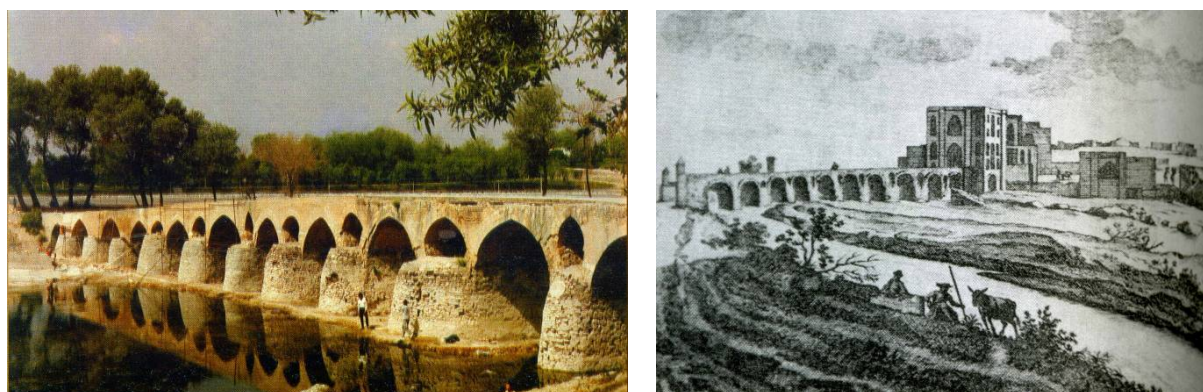


Fig. 144. Views of the Shahrestan bridge on the Zayandeh Rud

1-12: KHAJOO BRIDGE

Foundations of this bridge were laid in the 14th century. By the early 16th century it had been completed. In the middle of the bridge, a special structure was built for exclusive use of the Shah and the royal family which still stands intact and is known as Biglarbeigi having painted decorations. This structure is made of stones and bricks with 21 gutters and 26 spans and these dimensions: 150 m length, 14m width and a 5.7m wide passageway. It has four floors and on either side of the higher passageway there are 51 small or big chambers. Khajoo bridge was not only made for the passage of pedestrians and caravans but also functioned as a

promenade for the Shah and common people. Construction materials used in the structure were big stones in piles, bricks and chalk mortar. Additionally, tiles were used as a decorative item.

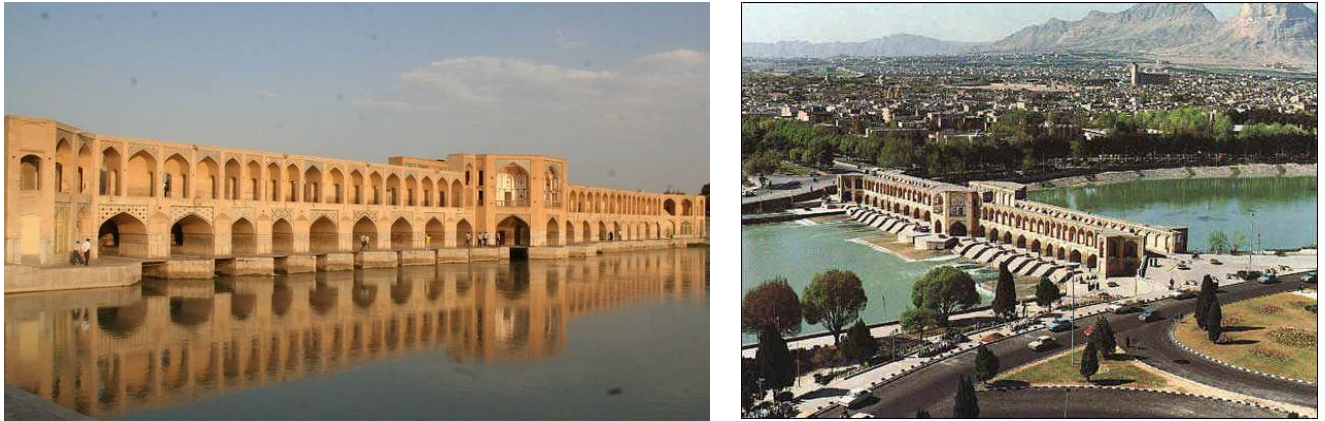


Fig. 145. Views of the Khajoo bridge, Isfahan.

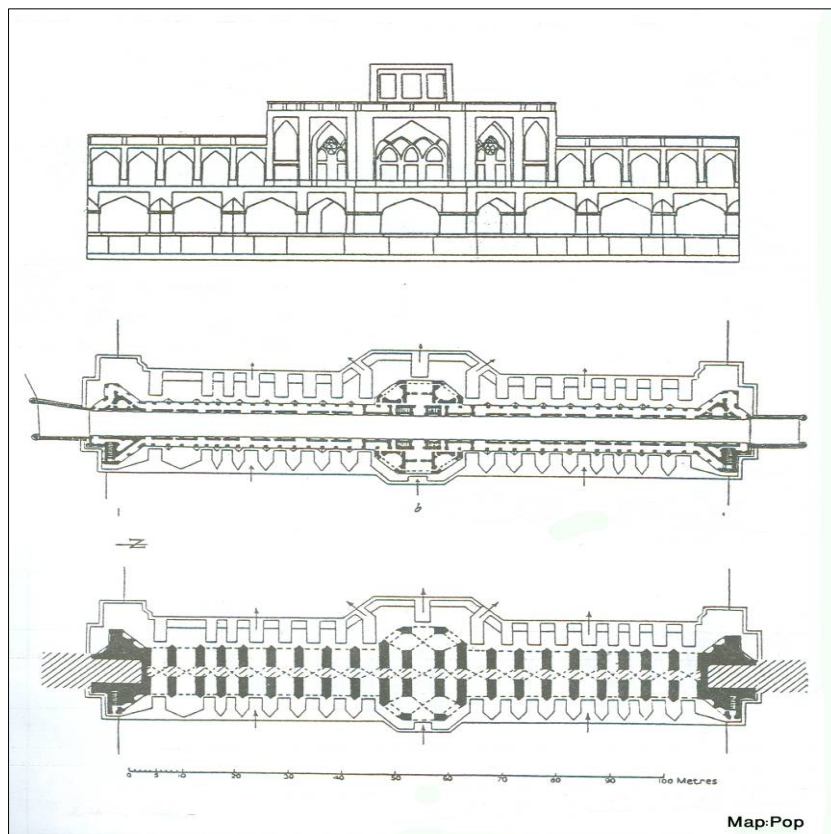


Fig. 146. Ground plan and section of the Khajoo bridge, Isfahan

1-13: SIOSEPOL Thirty-Three Arches bridge

This bridge which is a unique masterpiece of the regency of Shah Abbas I. It was built under the supervision and sponsorship of his famous commander, Allahverdikhan, on Zayandeh Rud. Siosepol is approximately 300 m long, 14m wide, and has two stories and is the longest bridge on Zayandeh Rud. Its lower floor has 32 spans with forked vaults and semi-circled waterways and large, wide corridors. Its higher floor consists of a main passageway and two walkways with small porticoes and several chambers. According to historians, Siosepol had originally 40 spans of which 7 are clogged and now only 33 spans remain. This bridge functioned as a link between the old Chaharbagh-e-Abbasi street to higher Chaharbagh street, Hezarjarib garden and Abbas Abad.



Fig. 147. SIOSEPOL

Conclusion:

The efficiency and adequacy of the Shushtar waterworks are much better than the above-mentioned cases. Its unique characteristic is the use of sophisticated engineering techniques which has a direct link to environmental condition and, more importantly, its 1700 years old history. Natural river bed in Shushtar is made of slates, which is exactly the case in the Shahrestan bridge of Isfahan. Natural contours of the course have been used in the construction of the Shâdorvân bridge-dam that make it without a straight axis unlike other bridge-dams thus due to foundation laying on natural rocks its axis is curved. Another exclusive characteristic of the bridge is its unprecedented length(540m). Shushtar's dams are largely heavy structures supporting dams. Natural river bed in Shushtar is made of stone but at Payepol in Dez it is in conglomerate that disintegrates rapidly in open air but keeps its quality underwater. The fact of laying foundation on resistant beds was intended to avoid river

bed erosion. Additionally, in the Shushtar Shâdorvân bridge, river bed from the Mizan dam as down to the Shâdorvân was paved with stone as a security against river bed erosion. This stonepaved path is several hundred metres long which is yet another exclusive characteristic in which natural stones of the bed are tied together with clamps. Traces of metal clamps were also seen in Mizan dam and north of Shushtar bridge-dam during underwater investigations. Shushtar bridge-dams unlike other water structure in other regions work as a chain i.e. Shâdorvân bridge-dam, the Gargar and Dariun canals are interdependant and several researchers believe that the Gargar Canal was dug in order to divert water and enable the Shâdorvân bridge-dam construction. Besides, there were mills specially at Shushtar Gargar Payepol.

BRIDGES: EEXAMPLES OUTSIDE IRAN

1-1: MESOPOTAMIA

In historical records, there are accounts of bridges built during the Neo-Assyrian period. Apparently, the construction of the first bridge was during the reign of Tiglat Pileser I in 1130 B.C. on the Euphrates near Babylon. Herodotus gives an account of the digging the lake, changing the course of the Euphrates and building Babylon' bridge by Nitogris.

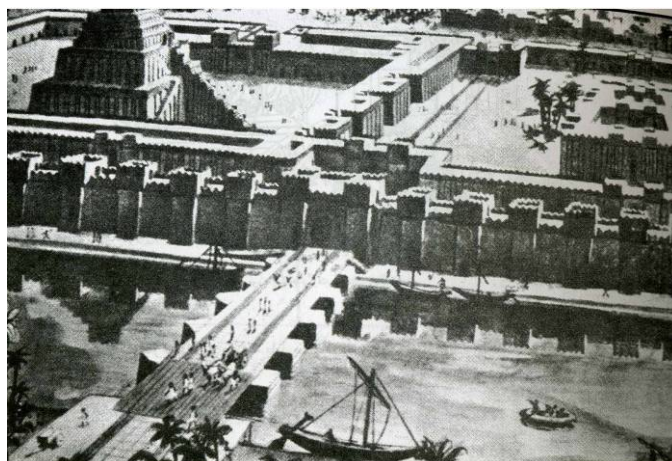


Fig. 148. The bridge in Babylon

1-2: URARTU

After the establishment of Urartian state in the first millennium BC in north-western Iran, eastern Anatolia and part of present Caucasia, significant changes were made in water resources management. Several irrigation networks were built based on advanced scientific and technical principles to supply water for drinking and agricultural matters. The main

reason for this progress lies in human and geographical factors which led Urartu rulers to build water structures like dams, artificial lakes, cisterns and canals. Gradually their craftsmanship improved and reached a level which caused Urartu government to be considered as one of the hydraulic civilizations of the ancient world which is also shown by archaeological findings.

Among the relics found, is a bridge built by the Urartians on the Arax River which is the Iran-Azerbaijan border. It dates back to the 8th century BC. There are sufficient traces remaining which reveal the size and pattern of this bridge.

This bridge was built to connect Vahram, a settlers village to the local castle fortifications in which the bridge crown functioned as the entrance to the gate and fortifications. A pile sized 10 by 10 made of big stones is seen at a dry place on Iranian side with a distance of 13m to the crown. On the Azeri side, a stone mass of the pile and part of the crown are clearly visible specially in flooding spots. Probably the bridge had four piles with wooden poles laying horizontally upon it serving as its passageway.

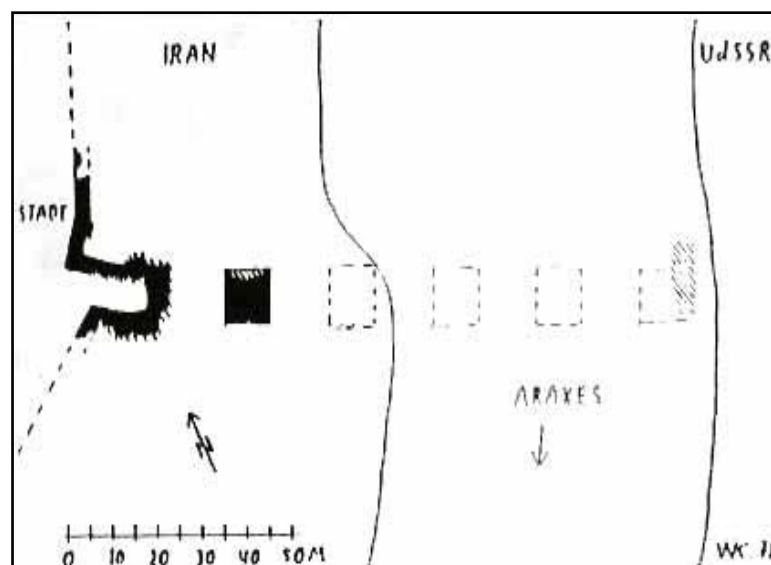


Fig. 149. Remains of an Urartian bridge on the Araxes

1-3: ROME

Romans were among advanced civilization in water technology leaving behind exceptional examples of water structures and irrigation networks.

After the defeat of Valerian and his captivity at the hands of Shapur, the Persian emperor forced Roman architects and other prisoners to construct water structures in Khuzestan specially Shushtar which led to the building and reconstruction of many water

structures in this part of Iran. Even today many of these structures are still known by the name of Qeysar meaning the Roman Kaiser e.g. Qeysar bridge-dam or the Shâdorvân bridge-dam and Qeysar dam or Mizan dam. Without doubt water structure construction in Iran dates back to earlier times because many Achaemenid monuments can still be seen here and in other regions like Fars. Dariun canal in Susa and Suez canal in Egypt are among them. Despite the Roman workforce and thought, many differences can be seen between monuments of these two country .Actually their resemblance is more cultural than physical.

Sasanian bridge building was never an imitation of Roman construction methods because Iranian styles and methods prevailed but Roman bridge building effects were brought to Iran after the defeat of Valerian by Shapur and showed itself in the Sasanian construction. In fact a political defeat paved the way for significant architectural changes in the victorious country which still continues."

Romans inherited a wealth of experience from Egyptians under the rule of Bataleseh and used it efficiently and in an unprecedented and long-lasting manner. They used to submerge thick poles in water and after boarding them up firmly, emptied their inner water and covered in between the poles or the visible river bed with stones or lime, then upon this foundation, constructed the pile. Eight Romans bridges were built on Tiber river like: Soblicus, Fabricus bridges etc.

As mentioned before, after drying up the river bed, Romans planted poles into the middle of the river in order to obstruct water current, then paved the bed with stones or lime and finally constructed bridge piles. Bed-making in water structures is also seen at a wide scale in Shushtar, for example in Shâdorvân structures first of all the river water was diverted into artificial canals built exclusively for this purpose, then river bed was made ready with chipped sand stones tied together with clamps. Due to the inter-dependence of Shushtar water structures, bed stone-pavement at a large scale is observed which occasionally amounts to hundreds of metres. This stone-pavements (bouldering) begins at a spot called Takht-e-Qeysar before Mizan dam and goes on a little further after Shâdorvân bridge-dam.

1-4: PONT DU GARD

Among other Roman engineering services regarding water structures were two-or three lined bridges which are considered as masterpieces of water engineering of which the most magnificent one was Pont du Gard bridge in France with a length of approximately 230 m and a mouth width of 25 m.

Pont du Gard is a three-lined bridge on Garden river strait which acted as a critical link in the water systems supplying most of the water needed for the ancient Roman city of Nemausus. With a height of 160 feet, this bridge had a dominant presence in Garden strait. Pont du Gard was made of stones put upon each other without using mortars. In those days finding high quality water and its delivery to Nemausus was not an easy task. The nearest water resource was at a distance of 20 km in a hilly area with deep valleys which required the use of an 8 km tunnel. Due to hilly grounds, building a diversion and subsidiary road westwards was impossible. The only suitable waterway was an eastwards U-shaped byway which avoided many obstacles and enabled the construction of water canals on slopes but this particular route needed a 50 km long water canal passing through Garden strait. For this reason the formidable Pont du Gard was used which despite its magnificent appearance is very delicate from an architectural point of view. Access to its top was made by rudimentary methods in which bridges were laid upon each other in a column-like fashion in three different layers. The lower steps row is heavier and bigger than the middle row which in turn is heavier and bigger than the upper one where water stands. Contemporary engineers like George Hook have conducted researches about Pont du Gard and its waterway and were fascinated by the general Roman understanding of engineering rules. Nemausus waterway began to deteriorate after the demise of Roman empire in the 4th century AD. Gradually, the sedimented lime started to clog the canal which finally was obstructed in the ninth century resulting in the abandonment of the waterway. Pont du Gard suffered heavy losses in the Middle Ages but its passage way remained in use until it was substituted in 1740. Finally in 1855 Napoleon the third ordered its repair and at present it is a world historical site registered on the World Heritage list.



Fig. 150. Pont du Gard, in southern France



Fig. 151. Water channels of the Pont du Gard

Conclusion:

Dam buildings in Shushtar is largely in weighted style in which short walls (parapets) were constructed serving as Abbands and subsequently bridge piles were built upon them. Among Shushtar dams comparable with Urartu straight-walled dams is Gargar dam built on Gargar Canal which is also a weighted dam constructed on a rocky bed, storing the water of Gargar river and guiding it to the other side of the dam via three tunnels.

One of the main factors of success in constructing water structures is the choice of a suitable location and knowledge of a waterproofing technique and observing it. In this method, part of the dam wall is set into the ground like the foundation of a house in order to prevent water leakage from beneath the parapet to the downstream of the dam. Indeed the terminal section of Urartian water structure parapets was under ground. Nevertheless Shushtar dams and bridge-dams were built on natural contours of the ground and on rocky beds. Otherwise the river bed was initially paved by big sandy rubble-stones mostly tied together with metal clamps, lastly the dam or bridge-dam was constructed on it.

3- TOWER

lthough there are many examples of historical towers outside Iran but no tower is known which belongs to a water structure complex near river side installations like: dams, dams, bridges, waterfalls, tunnels, castles etc. Sea shore towers like Alexandria Tower can not be regarded as comparable with Shushtar water structure because is not on seashore and is not part of another water structure complex.

4--DAMS AND THEIR TUNNELS**A: EXAMPLES INSIDE IRAN****4-1: JARREH DAM**

This dam was intended to elevate water level and divert it in order to irrigate fields located at downstream. Materials used for constructing this dam were rubble- and sand stones and waterproofed mortar. Amid dam remains and the rocks near it, traces of canals and holes are seen which were probably used to deliver water to surrounding fields and mills. This dam consists of two water canals on both its left and right sides as well as a side dam at the beginning of the water delivery canals, diversion tunnels, river sewer and aqueduct. Of the tunnels built inside the body of Jarreh dam, one is at the same level with the dam base and the other is at a height 4.5m above it. Water delivery canals in this dam were water proofed because of water accumulation behind the dam.



Fig. 152. The structure on the Jarrahi river



Fig. 153. View of Dahan-e-Shahr tunnel in Shushtar Gargar bridge-dam.



Fig. 154. View of Boleiti tunnel in Shushtar Gargar bridge-dam.

4-2: KARKHEH PAYEPOL

On the right shore and downstream of Karkheh payepol, the basin of a canal can be seen which continues along Karkheh toward the ancient Sasanian city of Ivanekarkheh. Additionally, canals began from the left river shore which crossed each other while their bases were at different levels.

4-3: AMIR BRIDGE-DAM

Materials used in constructing this structure include: chipped stones, metal braces and waterproofed mortar. Generally, water was diverted to farmlands via three canals which were: Gawesheer canal, Fana Khosrow and Atabak streams.

4-4: ARJAN BRIDGE-DAM

In the construction technique of this bridge-dam, it was intended to divert water via qanats located at Maroon river shore and/or building a diversion canal to dry up river bed in order to enable construction of buildings, which is exactly like other Sasanian bridge-dams.

Conclusion:

The Dariun canal of Shushtar despite its several branches, is itself branched off Karun river which irrigates more than forty thousand hectares of Mianab plain farmlands in Shooshtar. Three tunnels of Gargar bridge-dam irrigate agricultural fields as well as operating surrounding mills. Gargar dam has three tunnels at three different levels: the first one called Sekooreh tunnel, is at the lowest level equal with the dam bottom, the second one called Boleyti tunnel is located at a height of 5m and is the main course of water delivery to behind the dam, the third tunnel named Dahanneh Shahr was the pass for overlapping flood water. Added together these three dams delivered water to the other side of the dam and to the mills. Water delivery canals in Jarreh dam were filled with water, after water elevation behind the dam just like the canals branching off Gargar. Additionally, the Gargar dam like Jarreh dam has dam and diversion canals. But it also served as a gate to the town and its special canals delivered water to the mills. An interesting point to notice is the number of these tunnels along the river and their height.

EXAMPLES OUTSIDE IRAN

4-1: MESOPOTAMIA

Due to the lower level of Tigris and Euphrates than their surrounding lands, the need for irrigation systems was always felt in the region, therefore using water structures which facilitated water extraction was rather important and necessary. Mesopotamia had long time relations with Khuzestan plain which is actually the natural continuance of it. Several partian cities are seen along Nahrawan canals similar to the hand-made stream of Gargar which led to the development of the partian city of Dastova. As parts of Mesopotamia were occasionally an Iranian territory, many Iranian style water structures were built in them. During the Achaemenid rule, first attempts to construct dams on Euphrates and Arwandrood were made despite the difference between Euphrates and Tigris water levels also the fact that at the time of Babylonians, Euphrates flowed further east and had only one channel but Achaemenid dams were built at all costs. During the the Sasanian, Mesopotamia was

conquered by Iran which led to the construction of still more water structures inside the modern Iraq territory specially at the eastern shore of Arwand between Samarah and Kuwait. Sasanian engineers expanded irrigation systems of Diala River to a level beyond its capacity (Diala canal has a length of 445 km equal to 275 miles) a problem which was solved with the help of transferring water with special apparatus and canals upwards and into Diala River.

Irrigation networks were expanded in Mesopotamia and southern Iran during the reign of the Sasanian king, Khosrow I (531-579 AD). The Nahrawan canal on the Arwandrud is just an example. The canal was watered by means of a dam at a spot called Dur. This canal was later repaired during the Abbasid caliphs. The Nahrawan canal joined Diala river at Bakubeh.(53 km north-east of Baghdad and approximately 110 km downstream of the dam). Interestingly, they joined at the same level without any human intervention, a fact that shows the skill of Sasanian engineers in choosing a suitable location for the construction of the dam. About 36 km south of Bakubeh, there was another dam named Baladi that had been built to control Diala river water which directed its water into a short canals flowing into Arwand at a spot south of Baghdad and north of Ctesiphon. Before Baladi, Nahrawan canal with a width of 100 m and a depth of 8m reached Tigris after approximately 80-100 km, upon which several other dams were built to feed subsidiary canals at both sides of the Nahrawan, like Alqontareh near Oskaf with a length of 250m and a height of 10m.

Considering the Sasanian structures built in this part of Iran, specially the dams and canals systems, it can be concluded that in the sixth century A.D., the Diala river and its eastern branch were used in a wise and coordinated system working with the Tigris. Archaeological investigations in Khuzestan and the Diala river basin have revealed the vast expanse of waterworks and plantations and the great interest of the governments in agricultural affairs. Another initiative in Iraq was the construction of a vast network of streams from the Nahrawan, which delivered water to a wide area. A unique canal called Nahr-e Sai'd was built in the middle of the Euphrates which delivered water to the town of Rahba. It was built in 1120 on the river bank by the Abbasids but had to be reconstructed after an earthquake at the foot of the mountain. There are several off-takes all along this canal dug in the plain which acts as a permanent water resource for irrigation of the Saqqyas gardens. The Raqqa region above the Euphrates is located at Balih, and was developed by the Abbasid caliph, Harun al-rashid during his residency (797-808 A.D.) there. A vast irrigation network was constructed with an axis made of a huge canal branched off Euphrates having a length of 16m and a width of 10m called Nahr al-Nil. The Nahrawan canal on the Tigris supplied the water needed in Baghdad; this large canal was built by the Sasanians, and was at the same

direction as the Tigris but later was expanded in order to distribute water from the Diala. In the 19th century another dam was built on the Adhim (Uzaym) river with a height of approximately 15 m and a length of 200 m supplying two new canals named Nahr-e Bott and Nahr-e Rathan. Like other dams built by Arabs, this dam was made of stones tied with lead seals. During the 7th and 8th centuries, the local military base named Basreh was transformed into a real city with modern irrigation systems supplied by the Arvandrud.

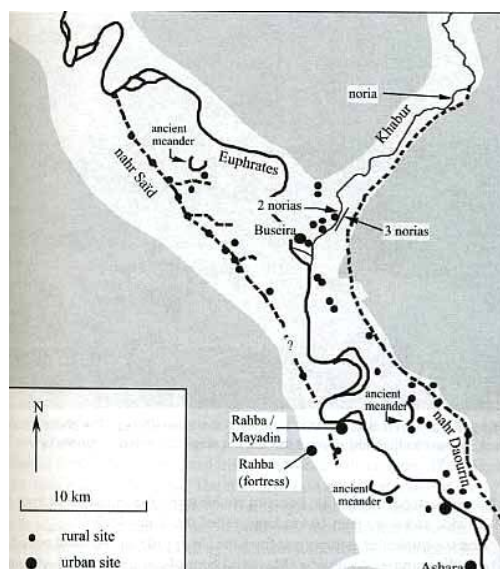


Fig. 155

4-2: PETRA

Jordan is an important country in Southwest Asia with water structures among which are a number of impressive ones like the Siq strait.

The reason for the development of Petra lies in its strategic location at a spot which served as a natural fort. Dams built by the Nabateans at Petra were reinforced by high sandstone mountains and their layout is marked by the joint action of water and wind. Access to this place is made only via narrow straits. The main access way to this place is called Siq which is effectively a strait penetrating into the mountains via Wadi Musa, the source of which is situated a few kilometres to the east. The length of this strait is 1500 m with a width of a few meters (occasionally under 3 m) and a depth of approximately 100 m.

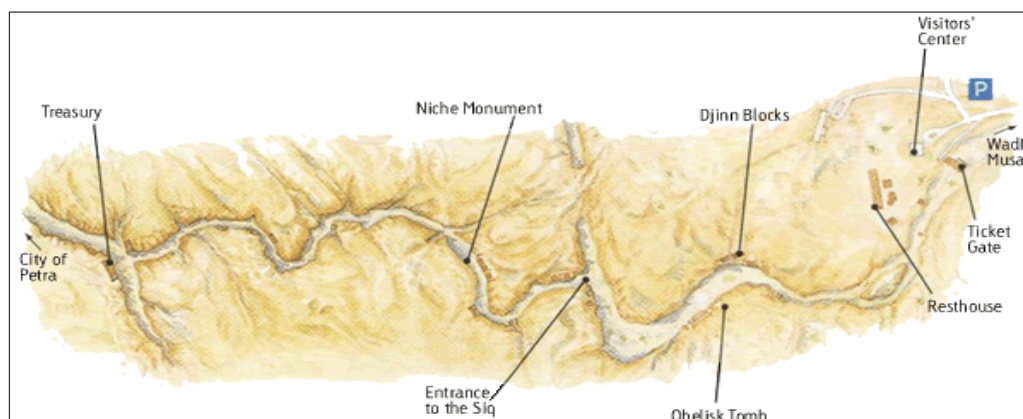


Fig. 156

Usually this wadi is arid but winter floods might erupt suddenly. The Nabateans built a dam at the entrance of Wadi Musa into the narrowest section of the strait which accompanies a tunnel with these dimensions: height: 9m, width: 6m and length: 88m which redirects flood water into the Wadi El Madhim. After flood water flow into Wadi El Metaha, their natural course joins in the middle of the town. This project was finished almost certainly at the beginning of the first century B.C. and after the start of urbanization here. The height of the dam was 14m and its length was 43 m. Water supply of the city is provided by waterways as well as expanded systems of dams, canals, water tanks and cisterns collecting discharged water of these storms. The first waterway was a tunnel storing the water of Wadi Musa spring which was built at the last 30 years of the first century A.D. as a brick and ceramic canal dug after the Siq was completed with five other waterways in the late first century A.D. These waterways included the ones built in Siq and were constructed along its left wall. (Viollet 2007.120-122).

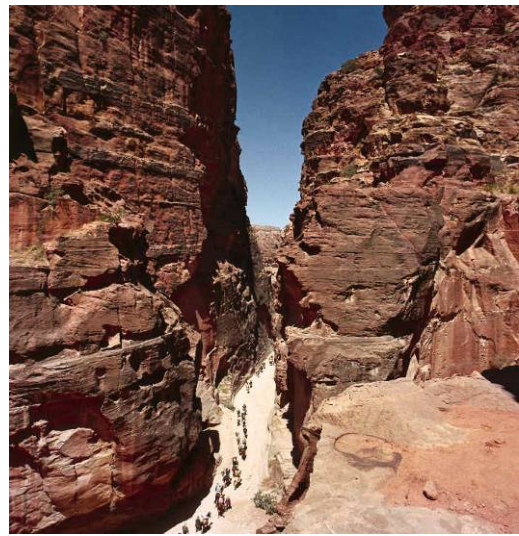


Fig. 157. Wadi Siq ,Petra Dam

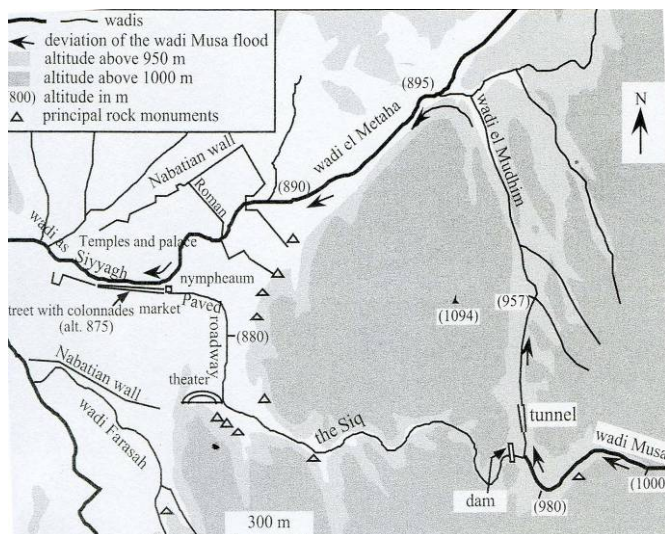


Fig. 158. Map of the Petra region

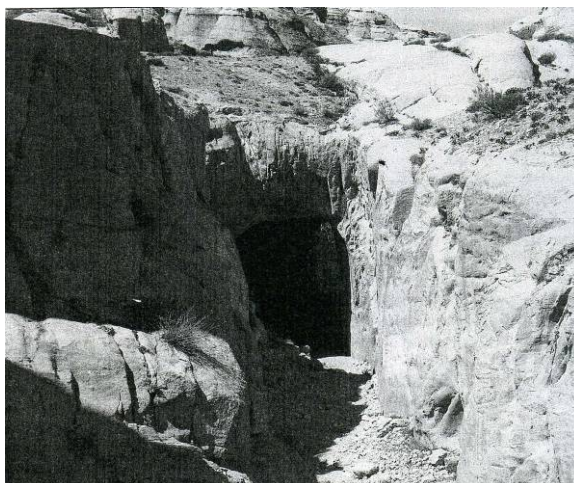


Fig. 159. The tunnel constructed by the Nabateans to redirect the flood waters of the Wadi Musa towards the el-Mudhim wadi. The tunnel is, at its entrance, 9m wide

4-3: URARTU

According to the available documents, Urartus were the first nation seriously engaged in building water structures. There are more than one hundred Urartu installations called Menoa related to construction operations of water canals, Apparently Urartus gave much importance to irrigation and water structures and built several structures covering a wide region which was unprecedented until the the Sasanian came to power.

(Most of the Sasanian structures were built by Shapur the first in Shushtar and most of Urartu ones by Menoa son of Ishpuaini)

The Urartian irrigation structures and systems included: canals, artificial lakes, streams, cisterns and castles but only their canals are comparable with Shushtar water structures. Urartu canals were built above the ground or dugged into cliffs and occasionally

turned into tunnel and burrows. Among all their constructions, a canal more than 70 km long built by Menoah, son of Ishpuaini is more famous. This canal has a width of 4.5 m and a depth of 1.5 m which enabled the watering of a wide area comparable with Gargar hand-made stream in Shushtar (the Gargar with a length of 82 km is the longest stream of its kind in Iran). At some parts, the depth of this canal reached 20m under the ground which irrigated vast farmlands in its outskirts and put into action mill wheels similar to Menoah canal.

Part of the Urartu dam walls was built inside the ground just like house foundations in order to prevent water leakage from beneath the parapet to the dam downstream. Probably the end of Urartu water structure parapets were constructed underground. Menoah has branches all along its course which are still used to operate water mills. Of course water delivery tunnel of Gargar has also several branches which are superior to Urartu ones. In these small tunnels which are locally called Neir, byways are seen which irrigate gardens along their course. Due to the level difference between Gargar Canal and its big tunnel with surrounding gardens, digging Neirs (small tunnel) is considered as an engineering achievement.



Fig. 160.

4-4: ROME

Fourteen waterways with a length of nearly 2100 km, passing through qanats and over magnificent vaults brought a daily amount of 300000 gallons of water from far off springs to the city of Rome. Additionally Romans were a nation with a regular program to expand irrigation networks in their town planning. In the first years of the fourth century BC, the city of Rome began constructing several viaducts in which the water was delivered to the city

by canals having a declining slope. These canals were constructed from the resource of the river and occasionally reached a length of 75 km. Remains of these Roman waterways can still be seen in many Roman cities whether inside Italy or in its former provinces.

4-5: CHINA

Due to the flowing of rivers like Yellow river, Chinese always paid special attention to building dams specially canals of which many historical examples are seen in this country. “The first great projects of building soil dams relate to spring and autumn periods. More clearly, it can be said that the start of these projects dates back to the first half of the seventh century BC. It is said that a duke named Huande Qi connected nine river together, all at the same direction which were probably used to dry up marshlands. A little later, this project was repeated along the course of other rivers throughout the history of China. In 602 BC, this river was flown in a new course which was several hundred kilometers eastwards.

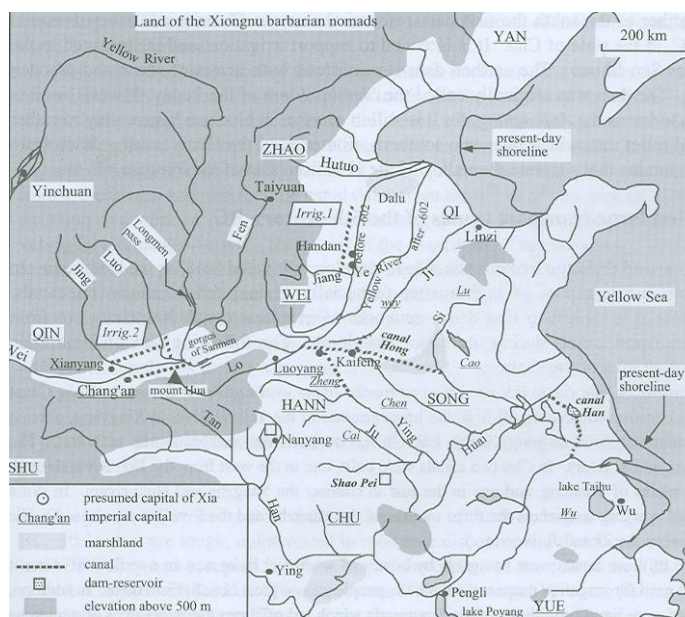


Fig. 161. The basian of the Yellow River and the blue River,from the Warring States up to the early Han Empire.The underlined upper-case names refer to these states after 350 B.C. .The underlined names in italics refer to the regions, more ancient, of the Spring and Autumn period. Grand irrigation projects of the feudal period:

Irrig1:between the Jiang and the Yellow Rivers(Ximen Bao)

Irrig2:Zhengguo canal and derivation canals (Zheng Guo)

Irrig3:Min basian-Figures8.5 and 8.6(Li Bing)

The name of this dam which is 3.9m high is Tianping. Other Abbands were also built on this canal by which it is possible to adjust water level and current as well as dividing the Spade Head of water in two to direct one of its branches toward this canal. Additionally another dam was built at this spot which disposed of extra water. If this dam had not been built, the high pressure of water could damage the conservative wall of the canal preventing water flowing

southwards. An advantage of building this structure is its calming effect on turbulent water as well as preventing dam breakage and enabling a slow flow of water. The canal water flows around Xiangon and is used to irrigate farmlands.

HONG CANAL

This canal flew in the lower section of Yellow Sea in Xing Yang and passed several towns joining Ji, Ru, Huai and Si rivers which flow in the same direction. Two canals were built in Chu: one flew westwards from Han river amid Yunneng plains and the other flew eastwards and connected Yangzhe and Huai rivers. A canal was dug in Wu which connected three mouths of Yangzhe and five lakes. Additionally, there is a canal in Qi between Zi and Ji rivers all of which are sailable. The most interesting connective canal of this era is the Hong canal(Wild Geese)which is actually a canal systems connecting Yellow Sea from a town called Xing Yang(jung yang)near Kaifeng to Ji river which flows north of Shandong mountains, but its resource is somewhere nearer beside inlets of Huai river north shore.

This canal has two branches: the northern branch (Bian canals) is usually used for transportation and probably travels the course of the ancient river of Bian (Pien) and joins Si and Huai river. Indeed a 900 km long river is made which is partly artificial for sure. The southern branch of it (Langtanqu canal)connects Yin, Sui and Kuo rivers at their resources having a length of 400 km between the Yellow Sea and Huai river and passing through Ying river. Its entrance on Xiang river actually creates an artificial canal having a near horizontal bed and a slope sufficient to empty 30% of Xiang water. This artificial canal is approximately 5 km long extending to near the resource of Li river.

Along Xian river, there is a 3 km long side canal with a depth of 1-2m and a width of 5-8m.The design of the main drainage? of Xiang is certainly adopted from a structure constructed several decades ago on Min river, having a separate annexation extending to beneath the drainage duct of the dam which is v-shaped. This complicated structure is designed in a manner that enables water elevation in order to supply the necessary water for the canal in which a basin is made having sufficient water for boats to sail.

MAGIC CANAL

Later, another canal was built behind this detached structure which enabled boats to travel freely to other canals. For this reason it was called the Magic canal and was rebuilt in 825 AD equipped with separate gates. These gates were on Li canal and gave boats the opportunity to sail easily even in low water condition. Completion of this project and other

canals in the feudalism era indeed made a canal (Hong) which connected Canton to Chang via Xi, Li, Xiang, Yangzhe and Huai rivers and afterwards linked the Yellow Sea to Wie canal.

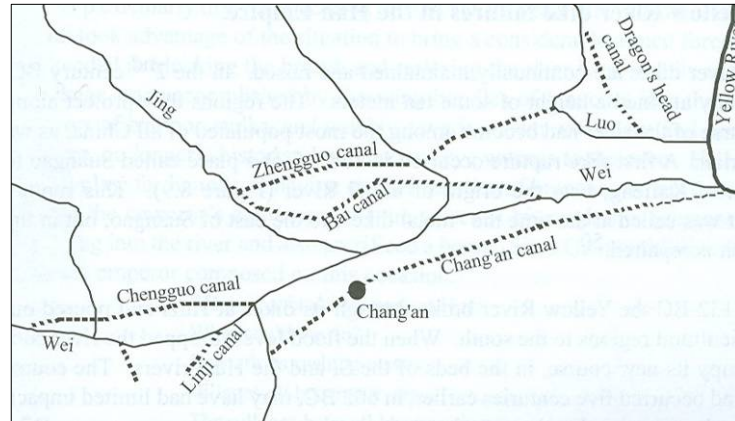


Fig. 162. The transport and imigation canals in the Wei basin, during the Han era,adapted from lian Ruiju ,Zheng zhaojin,Hu Jialin(1987) and other sources.

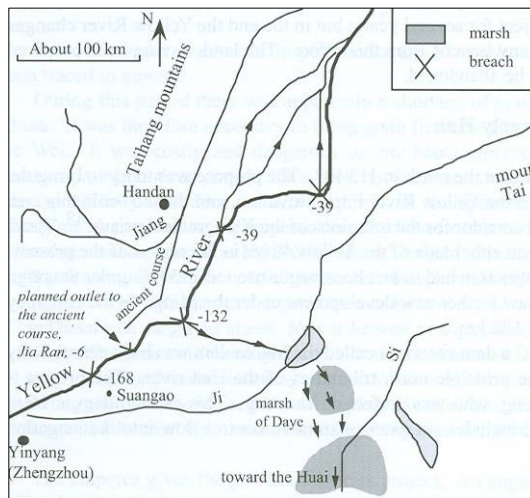


Fig. 163. Probable locations of the great Dam ruptures of the Yellow River under the early Han(adapted from Liang Ruiju,Zheng Zhaojin, i Jialian,1987, and other sources).

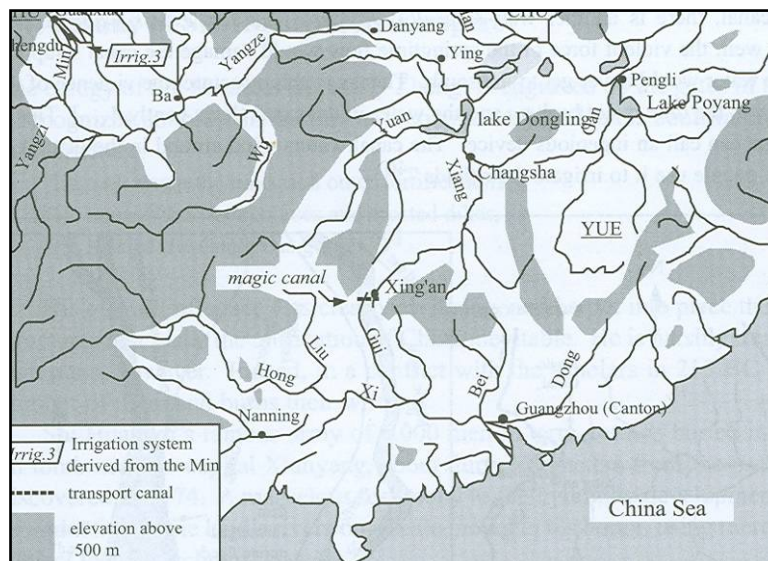
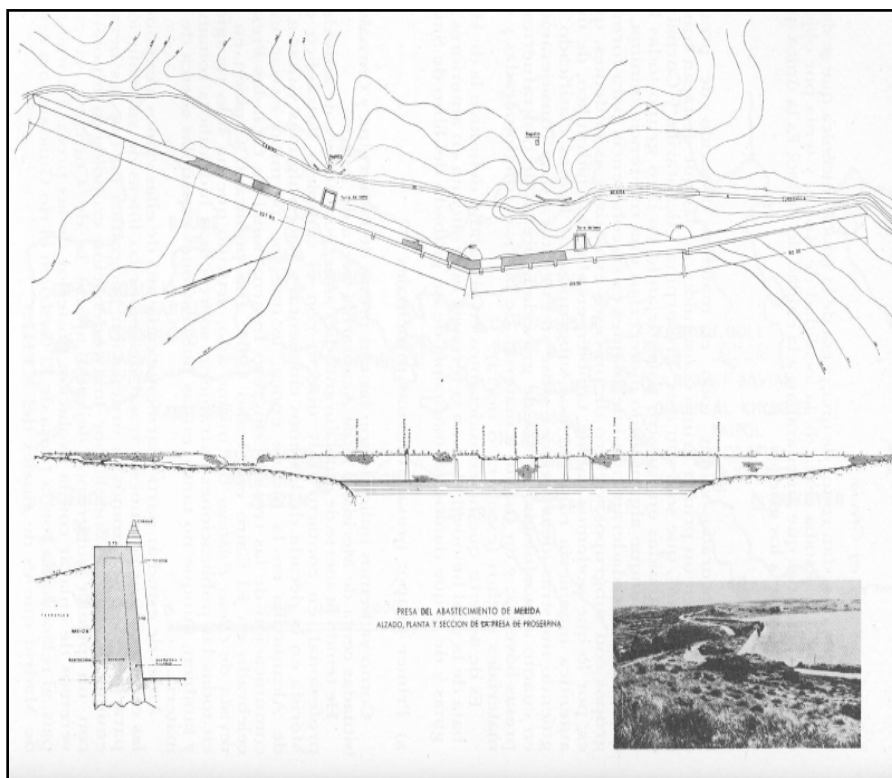
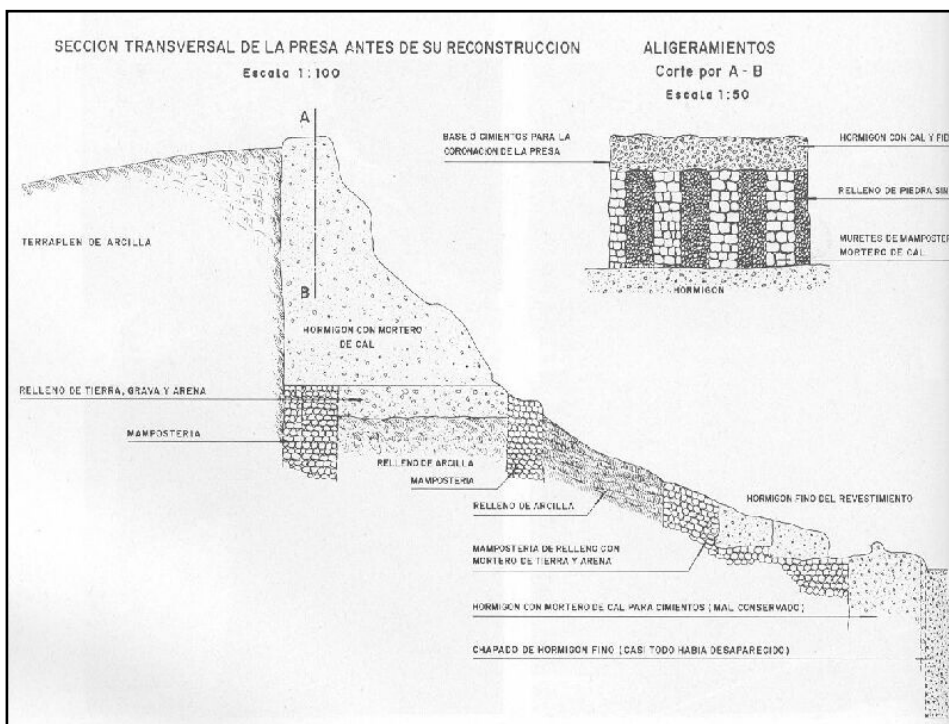


Fig. 164. The hydraulic works realized by the Qin in south China. The layout of the branched canals in the Chengdu region is taken from the map of von Richthofen (1877)

4-6: SPAIN

There are still the remains of about 80 water structures in Spain which are recognizable. All of them are dams with a height varying between 1-19m and a length varying between 700-m. Most of these structures fulfil the irrigation needs as well as water requirements for industrial and urban growth and are located at specific regions. There are 9 dams surrounding the northern major city of Saragossa and another 15 dams surrounding Toledo which connect northern Spain to Lositania. Additionally, 12 dams were built around the capital Merida for irrigation, industrial and urban purposes. Different techniques have been used in constructing two of the biggest dams in Spain which makes their comparison interesting. The oldest dam built in this region was Alcantarilla located at the apex of an aqueduct. It is 50 km long supplying water needed in Toledo. Alcantarilla passes Tagus valley via an inverted siphon. Dam-building in this region dates back to the second century B.C. which correspondence to the date of constructing Toledo. Alcantarilla is 14m high and 557m long consisting of a relatively simple wall guarded at the downstream of the river by forts. There is also a rampart at the eastern part of this region which alleviates water pressure. This dam was destroyed at an unspecified date apparently due to the compression of rampart walls in the counter-current.

Prosperina dam with a height of 15m and a length of 426m is located 6 km north of Merida. It has a stone-masonry wall guarded at its lower entrance with ramparts just like Alcantarilla and at its higher entrance by nine backup and stone masonry walls. Water is absorbed by two wells located inside ramparts and exactly opposite the dam wall.



Figs. 165-166



Figs. 167-168. Proserpina

The newest dam built between these dams is Cornalvo located 13 km north-east of Merida which consists of an earth gutter having a length of 220m with a max height of 20.8m. The upstream surface of its brook is divided by a series of retaining poles and is guarded by a backup wall at the higher section. The water absorbent tower has been built via water absorbent entrances in two floors located 10m upstream of the dam wall inside the reservoir and makes a steeper upstream slope. This layout is mostly seen in modern dams. The exact construction date of these dams is unknown but apparently Prosperina was built during the reign of Trajan i.e. approximately 100-110 BC. According to researchers, Cornalvo was built when Hadrian was in power which was around 120-130 AD. Cornalvo and Prosperina dams are still in use today thanks to their clever design and good maintenance.”(Violet 2007: 167-170)



Fig. 169. Cornalvo

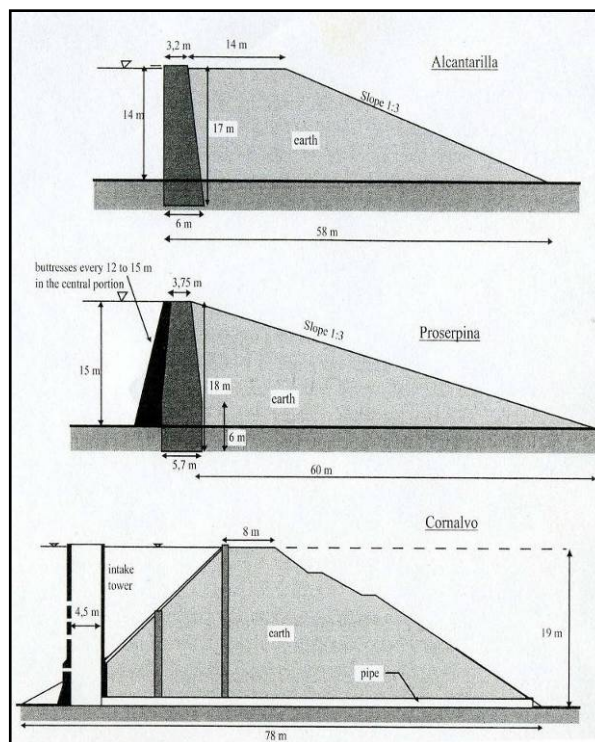


Fig. 170. Roman dams in Spain.

4-7: ARABIA

Numerous small dams have been built on wadis of Arabia specially in Mecca and Medina where the pilgrims gather (about 14 near the former and 4 near the latter) in order to divert flood water and to store them in cisterns and basins. Their length varies between 25-225m with a height varying between 2-12m. the biggest dam is Qusaybeh near Medina with a height of 30m which is significant. Some of the dams built in this region have epigraphs dating back to the Umayyades dynasty.

Conclusion:

Shushtar water structures also belong to a period before the Sasanian, some apparently date back to Elamides rule, despite lack of strong evidence. A well-watered river like Karun passing through Shushtar doubtlessly motivated the Sasanian to build tunnel, canals, bridges, dams and water mills, just like the land of Urartu which was suitable for water structures construction due to the presence of rivers like Arax and Artsani. Canals and streams of Shushtar were built on a rocky bed which in some parts became tunnel e.g. Gargar artificial stream in Shushtar which after departing from Karun and traveling some distance turns into a big tunnel transferring water to open fields then continues as a canal. Subsidiary tunnels separated from Menoa canal are comparable with tunnels branched off Gargar Canal. This

Canal has three tunnel in its course (Boleyti, Dahâne Shahr and Sekure) which were digged in three different levels inside natural cliffs. These tunnels control Gargar water and transport it to open fields in order to run mill wheels. Water delivery tunnel of Shushtar have also been built in a rocky bed which due to the resistance of their bed are still efficient and operative in supplying water after some 2000 years.

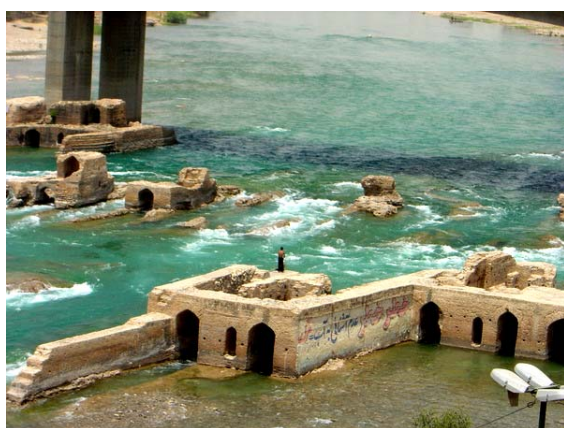
Mianab plain in Khuzestan is located between two branches of Karun and is a small model of Mesopotamia. Here due the level difference of river surface and surrounding fields, many attempts have been made to expand irrigation systems. The partian town of Dastova was developed as a result of constructing Dariun canal and Gargar Canal. A common characteristics are using natural features like rocks to construct canals as well as building long tunnels to control and direct water, like Boleyti tunnel built in the 360m long Gargar bridge-dam which was constructed beneath cliffs having triple functions: flood control, feeding mills and irrigating farms.

5-MILLS AND WATERFALLS

A-EXAMPLES INSIDE IRAN

5-1: DEZFUL

Near Dezful bridge-dam, remains of about 15 mills are seen operated by Dez river water power. These mills are boat-shaped and erected on river surface.



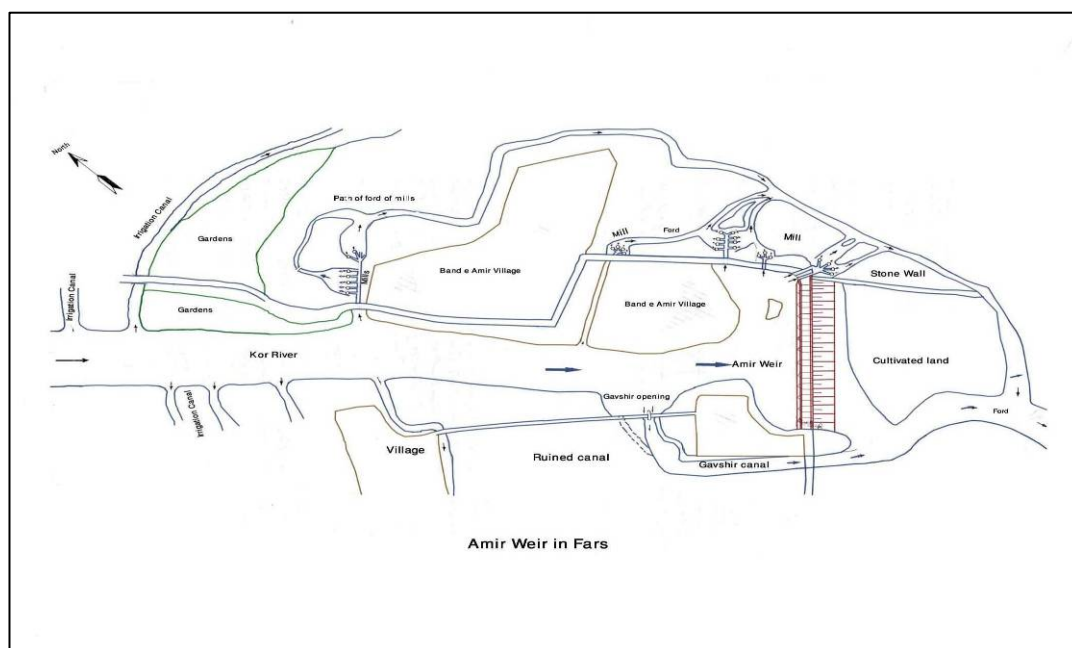
Figs. 171-172

5-2: ARJAN

Near Arjan bridge-dam there were mills rolled by Maroon water river but no trace of them remains.

5-3: BANDEAMIR COMPLEX

This complex had 25-30 mills of eddy type of which only remains of 25 mills are seen which made the region an economical pole.



Figs. 173. BANDEAMIR location and its mills.

5-4: TILKAN COMPLEX

This complex is located at a distance of 37 km from Band-e-amir and part of structures built on Kor river. Remains of 8 mills of eddy type are seen at its vicinity.

5-5: FEYZABAD

This dam was built on Kor having 22 mills of which only the remains of two still exist.

5-6: NIASAR

This town has a beautiful and historical complex comprised of waterfalls, mills and Chahartaghi (leanto). At the highest point of the town the fireplace was built and beneath this hill a spring called Eskandar is seen which after some distance flows downwards and makes Niasar waterfall with its mill built at the downstream. Due to the presence of the leanto, waterfall and mill, this complex is relatively like Shushtar waterfalls complex.



Figs. 174 -175. View of Niasar monuments.

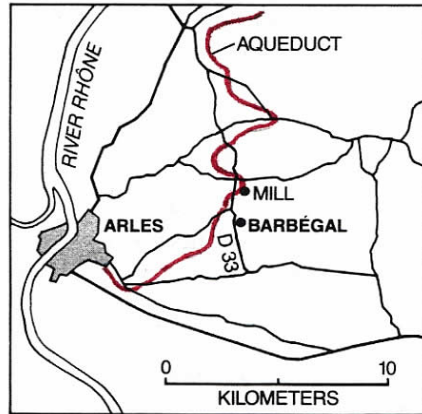
Conclusion:

In Niasar there are one water fall, one leanto and one mill but in Shushtar there are several of each. In Gargar course there are many leantoes which together with more than 50 mills made this region an industrial center of the past. The water discharged from these mills when flowing atop the cliff onto river surface, made powerful and beautiful waterfalls. Shushtar mills are more numerous and better-structured than mills in other locations and not only fulfill regional needs but also the requirements of surrounding towns and districts. Additionally beside most of Shushtar bridge-dams, smaller numbers of mills are seen.

EXAMPLES OUTSIDE IRAN

5-1: ROME

One of the biggest historical mills in the fourth century BC was Barbegel complex in which the power needed to run mill stones came from 16 water wheels set in two parallel axes each having eight wheels. Each axis was on a slope in which water flew and rolled them one by one. Before the water flows into the aqueduct, all eight axes begin to roll. An estimation of the efficiency of these structures including 50% downtime, shows that the flour needed for 12500 inhabitants of Arlene (present Arles) area in the 4th century BC was provided by it.



Figs. 176. The mill at Barbégal was built in the fourth century AD near the port of Arles, along an aqueduct that had once supplied water to the city.

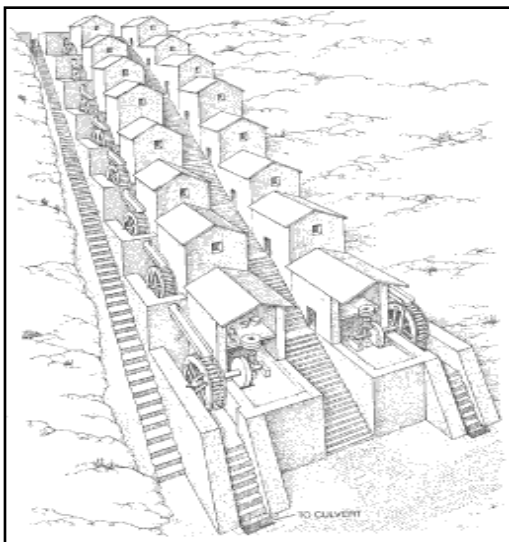


Fig. 177. Overshot waterwheels are conjectured to have driven

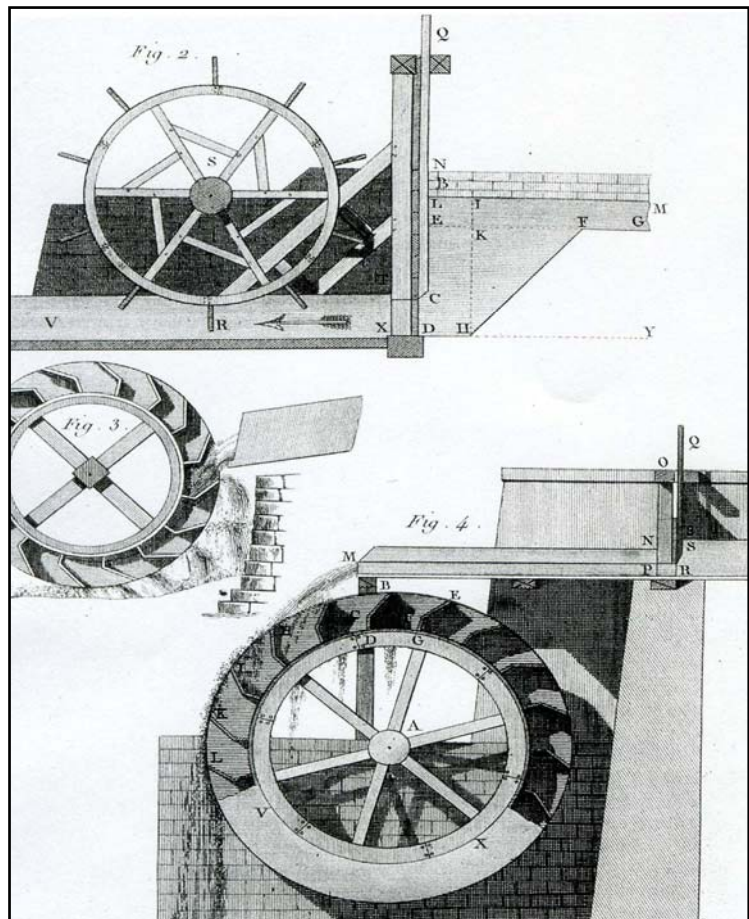


Fig. 178.

5-2: JORDAN

Jordan is one of the Asian countries active in building bridge water structures. This country possesses grand masterpieces of such structures like Siq strait water structure.

Conclusion:

Proper usage of natural features like cliffs to construct waterworks and long tunnels for controlling and directing water is comparable with specimen of Shushtar, like Boleyti tunnel in the Gargar bridge-dam with a length of 360m beneath local rocks which in addition to hindering floods, also fed mills and irrigation farms. Despite lack of any traces showing mills around Shâdorvân bridge-dam, some historians and researchers like Madam Diulafoa and Rogen have presented blueprints of them which show that apparently west, south and north of the dam, some mills had been constructed.

6-CASTLES

A-EXAMPLES INSIDE IRAN

Despite the variety of castles in Iran, apparently there are not a single one relevant to management, maintenance, safeguarding and river water distribution, built in connection with water structures.

6-EXAMPLES OUTSIDE IRAN

6-1: URARTU

The Urartian castle built on Van lake shore overlooked Khoshab river and Menoa canal. It was constructed in a dominant position over irrigation and water delivery system so as to enable the safekeeping of its facilities. A trench was built around the castle in order to prevent enemy attacks. Fountains inside the fortification made possible water usage at emergency occasions without the interference of enemies. A reservoir was built in Tooprak castle for supplying water with exclusive access from inside. Water needed by other castle inhabitants in nearby heights whether for drinking purposes or else was provided via gutters and ceramic or stone barrel-drains.

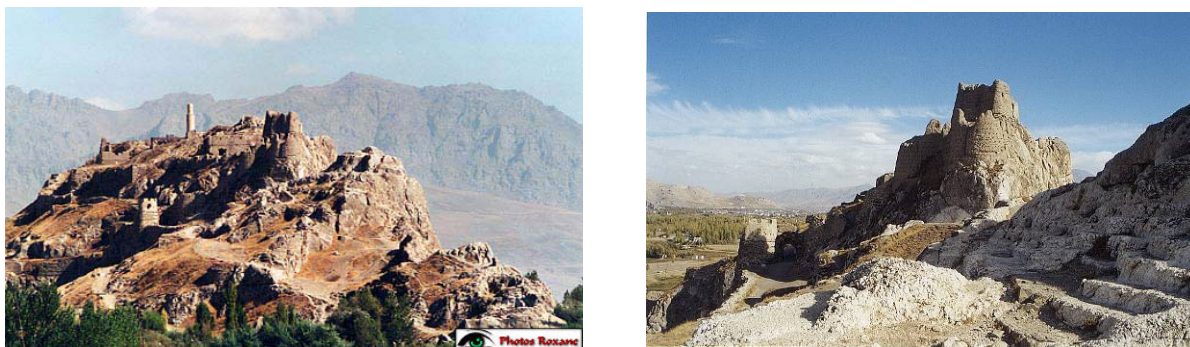


Fig. 179. Views of 'Van ' Urartian Castle.

Conclusion:

Salasel castle located north of Shushtar was built on a natural, high cliff and originally was the governor's resident as well as the city citadel but due to its dominant position over surrounding water structures, not only served as a safe haven for its own dwellers but also was regarded as the center for water management and control and surveillance of water structures. Shushtar castle is surrounded by a trench from east and south sides and from north and west is embraced by Shoteit (a Karun branch) and Dariun stream respectively which made stricter defence possible. In Salasel, different arrangements were made to access water during war or siege. In this respect there are stairways which lead to Dariun stream tunnel beneath the castle so as there was no need to go out and confront with the enemy which made an enduring resistance possible. Water delivery to the higher parts of the castle was performed by barrel-drains from the river water which after being stored in the basin was delivered to other sections of the castle again by barren-drains. Additionally, as was mentioned before as the regional governor dwelling center for many centuries, Salasel castle possessed all the characteristics of Urartu castles, with the exception that the huge water structures under Salasel are bar none.

7-HAND-MADE STREAMS, CANALS AND QANATS

A: EXAMPLES INSIDE IRAN

7-1: KARKHEH PAYEPOL

On the right side and downstream of Karkheh Payepol is seen the basin of a canal extending along Karkheh towards the ancient Sasanian city of Ivanekarkheh. There were also canals originating from the left river shore which crossed each other and had two different levels.

7-2: ARJAN BRIDGE-DAM

Water delivery was done via qanats or with the help of a diversion canal as well as drying up the river bed.

7-3: AMIR COMPLEX BRIDGE-DAM

This bridge is relatively similar to Shushtar water structure both structurally and functionally. Their resemblance are in the right and left diversion canals, stone-pavement of river bed and the mills beside the dam. There are other mouths along this bridge too, like the one related to the bridge built on Gawashir canal and the mouth built in the direction of the water diverted to the south-eastern mills of the dam. Generally speaking, water diversion was done via three chanells: Gawshir canal, Fana Khosrow and Atabak streams.



Fig. 180. View of 'Gawshir ' Canal.

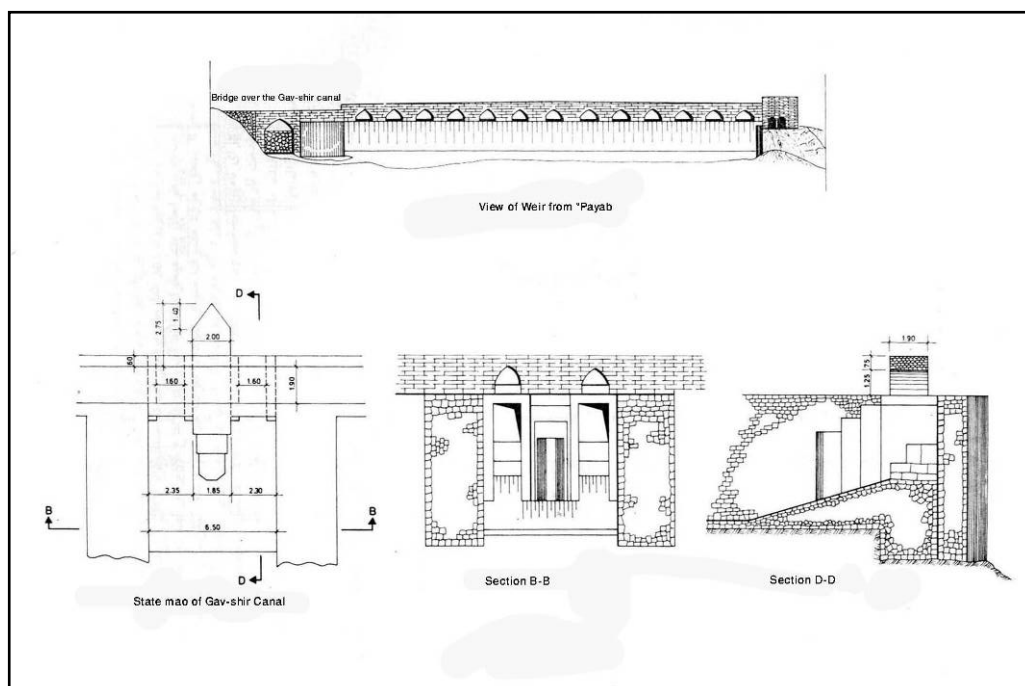


Fig. 181

Conclusion:

In Shushtar, the Dariun canal after branching off Karun river is itself divided into several branches which irrigate more than 40000 hectares of Mianab plain fields. The three tunnels of Gargar bridge-dam irrigate farmlands along their route in addition to feeding mills. For more information about the long, hand-made stream of Gargar, please refer to previous pages.

BRIDGES: EXAMPLES OUTSIDE IRAN**7-1: MESOPOTAMIA**

Due to the lower level of these rivers than the surrounding lands, the need for irrigation networks was always felt in this region. Therefore usage of water structures facilitated water extraction which had utmost importance for a land known as the cradle of many ancient civilizations. Actually Mesopotamia has a high place in the world history and deep ties with Khuzestan plain which is the continuance of Mesopotamia. Wars between Mesopotamia and Khuzestan governments as well as their cultural relations have caused many similarities between the two lands regarding culture, arts, architecture etc.

Mianab plain in Shushtar is effectively a small sample of Mesopotamia in which due to the different levels of land and river, irrigation networks have expanded. The Arasid city of Dastowa was developed because of the presence of Dariun canal and Gargar Canal. A similar situation is seen in Mesopotamia related to Nahrawan canal which was also constructed during the Arasids rule. Senakhrib, king of Assyria (7th century BC) was among Mesopotamian kings interested in building water structures.

7-2: JORDAN

The reader is referred to previous pages under the same title.

7-3: URARTU

The reader is referred to previous pages under the same title.

7-4: ROME

The reader is referred to previous pages under the same title.

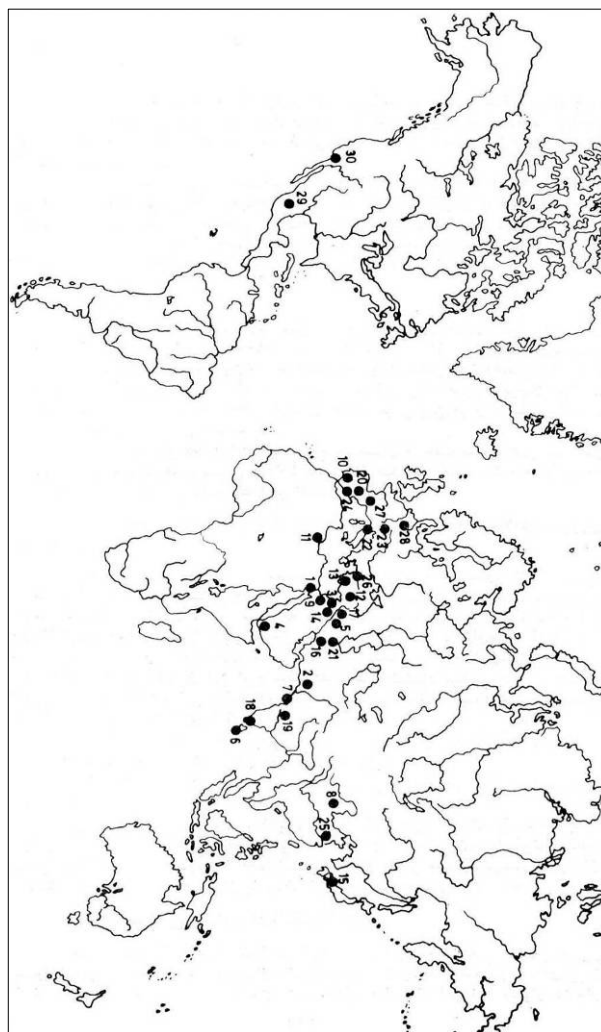
7-5: CHINA

The reader is referred to previous pages under the same title.



Fig. 182. Location of old Iranian dams & bridges on the map : 26

1-Cyrus the great Dams	16-Pay-e- pol bridge -dam	31-Darwaze ghoran dam	46-Golestan dam
2-Dams in the kor river	17-Karkhe dam	32-Dokhtar soil dam	47-Torogh dam
3-Bahman dam	18-Khak dam	33-Tous bridge-dam	48-Ashraf dam
4- Dariun the Great dam	19-Khoda afarid bridge-dam	34-shesh taraz Dam	49-Ghazvin dam
5-Aghili dam	20-Argan dam	35-Save Dam	50-Dara dam
6- Dokhtar dam	21-Shahr-e-lut dam	36-Kobar Dam	51-Âmar shah dam
7- mizan dam	22-Darwaze dam	37-Tabas Dam	52-Alah verdi khan dam
8-Gar gar bridge -dam	23-The difrent dam in the PersianGulf island	38-Ghohrud dam	53-Abshar dam
9-Ayar dam	24-River Mond Dams	39-Ghamsar dam	54-Sarvan dam
10-Mahi bazan dam	25-Amir dam	40-Khojoo bridge-dam	55-Goli dam
11-Dara dam and ghir dam	26-Feyz abad dam	41-Akhlamddam	56-Shânzdah deh dam
12-lashkar bridge -dam	27-Tilkan dam	42-Fariman dam	57-Ghatalat shah dam
13-Shah ali bridge-dam	28-Movan dam	43-Kalat dam	58-Shadervan bridge-dam
14-shushtar bridge -dam	29-Hasan abad dam	44-Karet dam	59-Khalaf abâd
15-Dezful bridge- dam	30-Jahan abad dam	45-Salami dam	



183. The location of universal historical dams, based on their establishment date (up to 18th century A.D)

- 1- Kosheish (2900B.C) and Sadd-el-Kafara (2500B.C)
- 2- Mashkai and Lakorin (200B.C)
- 3 - Homs(1300 B.C)

- 4- Sudd-al-Arim (750 B.C)
- 5- Ajilah , Qayin and Bavian (700 B.C)
- 6- Basawakkulam (4300B.C) and later Sinhalese dams
- 7- Sudarsana (300 B.C)
- 8- Gukow (2400 B.C)
- 9- Siq and Kornub (Christ)
- 10- Cornalbo, proserpina and Esparragalejo (1st.century)
- 11- Dams near Homs (Roman)
- 12- Orukaya(Roman)
- 13- Cavdarhisar (Roman)
- 14- Al- Harbaqa (Roman)
- 15- Kaerumataik(162) and Daimonike
- 16- Shâdorvân (270 A.D)
- 17- Dara (550 B.C)
- 18- Moti Talav (10th century)
- 19- Bhojpur (11th century)
- 20- Almonacid (11th century)
- 21-Kebar and Saveh
- 22- Cento (14th century)
- 23-Sepielfreudercee (1460)
- 24- Tibi (1589) and Elche (1590)
- 25- Ming (16/17th century)
- 26-Ikinci (1651)
- 27-Se.Ferreol (1675)
- 28- Oderteich (1721)
- 29- Pabellon, Los Arcos and San jose de Guadalupe(18th century)
- 30- San Diyego and Los Anjeles

Comparative tables of monuments and sites :

1 .Monument type: bridge

No	Name	fig number	Material	Dimensions			Era	Location
				Height m	Width m	Length m		
1	The old Dezful bridge-Dam	132-135	Stone, Saruj	15	-	340	Sassanid (248-630A.D)	Khuzestan Dezful
2	Karkhe Paye pol bridge	-	Stone, Saruj and metal clamp	-	-	640	Sassanid	Kuzestan susia
3	Arjan bridge-Dam	136	Stone, Saruj and metal clamp	7	-	125	Sassanid	Kuzestan Behbahan
4	Dorud-zan bridge-Dam	137	stones	-	-	-	Achemenid 550-330B.C)(Fars Marvdasht
5	Amir bridge-Dam	138-139	Stone, Saruj and metal clamp	3.8	5	105	AL-e-buye (9A.D)	Fars Marvdasht
6	Tilakan bridge-Dam	140	Stone, Saruj and metal clamp	6	16-17.5	162	AL-e-buye (9A.D)	Fars Marvdasht
7	Bardeboride	141	Stone, Saruj and metal clamp	-	-	-	Achemenid	Fars Marvdasht
8	Mehrnerse	142	Stone, Saruj	-	-	-	Sassanid	Fars
9	Khan bridge	143	Stone, Saruj	-	-	-	16 AD	Fars Marvdasht
10	Shahrestan bridge-Dam	144	Brick, Stone, Saruj	4.5-6.9	2.5-5	105	Sassanid	Esfahan
11	Khaju bridge	140-146	Brick, Stone, Saruj	-	11.65	131.5	16 AD	Esfahan
12	Sio-se-pol Bridge	147	Brick, Stone, Saruj	-	14	300	Safavid (16 AD)	Esfahan
13	Pant du gard	150-151	stone	48	-	230	4 AD	France

2. Monument type: Dam

No	Name	fig number	Material	Dimensions			Era	Location
				Height m	Width m	Length m		
1	Jarre Dam	152	Stone, Saruj	19	-	-	Sassanid (248-630A.D)	Khuzestan Ramhormoz
2	Feiz-abad Dam	-	Stone, Saruj	3-4	5-12	222	achemenid (550-330B.C)	Fars Marvdasht
3	Uskaf dam	-	-	10	-	250	-	Iraq
4	Petra dam	157-159	Stone	14	-	43	-	Jordan
5	Alkantarilla	170	Stone	14	-	557	2 B.C	Spain
6	Persoperinna	165-168,170	Stone	15	-	426	100 B.C	Spain
7	Caralanno	169,170	Stone	20.8	-	220	120 AD	Spain

3. Monument type: Canal

No	Name	fig number	Dimensions			Era	Location
			Height m	Width m	Length Km		
1	Gav-Shir Canal	180-181	7	10	9	Sassanid	Fars Marvdasht
2	Dialeh canal	155	-	-	445	Sassanid	Iraq
3	Nahravan Canal	155	8	100	80	Sassanid	Iraq
4	Saiid Canal	155	-	-	35	1120 A.D	Iraq
5	Menova Canal	-	1.5	4.5	70	-	Urartu
6	Hong Canal	162-164	-	-	-	7 B.C	China
7	Magic Canal	162-164	-	-	-	7 B.C	China

4. Monument type: Watermill

No	Name	fig number	Number	Type	Era	Location
1	Dezful mills	171-172	15	boat	Sassanid	Khuzestan Dezful
2	Band-e-Amir mills	173	25	Eddy	Al-e-buye	Fars Marvdasht
3	Band-e-Tilakan mills	-	8	-	900AD	Fars Marvdasht
4	Band-e-Feizabad	-	22	Eddy	900AD	Fars Marvdasht
5	Niasar mills	174-175	1	-	Safavid	Esfahan Niasar
6	Barbegal mills	176-178	16	-	4 B.C	Rome

3.d. Integrity and/ or Authenticity

The Shushtar Historical Hydraulic System retains a high level of authenticity and integrity as a comprehensive and continuing functional system. The natural environment and significant characteristics of the System can be considered completely intact since ancient times. The system truthfully represents the technological innovation and function of system in its entirety. In spite of the passage of time, natural weathering, modernization, the Shushtar Historical Hydraulic System has always continued to serve the functions for which it was created. This was guaranteed through regular maintenance, conservation and valorization.

During its life of more than 2,000 years, the functions of the Shushtar Historical Hydraulic System have evolved through the development of technologies. For example, the first industrial electricity distribution center in Iran was established within the Shushtar Historical Hydraulic System, which integrated some alterations to the facilities within the system. These interventions, however, have been integrated in a compatible and harmonious manner, demonstrating the evolution of the traditional functions of the System. The main objective and function of this System has always been to manage the hydraulic energy and water resources in a sustainable manner, respecting the environment, as well as the needs of the local communities. The continuous agricultural, economic, industrial, trading and cultural life of Shushtar region also testifies to the fact that the System has been continued.

Moreover, the authenticity of this System can be seen in all its elements including, design, workmanship, location, setting, function and materials. There are no significant alterations or destructive interventions in this System. Nevertheless, each nationally registered property within the SHHS has been analyzed and researched to examine the level of the authenticity and integrity. These studies are presented below:

1.3.d

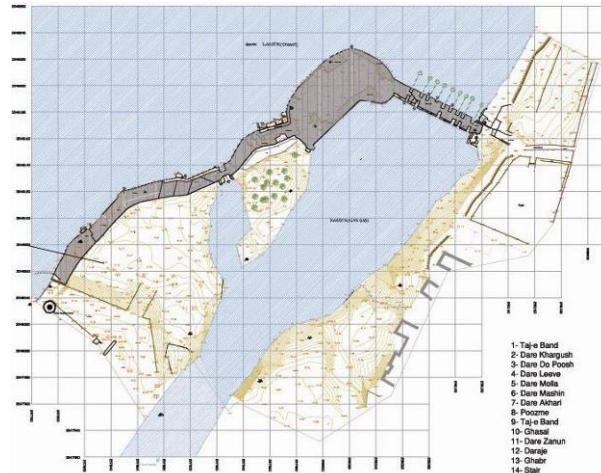
Site name: **Band-e Mizân Dam**

Site No in the List of National Iranian Monuments: 2331

Recording date: 1999



Fig. 184



Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design. Just Dam has had a crest over its up surface that has been ruined during the time.
- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in site. Just in some part it has been consolidated according to the workmanship authenticity.
- **Setting:** the original place and location of site as an ancient Dam over Karun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape.
- **Material:** the elemental materials of this site are stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions. But there are differences in some part of site due to different restoration periods.

Integrity:

- **Visual:** the arrangement and color of sites are original, and there aren't any interventions in it.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.

- **Functional:** the site has maintained its functional integrity as a Dam over Karun River by reserving, dividing and regulating Karun water. At present this functional integrity is preserved, and there are no destructive interventions.

2.3.d

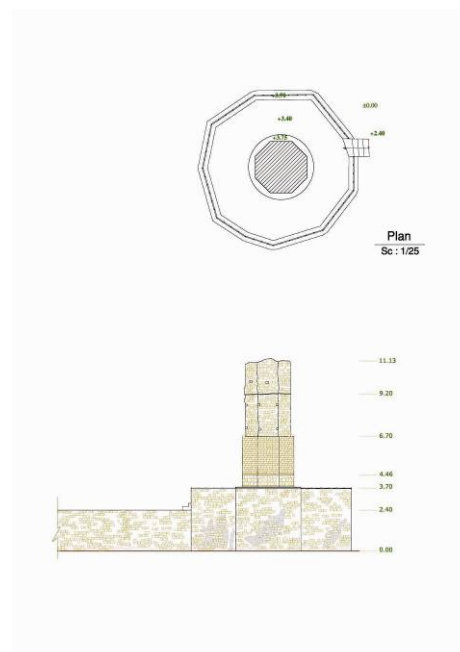
Site name: **Kolâh-Faranghi Tower**

Site No in the List of National Iranian Monuments: 2611

Recording date: 1999



Fig. 185



Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents.
- **Workmanship:** The original workmanship of site has not been altered and there aren't any interventions in site workmanship, but its pier has been consolidated.
- **Setting:** the original place and location of site as guarding tower and indicator for measurement of Karun water, has been maintained, and there aren't any visual pollutions in site cultural and natural landscape.
- **Material:** the elemental materials of this site are brick, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** the arrangement and color of site are original, just has been made a green space in site core zone that its wall connects to site's body. It has been deliberated some alternatives in management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has lost its functional integrity with Salasel castle and Mizan Dam. At present its security and measurement functions have been changed to symbolic and monumental role.

3.3.d**Site name: Gargar Canal**

Site No in the List of National Iranian Monuments: 17599

Recording date: 2005

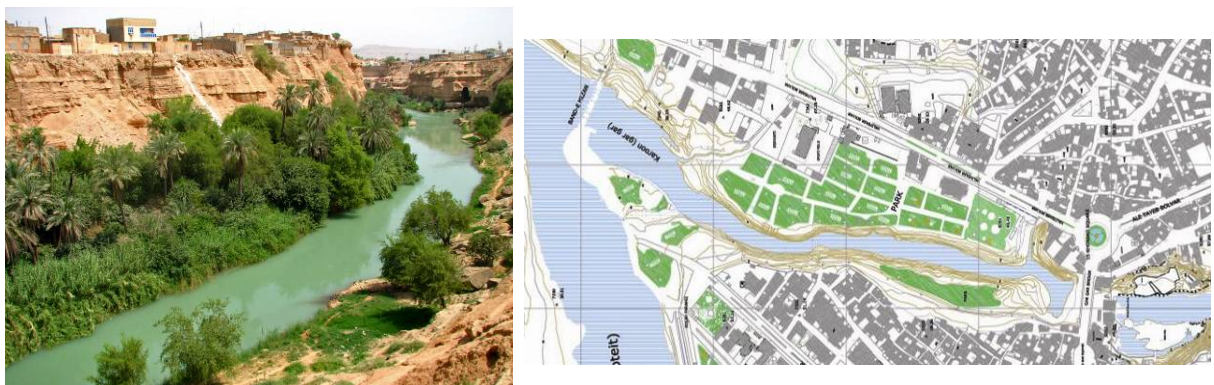


Fig. 186

Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.
- **Workmanship:** This Canal and its depended plants are hand carved form in original workmanship. It has not been altered and there aren't any interventions in site.
- **Setting:** the original place and location of site as a hand carved Canal, including sluices, openings, Course and direct of motion and bridge-Dams location, has been maintained and there aren't any visual pollutions in site landscape.
- **Material:** the elemental materials of this site are natural and original and there aren't any interventions.

Integrity:

- **Visual:** The arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has maintained its functional integrity in hydraulic function by irrigating agricultural lands of Myan-Ab region, but its function for rotating mills wheels has been changed to symbolic and monumental role.

4.3.d**Site name: Polband-e-Gargar bridge- Dam**

Site No in the List of National Iranian Monuments: 2914

Recording date: 2000

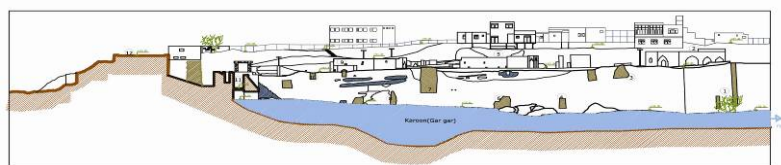
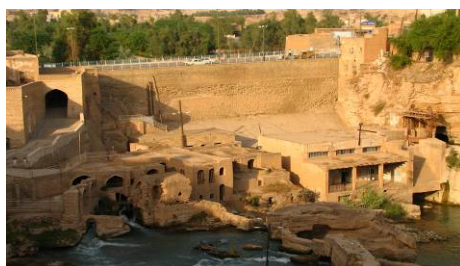


Fig. 187

Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.
- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in site.
- **Setting:** The original place and location of site as an ancient bridge-Dam over Gargar Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape.
- **Material:** the elemental materials of this site are stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** the arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has maintained its functional integrity between hydraulic and interconnecting functions but nowadays modern vehicles are passing over this ancient bridge-Dam, that has been deliberated some alternatives in short time programs of management plan for eliminating these issues.

5.3.d

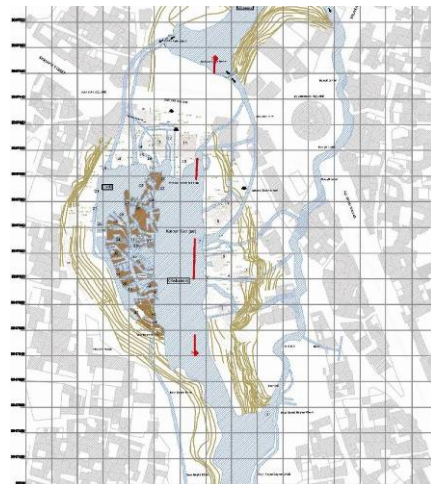
Site name: **Watermills and Waterfalls area**

Site No in the List of National Iranian Monuments: 2180

Recording date: 1998



Fig. 188

**Authenticity:**

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.
- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in site.
- **Setting:** the original place and location of site as a massive traditional factory that was working by water power, has been maintained, and there aren't any visual pollution in site cultural and natural landscape. Just has been constructed some disharmonious buildings in site's buffer zone, that has been deliberated some alternatives in short

time programs of management plan for eliminating these issues, and removing them from site buffer zone.

- **Material:** the elemental materials of this site are stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity. Just an ice factory had been constructed over the west mills remains by modern materials that at present has lost its function and demolished. That has been deliberated some alternatives in short time programs of management plan for presenting this factory and removing its disharmonious materials from site core zone.

Integrity:

- **Visual:** the arrangement and color of sites are original, and there aren't any interventions in it. Just the presence of light posts and electricity cables in site core zone has altered the visual integrity. That has been planed a standard lighting system in short time programs of management plan for removing disharmonious posts and cables from site core zone.
- **Structural:** : the original complicated structure of site as a hand carved factory, including sluices, openings, Course and direct of water motion and mills location, has been maintained and there aren't any structural interventions in site.
- **Functional:** the site has lost its functional integrity as a traditional factory. At present its productive and commercial functions have been changed to symbolic and aesthetic role

6.3.d

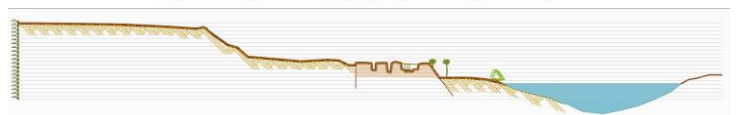
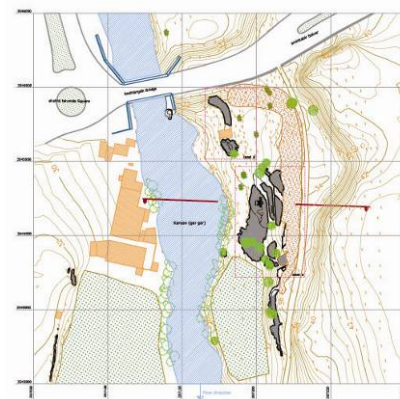
Site name: **Borj-e 'Ayâr Bridge-dam and Sâbe'in Sanctuary**

Site No in the List of National Iranian Monuments: 2940

Recording date: 2000



Fig. 189



Authenticity:

- **Design:** this System is including an ancient bridge-Dam over Gargar Canal and an archaeological site called temple attributed to Sabeen (the Khuzestan Mandaic). The original design of sites has not been altered and there aren't any interventions in sites design, but their general design has been damaged in during time, by natural agents.
- **Workmanship:** The original workmanship of sites is assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.
- **Setting:** the original place and location of site as an ancient bridge-Dam over Gargar Canal and a temple, has been maintained, and there aren't any visual pollutions in site cultural and natural landscape. At present a semi modern bridge has been constructed over the destructive ancient bridge, without respecting to site authenticity. It has been deliberated some alternatives to harmonizing this intervention with site authenticity in management plan.
- **Material:** The original materials of sites are assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.

Integrity:

- **Visual:** the arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the sites have maintained their structural integrity and all of structural components are original and there aren't any structural interventions in sites.
- **Functional:** the sites have lost their functional integrity as a bridge-Dam and temple. At present their hydraulic and religious functions have been changed to symbolic and monumental role.

7.3.d

Site name: **Mâhibâzân (khodââfarin (God created)) Bridge-dam**

Site No in the List of National Iranian Monuments: 4207

Recording date: 2001



Fig. 190



Authenticity:

- **Design:** The original plan of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents. At present this site and it's around site are important as an archaeological and aesthetical area.
- **Workmanship:** The original workmanship of site is assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains. As it is apparent from site's name, the site forming and more its elemental workmanship are natural and have been created by nature.
- **Setting:** The original place and location of site as an ancient Dam over Gargar Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape.
- **Material:** the elemental materials of this site are brick, stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** The arrangement and color of sites are original, but its general design has been damaged in during time.
- **Structural:** The site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.

- **Functional:** the site has lost its functional integrity as a bridge-Dam. At present its hydraulic and interconnecting functions have been changed to symbolic and monumental role and due to diversity of volumes that have been created by gradual erosion of site's bed stones, this site has gained some pure aesthetic values.

8.3.d

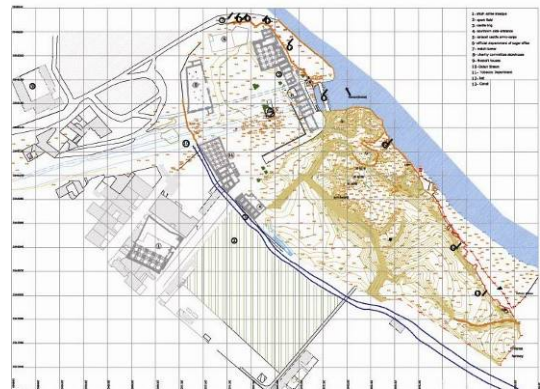
Site name: **Salâsel Castle**

Site No in the List of National Iranian Monuments: 1117

Recording date: 1975



Fig. 191



Authenticity:

- **Design:** The original plan of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents. At present this site and it's around site are important as an archaeological area.
- **Workmanship:** The original workmanship of site is assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.
- **Setting:** The original place and location of site as an ancient strategic castle, has been maintained, and there are not any visual pollution in site cultural and natural landscape. Just has been constructed some disharmonious buildings in site's buffer zone, that has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Material:** The original materials of sites are assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.

Integrity:

- **Visual:** The arrangement and color of sites are original, but its general design has been damaged in during time, by natural and human agents, and some main parts of it have been devastated.
- **Structural:** The site has maintained its complicated structural integrity and all of structural components are original and there aren't any structural interventions in site. The discovering of original structure is requiring archaeological excavations. That has been planed some programs in management plan for implementing these issues.
- **Functional:** The site has lost its functional integrity as a castle. At present its security and governmental function has been changed to symbolic and monumental role.

9.3.d**Site name: Dâriun Canal**

Site No in the List of National Iranian Monuments: 4141

Recording date: 2001

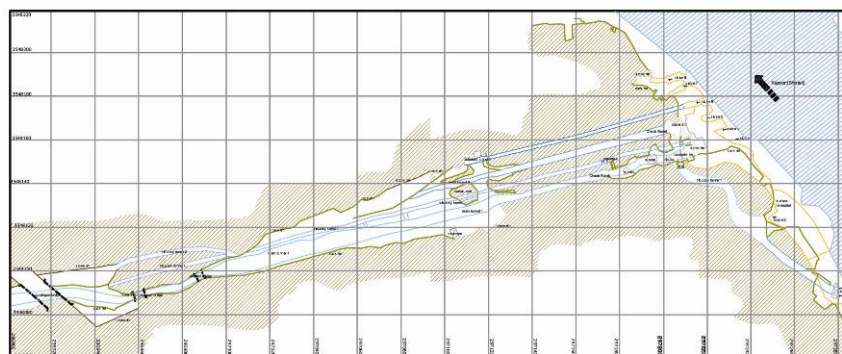


Fig. 192

Authenticity:

- **Design:** The original design of site, refer to achaemenian dynasty (529-330 B.C.) but it has been restored in different period of time, due to its bed erosion. Nowadays place and trace of the site is conforming to historical evidences.
- **Workmanship:** This Canal and its depended plants are hand carved form in original workmanship, but now it has been carried out interventions, that in some part, are altered its original appearance. We will try to present this original workmanship in educational programs of management plan.

- **Setting:** the original place and location of site as a hand carved Canal, including sluices, openings, Course and direct of motion and bridge-Dams location, has been maintained and there aren't any visual pollutions in site landscape.
- **Material:** the elemental materials of this site are natural and original, but there are differences in some part of site due to different restoration periods. At present, Canal hand carved bed, has been consolidated with concrete by ministry of power.

Integrity:

- **Visual:** the arrangement and color of site are original, but during the restoration, it has been carried out some interventions that are relatively altered the open surface of Canal authenticity. It has been deliberated some alternatives in management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has maintained its functional integrity in hydraulic function by irrigating agricultural lands of Myan-Ab region, but its security function has been changed to symbolic and monumental role.

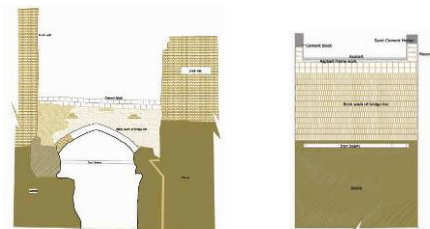
Name of site: 9-1. Single arch bridges**9-1-1.3.d****Site name: Sengborun Bridge**

Site No in the List of National Iranian Monuments: 4141

Recording date: 2005



Fig. 193

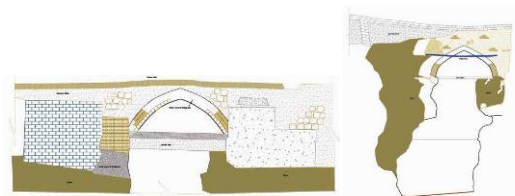
**9-1-2.3.d****Site name: Mostofi Bridge**

Site No in the List of National Iranian Monuments: 4141

Recording date: 2005



Fig. 194



9-1-2.3.d

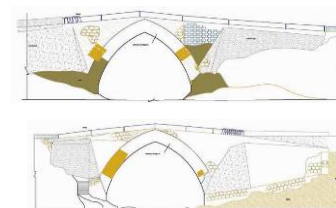
Site name: **Hâj-Khodâii Bridge**

Site No in the List of National Iranian Monuments: 11959

Recording date: 2005



Fig. 195

**Authenticity:**

- **Design:** The original design of sites has not been altered and there aren't any interventions in site design.
- **Workmanship:** The original workmanship of sites is assessable on the basis of evidences. It has not been altered and there aren't any interventions in site.
- **Setting:** The original place and location of sites as ancient bridges over Dariun Canal have been maintained, and there aren't, any visual pollution in sites cultural and natural landscape.
- **Material:** the elemental materials of this site are stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** the arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the sites have maintained their structural integrity and all of structural components are original and there aren't any structural interventions in sites.
- **Functional:** the sites has maintained their functional integrity between hydraulic and interconnecting functions but nowadays modern vehicles are passing over this ancient bridges, that has been deliberated some alternatives in short time programs of management plan for eliminating these issues.

10.3.d

Site name: **Polband-e Shâdorvân Bridge-Dam**

Site No in the List of National Iranian Monuments: 78

Recording date: 1931

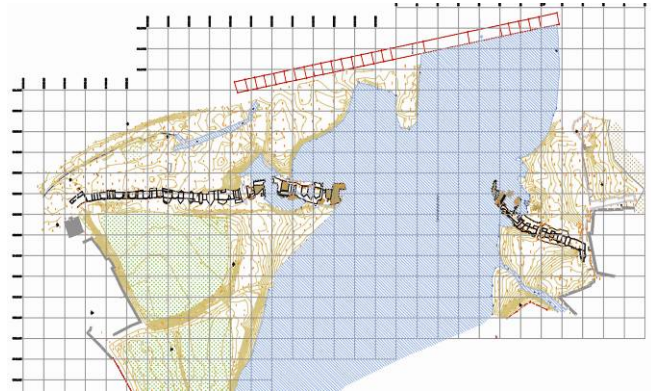
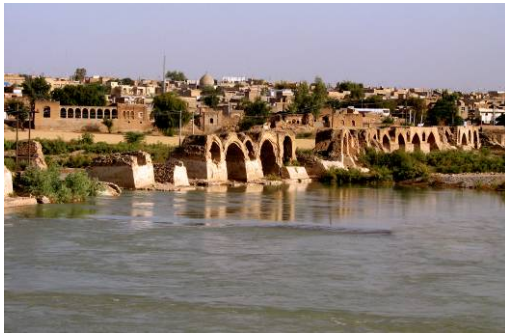


Fig 196

Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents and some main parts of it in middle sections have been devastated.
- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in remains. Just in some part it has been consolidated according to the workmanship authenticity.
- **Setting:** the original place and location of site as an ancient bridge-Dam over Karun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape. Just, at present a modern bridge has been constructed in the site's buffer zone that must be analyze and study in authenticity point of view.
- **Material:** the elemental materials of this site are brick, stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** the arrangement and color of sites are original, just some main parts of it in middle sections have been devastated and in last years installed electricity posts in site's body has falsified its authenticity. that has been deliberated some alternatives in short time programs of management plan for eliminating these issues and removing electricity posts from site core zone.

- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has lost its functional integrity as a bridge-Dam. At present its hydraulic and interconnecting functions have been changed to symbolic and monumental role.

11.3.d

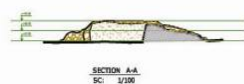
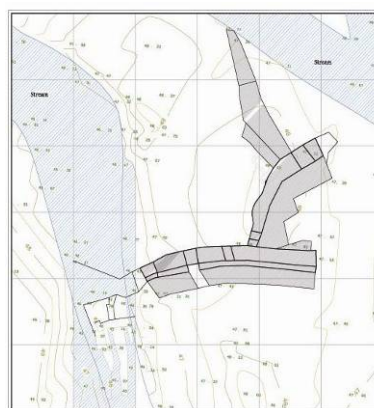
Site name: **Band-e Khâk Dam**

Site No in the List of National Iranian Monuments: 10874

Recording date: 2002



Fig. 197



Authenticity:

- **Design:** The original plan of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents. At present this site and it's around site are important as an archaeological area.
- **Workmanship:** The original workmanship of site is assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.
- **Setting:** The original place and location of site as an ancient Dam over Dariun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape.
- **Material:** The original materials of sites are assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.

Integrity:

- **Visual:** The arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** The site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** The site has lost its functional integrity as a Dam. At present its hydraulic function has been changed to symbolic and monumental role.

12.3.d**Site name: Lashkar Bridge-Dam**

Site No in the List of National Iranian Monuments: 2359

Recording date: 1999

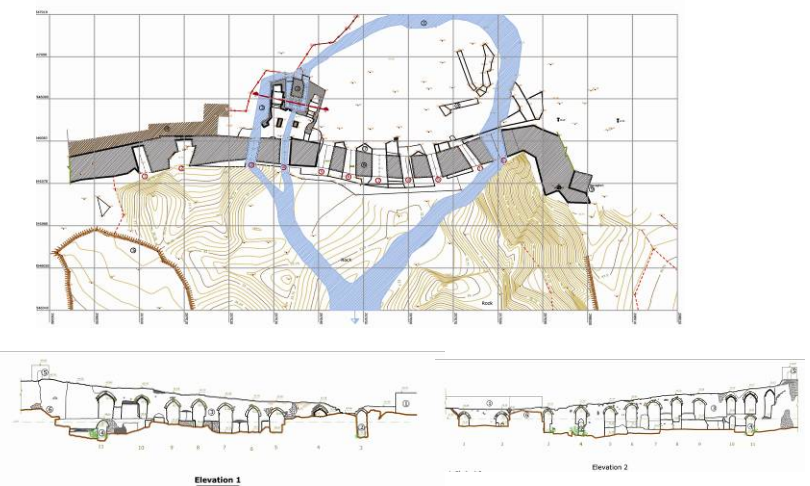


Fig. 198

Authenticity:

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.
- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in remains. Just in some part it has been consolidated according to the workmanship authenticity.
- **Setting:** the original place and location of site as an ancient bridge-Dam over Dariun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape. Just, at present a workshop has been constructed in the site's buffer zone that must be analyze and study in authenticity point of view.

- **Material:** the elemental materials of this site are brick, stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** The arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has lost its functional integrity as a bridge-Dam. At present its hydraulic and interconnecting functions have been changed to symbolic and monumental role.

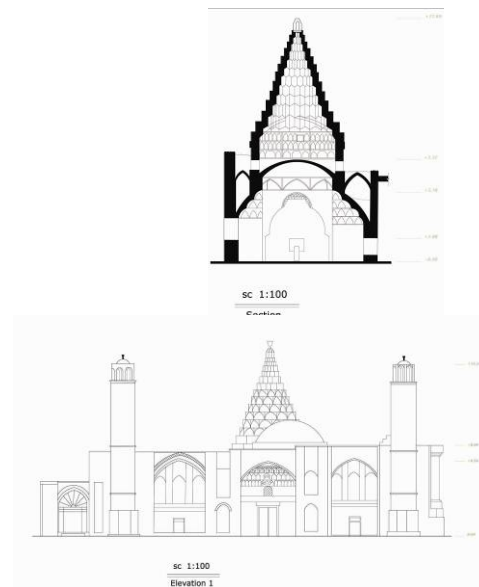
12.1.3.d**Site name: Emâmzâdeh Abdollâh Shrine**

Site No in the List of National Iranian Monuments: 364

Recording date: 1942



Fig. 199

**Authenticity:**

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.
- **Workmanship:** The original workmanship of site has not been altered and there have not been any interventions. In some minor part, there has been consolidation according to the authenticity workmanship.

- **Setting:** the original place and location of site as an ancient Shrine near the Lashkar Bridge-Dam has been maintained, and there aren't, any visual pollution in site cultural and natural landscape. Just, at present a workshop has been constructed in the site's buffer zone that must be analyze and study in authenticity point of view.
- **Material:** the elemental materials of this site are brick, stone, Saruj mortar, tile, and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** The arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has maintained its functional integrity as a Shrine near Lashkar Bridge-Dam. At present this functional integrity is preserved, and there are no destructive interventions.

12.2.3.d

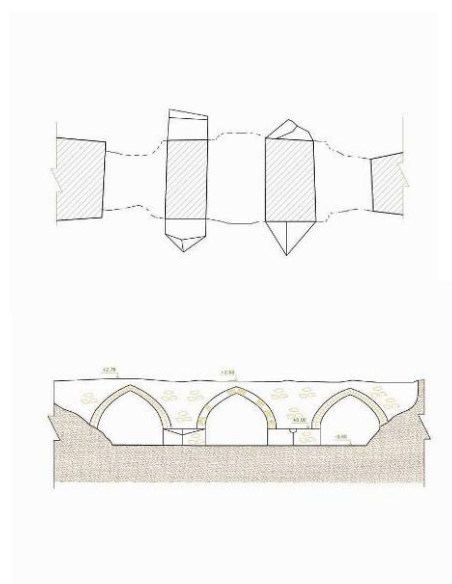
Site name: **Pol-e Shâh-Ali Bridge**

Site No in the List of National Iranian Monuments: 7938

Recording date: 2002



Fig 200

**Authenticity:**

- **Design:** The original design of site has not been altered and there aren't any interventions in site design.

- **Workmanship:** The original workmanship of site is assessable on the basis of evidences. It has not been altered and there aren't any interventions in site.
- **Setting:** the original place and location of site as an ancient bridge over Dariun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape. Just, at present a road has been constructed in the site's buffer zone that must be analyze and study in authenticity point of view.
- **Material:** the elemental materials of this site are stone, Saruj mortar and sand stone in foundation that all of them have maintained their authenticity, and there aren't any interventions.

Integrity:

- **Visual:** the arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** the site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** the site has lost its functional integrity as a bridge. At present its hydraulic and interconnecting functions have been changed to symbolic and monumental role.

13.3.d

Site name: **Band-e Sharâbdâr Dam**

Site No in the List of National Iranian Monuments: 4218

Recording date: 2001

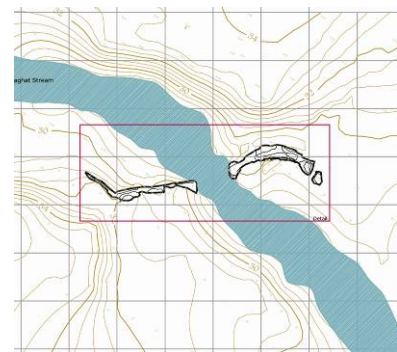


Fig. 201



Authenticity:

- **Design:** The original plan of site has not been altered and there aren't any interventions in site design, but its general design has been damaged in during time, by natural agents. At present this site and it's around site are important as an archaeological area.
- **Workmanship:** The original workmanship of site is assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.
- **Setting:** The original place and location of site as an ancient Dam over Dariun Canal has been maintained, and there aren't, any visual pollution in site cultural and natural landscape.
- **Material:** The original materials of sites are assessable and excavation on the basis of evidences. It has not been altered and there aren't any interventions in remains.

Integrity:

- **Visual:** The arrangement and color of sites are original, just has been made some disharmonious functions in site's buffer zone. It has been deliberated some alternatives in short time programs of management plan for eliminating these issues.
- **Structural:** The site has maintained its structural integrity and all of structural components are original and there aren't any structural interventions in site.
- **Functional:** The site has lost its functional integrity as a Dam. At present its hydraulic function has been changed to symbolic and monumental role.

Final Conclusion:

In its entirety, SHHS may be considered to meet the World Heritage tests of authenticity and integrity.

As demonstrated above, the SHHS credibly expresses its authentic character through the original location and setting, use, function, and technique. The local communities continue to maintain the traditional use of the property. Therefore this cultural continuity demonstrates the authentic spirit and feeling which has never ceased to exist since over 2,000 years ago. While certain ancient functions of some parts of the property are no longer continuing, the symbolism and monumental importance of these parts require them to be conserved as part of

the entire heritage property.

The SHHS includes all the elements necessary to express its outstanding universal value. The SHHS represents all necessary features and processes which convey this property's significance. It has not suffered from any adverse effects of development or neglect. The visual and structural integrity is intact throughout the entire property, as described above.

4

STATE OF CONSERVATION AND FACTORS AFFECTING THE PROPERTY

4.a. Present state of conservation

In view of the fact that the present states of conservation and factors affecting the property are depended to some different agents that threatened the sites and monuments, first, any one sites and monuments in the SHHS are researched an analyzed, number of some most important factors will be reporterd, in the end of this research

1-State of conservation (*Band-e Mizân Dam*)



Fig. 202

Band-e Mizân Dam is a stable and steady structure that is why it still exists in such a good conditions after long period of time. So, according to SHHS management plan, this relic will be under the control of conservative plans of ICHHTO base for SHHS until the compilation of appropriate basic information.

The most important problems regarding Dam's present conditions are as following:

1. corrosion and deterioration Dam's columns
2. superficial and deep cracks on the Dam's columns
3. obstruction of some mouths
4. recent annexations to the Dam (especially cement concrete floor in the eastern side)
5. stone aterials



Fig. 203-204

-State of Conservation (Kolâh-Farangi Tower)

No clear evidence is at hand about its historical background but its outward appearance shows that large parts of it have been devastated in the course of time. What remains is structurally stable but the erosion process must be controlled somehow.



Fig. 205

3-State of conservation and factors affecting the property (Gargar Canal)



Fig. 206

1. Before compilation of management plan for hydro-constructions, Gargar Canal would have been controlled as a natural-historic relic through the regulations of Power ministry and the supports of ICHHTO, so the whole Canal and its route remains almost untouched.
2. In the new regulations for conservation of hydro-constructions, Gargar Canal's route and its bank from Band-e Mizân Dam to Raght Dam have been clarified as its boundary; also its limits have been determined. In order to preserve steam's origin by all means, keeping the original connections between the Canal and historic city of Shushtar has been noticed in terms of functional characteristics as a factor to preserve physical aspects of the city in the new conservation regulations.

4-State of conservation (Gargar Beidge-Dam)



Fig. 207

1. Gargar Bridge-Dam is a strong and stable structure. As the basic structure of bridge-Dam has been built on natural rocks, despite of heavy car traffic which has been passing via the bridge for recent decades, there is no major deconstruction or demolition on the bridge-Dam.
2. however, there are some minor problems on the bridge in general:
weathering and corrosion in base rocky stone of the bridge
weathering in the stone's surface in the middle part of the bridge (Qajar Era)
3. There is some remaining of sites at the eastern side of bridge-Dam, which probably belong to city's old gate. Weathering can, also, be seen in those parts.

5-State of conservation (watermills and waterfalls area)

Watermills System comprises various segments of which each has different physical and maintenance conditions. All preserving actions done so far for maintaining those different parts are as following:

1. Core zone and the common situation

Regarding the ground's topographic shape, core zone has been separated from other urban areas and been conserved against outer problems and impacts.

In order to decrease the hazard of demolition in damaged parts and to minimize the probable dangers limiting the tourists, the western and eastern parts of the System are completely protected until the compilation of conservation studies, so all ordinary people and all tourists will be prevented from entering to those hazardous areas.

A permanent research base has been established in one of valuable houses beside the System in order to conserve, monitor, and reorganize the area.



Fig. 208

The area has been equipped with temporary lightening system to enable tourists to visit the relic, but an appropriate and permanent lightening system must be provided for the System in the future.



Fig. 209

The System, in general, comprises two parts which are the visible part and the under ground part. All efforts done so far were to secure and to conserve the visible part. On the other hand, all under ground elements such as tunnels, dug down water passages, and watermills' equipments have been dredged and been stabilized towards complete conservation of the System, for one of the most immediate needs of System is to stabilize all those tunnels' walls. In addition, some temporary parapets have been installed to prevent tourists from falling down.

All city's developments in the past within the boundary of relic have affected the view of System in addition to damaging adjacent parts of that and its under ground segments. Minimizing those damages needs to provide and to implement especial plans and also needs to change urban connections physically. To do so, all required activities have been planed in the System's management plan which should be implemented with local authorities' and national government's consent.

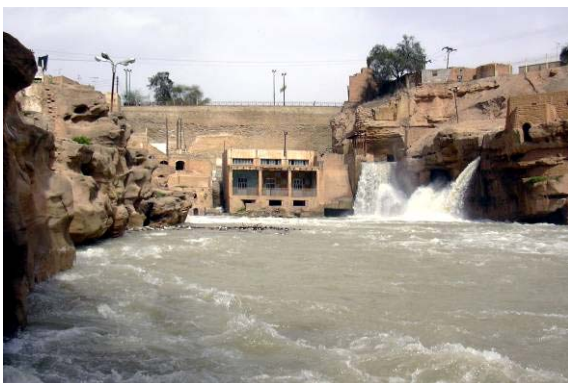


Fig. 210



Fig. 211

Nowadays, some guardsmen have been employed by ICHHTO to look after the System in addition to give needed services to the tourists.

2. core zone area, northern part

The constructions built in 1940s at the northern part of System are the most important change in that part. Leaving or demolishing those buildings needs more investigations and more studies, so all of them are kept presently as they are.

All elements added to northern side for preparing visiting routes are temporary, and reorganization of them has been planned in improvement plan.

System's entrance and the information office for tourists have been fitted at restored buildings in the northern side.



Fig. 212



Fig. 213



Fig. 214

3. core zone area, western part

The differentiation of erosion process in various layers of western wall caused the demolition of this part of System. All activities done for preserving this part have been physical protection because of complication of the situation.

All constructions built beside the western wall in the past accelerate the progress of deterioration, so owning and improving those buildings have been planned in management plan.

with the exception of western side, in stone parts and in hand-dug sites in the rocks within the System, some grades of deterioration and weathering are seen in which the process of rehabilitation needs further studies and planning.

At the island, most of corridors, canals, and sites dug in stones are proportionally stable, but need their walls to be stabilized.

4. core zone area, eastern part

At the eastern side, some of architectural sites, which have been built on the ground and been demolished in the past, have been rehabilitated. However, the under ground parts of watermills, corridors, and tunnels are kept in previous condition and all efforts will be done for their protection.

6-State of conservation (Borj-e-Ayaar bridge-Dam and Sâbe'in 's sanctuary)

The core zone comprises a System of sites situated in an expanded area. Borj-e 'Ayâr Bridge-Dam and Sâbe'in Sanctuary are easily recognizable amongst all Sites. The core zone, boundary, and conservative regulations have been clarified for both mentioned sites, so any increase in deterioration progress has been prevented and controlled. Hence, different parts' conditions are as following:

- a. There is some remaining parts from the relic used to be called Borj-e-Ayaar. According to historical documents, this building was seriously damaged two centuries ago. Nowadays, the remaining of relic is preserved through periodic controls and technical visits. It's anticipated that the process of relic's erosion and some stabilization solutions for that to be studied in the conservation plan.
- b. Other relic of the System is called Saabein sanctuary. Remaining parts of the relic have been dug in rocks, so they are proportionally stable.



Fig. 215

- c. According to primary explorations, there are, probably, some other sites neglected so far within the core zone area. Those sites are subject of demolitions arisen from urban activities. The core zone has been expanded and some new regulations have been set up for that in order to revitalize those sites. Improving core zone to rehabilitate the sites has a high priority in such conservation plans for SHHS.



Fig. 216

7-State of conservation Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam



Fig. 217

1. Despite the fact that this bridge-Dam is very far from urban areas and development of the city has not strongly affected the area of relic, but the way in which the relic has been utilized has not fulfill its historical values.
2. Unfortunately, the area of relic has been used for fish nurturing in the past decade, and presently this is the most noticeable damage for relic. Removing that utilization method is the first priority in conservation plans.
3. The Dam is divided into natural and artificial parts. There are some remaining parts of artificial segment which are exposed to deterioration.
4. The natural part consists of a stone bulk which is in satisfactory conditions.
5. Because of unfit utilizations of core zone, the boundary of that is unclear and the relations between different parts cannot be distinguished perfectly, so reorganizing the core zone and clearing the sites are priorities of conservation plan.
6. No excavations have been planed and done in core zone so far. Also, there are some remaining parts in the area which must be more investigated.



Fig. 218



Fig. 219

8-State of conservation (Salâsel Castle)



Fig. 220

Salâsel Castle was extremely damaged in the past century. Abandonment, strong earthquake, and flood have destroyed the Castle. Lessening the historic importance of relic, demolition of major parts of Castle caused the new constructions to encroach on relic's core zone and the

process of erosion to be continued. At the present, general condition of different parts of relic is as following:

- a. Some parts of majority of the constructions locating at higher level of relic have been demolished. Because of lack of required information about buildings' previous conditions, at the present, architectural remaining of System have been stabilized until basic studies to be completed, and they are under the monitoring of ICHHTO base for SHHS.
- b. Majority of Castle's existing parts are under ground level or have been buried in the ground, and they have not been excavated so far. Conservation plan for the System needs long-term inclusive excavations throughout the Castle. Hence, a temporary visit route has been designed within the area in order to facilitate visit of the System while preventing undiscovered parts to be more damaged. Designing and making permanent routes requires the compilation of documentary studies within the area.
- c. In order to conserve the Castle more efficiently and to facilitate the implementation process of conservation plan, some experts of ICHHTO base for SHHS have settled in remaining constructions within the area. Moreover, they give information to tourists and they monitor core zone's conditions.
- d. Temporary lightening has been implemented in core zone for better protecting that.
- e. Settling position of Castle on top of rocks and Dâriun canal passing under that are some special characters of Castle. Dâriun's inlet, which is one of the other hydro constructions in Shushtar, has been created in Castle's fundamental rock and it joins the moat surrounding relic after passing under that. There is some remaining of this historic canal under the Castle at the present. Unfortunately, the inlet and part to the canal have been demolished and renovated to increase its hydraulic capacity. Some parts of those sites now exist and need to be conserved and documented.



Fig. 221



Fig. 222

9- State of conservation (Dâriun Canal and Single Arch Bridges)

Since a long time ago, Dâriun Canal has supplied the water needed for farm lands of Shushtar. For this reason it has been restored and repaired in various periods of time by different methods. For instance, due to the lowering of river water surface, a large part of the Canal including one of its intake have been reconstructed recently. Presently, the general route of the Canal is corresponds to its original direction. Sections of the monument not being within the irrigation course (especially those under Salâsel Castle) have remained in their former state. But consolidation and restoration of historical parts as well as environmental reorganization of the entire monument is necessary.

Two one-mouthed bridges on the Canal have also been used as access routes since a long time ago and have been restored and repaired frequently. Therefore, structural damages are not evident in monuments bodies. But continuance of the monuments stability requires the completion of structure and body investigation as well as monitoring reports. Adjustment of the historical landscape of the area and its monuments have been envisaged within environmental reorganization plans.

10- State of conservation (Polband-e-Shâdorvân Bridge-Dam)

Present remains of Shâdorvân bridge Dam consist of three main parts:

- 1-The southern section with 28 openings
- 2-The northern section with 10 openings
- 3-Relevant stone monuments north of the bridge Dam



Fig. 223

Only four opening remain from the mid section. It seems that some evidence of piles, bed-making for this section still remain submerged in river deposits but due to technical and

administrative problems, their excavation and examination has not yet been possible.

1-The southern section status:

This section has been greatly damaged. Some of its vaults have collapsed and the remainder is collapsing. In order to save the remaining sections, several southern opening have been restored in recent years. But as restoration at a large scale harms the authenticity of historical evidence, for the time being this solution has been put aside and other ones are being considered to achieve consolidation as well as safeguarding the unstable parts.

Due to the extreme depreciation in the fabric of the monuments and the instability of its



Fig. 224



Fig. 225

structure as well as its position on the great, uncontrollable Karun River, environmental protection and consolidation of the monument requires solving of several technical and administrative difficulties and complications as well as utilization of a large spectrum of expertise. It is predicted that in the management plan of the water system an appropriate solution will be provided and performed by using the experience and knowledge of Iranian and foreign experts in order to conserve and safeguard the unstable and damaged structure of Shâdorvân bridge Dam. At present, the most important damages visible in the fabric of the monument are:

1-1: Destruction of the southern access route to the bridge

1-2: Collapse of vaults

1-3: Depreciation and demolition of the bridge dam as well as instability of the remaining vaults

1-4: Depreciation and demolition of facade materials and the protective layers of the structure

1-5: Deep cracks in the structure, piles and opening of the bridge

1-6: Extreme depreciation and weathering

1-7: Gradual separation of stone materials from the building (due to mortar erosion)

1-8: Effect of biological factors on the building

2. Condition of the northern section:

General condition of the northern section is better than the southern section. Despite its being older than the southern section, its position in the outer meander of the river has kept it safe from the detrimental river current. Anyway, the passage of time has left traces of depreciation in the building as follows:

2-1: Collapse of terminal vaults and the northern access route to the bridge

2-2: Depreciation and demolition of the bridge dam

2-3: Depreciation and demolition of most of the facade and the protective layers of the structure

2-4: Weathering of mortars and materials

2-5: Surface fractures

3-Condition of stone parts in its northern section:

Here solid slates have been used and are therefore stable but in the eastern section of the new bridge, stone monuments are occasionally unstable and need structural pathology and consolidation. In the remaining parts including those west of the new bridge, no significant damage is seen but weathering is common.

11-State of conservation (Band-e-Khâk Dam)

1. There have not been any specific conservative regulations for the relic before establishing the ICHHTO base for SHHS. so, in order to make Allaame Sheikh's boulevard some parts of Dam have been demolished that is why it has lost its function as a Dam. Khâk Dam is not in satisfactory conditions and, at the present, its core zone and limits interaction with main road and city's roads network. Making some policies to reform this situation is in priority of such conservation plans for relic though determining the limits and core zone of relic for conservation in 1377 (1998) has stopped its more demolition.
2. Abandonment of Khâk Dam caused it to get unclear in natural environment and to be deteriorated by plants having grown on that. So, reorganizing its core zone and its surrounding areas is in priority of conservation plans.

12-State of Conservation (Lashkar Bridge-Dam)



Fig. 226



Fig. 227

Lashkar bridge Dam is a relatively resistive and robust building because despite undergoing many events during its life, the structure as a whole is still in an optimal condition and its original form has been preserved. Nevertheless, the most important damages inflicted on its body at present are:

- 1-Destruction of parts of the dam and access routes to the bridge specially the western one in the past.
- 2-Deep crackings in its piles and vaults.
- 3-Extreme depreciation of its fabric
- 4-Gradual separation of stone materials from the building (due to mortar erosion)
- 5-Effect of biological factors on the building



Fig. 228

12a: State of conservation and factors affecting the property (Emamzade Abdollah)

The construction of tomb of Emamzade Abdollah is a rigid and stable structure which has not been mainly damaged. However, because of absence of comprehensive conservation regulations for the relic in the past, there are some problems, now, within the core zone and limits of relic. It is anticipated that relic's core zone and limits to be reorganized through implementing the management plan for SHHS to solve those kinds of existing problems.

The most important problems in relic's current conservation plan are as following:

1. lack of appropriate coordination in conservation policies for the area

Various decisions were taken in the past for renovating and maintaining the property. However, those attempts have partially damaged the origin of relic because they were not based on an integrated policy, and they also present different forms and tendencies in repairing a building. It is anticipated that an appropriate approach to be planned through a comprehensive studies and problem identifications for relic for eliminating the traces of those harmful changes.

2. Unfitness of existing installments, equipments, and new services within the System with building's historical spirit.

All equipments added to core zone of relic in different periods and eras to facilitate utilization of relic are incompatible with historical character of the building and have damaged the origin of System. Relic's lights, rampart, entrance, toilets, graphic signs, etc. are some examples of unfit elements within and around the relic. According to current new plan, it is essential that an approach to be planned for removing all unfit elements and for improving the quality of services and relic's installments as soon as possible.

3. installing useless goods and other things on the building

Installing some equipment directly on the construction's body is another damaging factor for relic. It is essential that some solutions to be planned for removing those equipments and for providing appropriate facilities in the right way according to conservation regulations.



Fig. 229

4. unfitness of core zone and area's conditions with the historical character of building
unfit paving and landscape planning at the entrance of the building

The plan and the materials used for organizing the area in front of building's entrance does not fit the historical character of building, and caused the relic to be unorganized and unclear. According to Management Plan, it is anticipated that there will be an agreement with Shushtar municipality to plan and reorganize above mentioned area and relic's surroundings with regard to System's conservation regulations.

abandonment of other spaces

With the exception of the south entrance's area which its problems mentioned before, all surrounding spaces have been left as they were, and no plan has been implemented to reorganize and to utilize them so far. According to current new plan, it is anticipated that an integrated approach would be base for reorganizing three sites (Emamzade Abdollah, Lashgar Bridge, and Khâk weri).



Fig. 230

5. Despite the stability of building in general, some problems such as scum on the bricks, weathering, and cracks are seen in the construction of relic, which renovating and reorganizing them needs some studies in depth in problem identifications and restoration of such buildings.



Fig. 231

12b.State of Conservation (Shâhali bridge)

Part of the Shâhali bridge has been destructed during the construction of Allameh Shushtari road. Its main middle section is still standing and the bridge structure is generally stable but erosion caused by environmental factors has damaged the fabric of the monument specially its external layers and bridge dam which might cause instability in the long run. After pathological studies and monument documentation, it is expected that appropriate approaches are taken to increase its stability.

Because in the past no specific conservation plan was adopted for this monument, also the fact that locals had direct access to this building, it suffered occasional damages in its fabric. But based on present plans for conservation of core zone, it will be properly fenced, additionally warning signs will be set up so as to prevent such harms.



Fig. 232

13-State of conservation (*Band-e Sharâbdâr Dam*)

1. Large part of relic was destroyed in the past. The importance of this Dam as a part of whole SHHS has been neglected so far, and no especial policy has been applied to conserve that.
2. Expansion and development of residential areas closed to relic and, as a result, urban modern activities have aggravated the process of demolition of relic.

4.b. Factors affecting the property

4.b.1- *Band-e Mizân Dam*

(i) *Development pressures (e.g., encroachment, adaptation, agriculture, mining)*

1.1. direct impacts

- 1.1.1. The most important impact of the new technologies on the relic is the concrete layer used for facilitating traffic on the bridge, which in turn is the most serious damage for the Dam. Any decision for intervention in that without comprehensive studies is impossible.
- 1.1.2. Using engine vehicles in the city caused the Dam to be used as a shortcut way. This using method did not visibly change the physical structure of the Dam, but it accelerated the process of erosion in bridge's surface materials and it also damaged its view.

1.2. indirect impacts

- 1.2.1. Building up the dams on Karoon River has changed its regime. It means that river's damaging force has been increased, so the progress of deterioration and of corrosion of hydro structures such as *Band-e Mizân Dam* has been aggravated.
- 1.2.2. Pollutant gases being produces by vehicles and industrial manufacturers have changed the balance of chemical substances in the air. Composition of those substances with the humidity of the air increases the acidity of that and finally the progress of corrosion of the materials.

(ii) *Environmental pressures (e.g., pollution, climate, change, desertification)*

2.1. The water flowing in river has been the most important continual deterioration factor. Erosion symptoms are seen especially in eastern side's columns of the Dam. According to mentioned factor, deteriorating impact of the river's water has been increased through building up various dams and Dams on Karoon River.

2.2. Floating things, also, have been a continual corrosion factor for the bridge's columns. This factor acts more harmfully when the river is flooding and is carrying a lot of floating things.

2.3. The traces of other continual environmental deteriorating factors such as sunshine, wind, and rain are seen on the construction's materials, but they have not changed the major structural form of the relic.

2.4. The humidity of environment changes the relic into a suitable place for the plants, algae, and moulds. Although, these factors damage the building slowly in long term but they aggravate the progress of superficial deterioration of the building.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

3.1. Especial form and structural Systemity of Band-e Mizân Dam preserved it against the natural overwhelming disasters having occurred in Shushtar so far, and Band-e Mizân Dam still remains in original form more than the other historic sites.

(iv) Visitor/tourism pressures

4.1. Because of the stability of the construction, no structural demolition has happened due to the visitors' appearance so far.

4.2. The other damages in the relic are the traces of written words and carvings made by some visitors who were not aware of the value of the relic.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.2- Kolâh-Farangi Tower

(i) Development pressures (e.g., encroachment, adaptation, agriculture, mining)

No clear evidence is at hand about its historical background but its outward appearance shows that large parts of it have been devastated in the course of time. What remains is structurally stable but the erosion process must be controlled somehow.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1-1: Modern scientific advances have influenced it indirectly during town development as follows:

1-1-1: Changing the historical-natural landscape of the monument

1-1-2: Altering its relation with the historical town and other Shushtar historical water system monuments specially north of it.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

2-1: Erosion caused by natural factors (such as sun, wind, rain, ...) has had a clear effect on the monument. Due to the destruction of the facade materials at the remaining sections, the erosion process has become a worrying factor which must be controlled by effective measures.

(iv) Visitor/tourism pressures

1- The possibility of direct access to the building and visitors' negligence have left negative effects on its fabric. But according to the new monument conservation management plan of water system, direct access to the monument will be limited in order to prevent such damages.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.3-Gargar Canal

(i) Development pressures (e.g., encroachment, adaptation, agriculture, mining)

Changes in using construction materials and the methods of building up housing units have affected the view of Gargar Canal. Historic city's view has been an inseparable segment from the historical character of the relic. Some shortages in previous conservative plans for Gargar Canal and also renewal of some historic buildings overlooking to the Canal have crashed the relic's landscape. However, new nationally registered conservative regulations can insure that historic landscape of Gargar Canal will be reorganized through implementing those regulations.



Fig. 233. Aerial photo
 1- Band-e Mizân Dam
 2- Watermills and Waterfalls area
 3- Bagh-e Khan
 4- Borj-e 'Ayâr Bridge-dam and Sâbe'in Sanctuary

The other negative impact of new technologies on origin view of the relic has been the construction of a coastal road at western side of Gargar Canal. Having started at southern side of the city, this road has affected the origin view of Gargar. In the new regulations, building up rest of the road would be stopped.

Three new bridges were constructed on Gargar Canal from the time of propagation of new construction methods. The first bridge was, as mentioned before, created through the change happened in bridge-Dam of Gargar and the two new bridges were constructed later. It's anticipated that car traffic passing Gargar Bridge would be stopped via reforming the master plan which will also improve the traffic network so that the car traffic passing the historic area reaches to minimum.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1. All plants growing alongside the Canal and on its bank are an important element in historic character of the Canal. However, some of those plants aggravate the process of erosion of Canal's bank (wall), so it is essential to plan for reducing these damages.

2- Some environmental natural progressive reactions always accelerate the deterioration process of the Canal's bank in addition to growing the plants. In some parts of Canal's route, especially in waterfalls area, the steam's wall is to be demolished due to erosions happened in that. As, any intervention to increase the wall's resistance will crash the natural historical view of the relic, it is essential that some comprehensive studies to be

done to investigate the progress of erosion of relic and to come with some solutions for stabilizing them.



Fig. 234

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1. Whole SHHS constructions work in an integrated system so that the amount of water entering Gargar branch is amazingly controlled, so there is no report on flowing any flood in origin of Canal. Moreover, there is nothing witnessing any impact of natural disasters on the Canal except the natural demolitions occurred on the walls because of the weathering and of deteriorating factors.

(iv) Visitor/tourism pressures

.1. Using coastal areas of Gargar Canal as a place to go for picnic by the inhabitants has always been ensuring Canal's life. In the new conservative plan, this matter has also been emphasized on. However, lack of properly educating and informing the people caused, in the recent years, that some of those tourists damage the origin view of the Canal by throwing away the wastes. Solving this problem is one of the new plan's priorities.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.4-Polband-e Gar gar Bridge-Dam

(i) Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-In 1940s, a major change happened in physical form of relic. As part of urban renewal program, at that time, bridge's height was increased and also a street was made on that for traffic.

2-Constructing an electricity manufacturer and a pumping unit in 1940s and 1950s at the south side of relic was an important change within the watermills area and also in the view of Gargar bridge-Dam. This in turn caused the southern wedge-shape core of bridge-Dam not to be seen from most of the views.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

The softness and changeability of sandstone causes it to be very fragile and to deteriorate fast. Air pollution and releasing the wastewater into the river, also, have accelerated the progress of relic's erosion during recent years.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-Shushtar settlement's position makes it to be, always, in danger of flood and earthquake. However, no report in historical document proves any demolition as result of natural disasters.

2-In the beginning of ninetieth century, the construction of Band-e Mizân Dam, the Dam built on the Canal on the way to Gargar bridge-Dam, was completed and its height was added in order to minimize the impact of floods on that.

(iv) Visitor/tourism pressures

1-Shushtar settlement's position makes it to be, always, in danger of flood and earthquake. However, no report in historical document proves any demolition as result of natural disasters.

2-In the beginning of ninetieth century, the construction of Band-e Mizân Dam, the Dam built on the Canal on the way to Gargar bridge-Dam, was completed and its height was added in order to minimize the impact of floods on that.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.5 - Watermills and Waterfalls area

Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-Constructing electricity generating company, ice manufacturer, and a pumping unit in 1940s and 1950s were the first impacts of modernization within the watermills area. Those buildings have mainly changed the System's view. All sites at the western side had been built in traditional methods of which a little remaining exists now. The northern part's constructions (electricity manufacturer and pumping unit) are in previous conditions.

2-Adding Gargar bridge-Dam's height in 1940s to facilitate passing car traffic on that was another change in System's view.

3-New methods in constructing buildings and fast rate of development in recent decades caused expansion of the city towards the System's core zone. This issue, in addition to change the origin of historical landscape of relic, caused under ground sites to be under pressure and finally to be changed and demolished.

(i) Environmental pressures (e.g., pollution, climate, change, desertification)

All sites of the System have been built on sandstone base. Soft and changeable texture of sandstone is very fragile and is easily deteriorated against physical and chemical changes. Pollutant gases in the air and releasing pollutant liquids into the river have aggravated the process of erosion in those sites .

in addition to chemical changes in environment, building up the dams and conducting river's water for urban water supply and agricultural purposes caused some parts of the System especially Boliti tunnel to stay out of the water during most times of the year. Aridity decreases the resistance of sandstone and aggravates the progress of erosion. All kinds of deteriorations have been taken into consideration in conservation, monitoring, and study plans.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1.Shushtar settlement's position makes it to be, always, in danger of flood and earthquake. However, no report in historical document proves any demolition as result of natural disasters. According to existing documents, the impact of natural disasters on the System's changes is as following:

2.In the beginning of ninetieth century, the construction of Band-e Mizân Dam, the Dam built on the Canal on the way to Gargar bridge-Dam, was completed and its height was added in order to minimize the impact of floods on that.

3.The western wall of System has been extremely deteriorated and is about to demolition due to natural factors' impact especially weathering and strong raining.



Fig. 235

4.In the past, earthquakes and strong rains have strongly damaged all sites existing on the ground. This is highly visible in the western island's buildings of which only a little remain.

(ii) Visitor/tourism pressures

Tourists having visited the System before the establishment of ICHHTO's base (1377) have damaged the fragile and deteriorated texture of the System. these damages can be divided into two categories:

1-Changes which some tourists have caused tendentiously but because of unawareness of sites ' values in them especially inside tunnels and underground water passages. This kind of damage can easily be seen in Sika (southwestern side of System) more than other parts.
2-Large number of tourists has visited the System during last years, so together with lack of specific and particular visit routes in relic increased instability, changing the form, and in some cases demolition of some parts of relic. Fortunately, the ICHHTO's base has provided some plans for controlling the process of erosion.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b.

4.b.6 - Borj-e 'Ayâr Bridge-Dam and Sâbe'in Sanctuary

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-Constructing the road and the bridge within the core zone to facilitate car traffic and to connect historic part of the city to new developed regions at the eastern side of Gargar has made a noticeable change in sites' landscape. In addition, Because of shortages in conservative regulations in the past, vehicles' traffic especially motorcycles' within the core zone, most probably, have damaged some parts of remaining sites in the area. Presently, those harmful factors have stopped damaging more.

2-Fast rate of city's development has, also, slightly altered the landscape of area. The core zone of relic was located out of historic city, but nowadays it is located within the new city of Shushtar. The expansion of city in both outside and inside of present core zone and its equipments has changed sites' landscape and view. In addition, some parts of historic remaining of the area must have been destroyed during development of the city.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1-The same as other historical sites, all sites in core zone are in a very exposed position of natural deteriorating factors such as wind, rainfalls, and sunshine. Among all sites in core zone, remaining parts of Borj-e-Ayaar are extremely in danger of mentioned factors, and providing a particular preventive plan for decreasing those damages which destroy remaining of sites is essential.

2-The impact of erosion on stone remaining parts of Saabein sanctuary is very slow. However, this impact is unknown and needs specific investigations for other remaining parts of sites in core zone which have not been excavated so far.

3-Growing of plants and moulds on the surface of sites particularly in Sâbe'in sanctuary's boundary has aggravated the process of deterioration. Clearing this area from those plants needs field excavations to determine the exact limits of relic's boundary and needs a plan to be compiled to control growing of plants without damaging the sites. Moreover, the

Mentioned plan must guaranty preserving the origin plant envelop and the natural landscape of the area, which are an important element of area's valuable characters.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

3.1. According to historical reports, river's flood was the main reason behind demolition of Borj-e-Ayaar bridge-Dam. Those reports say that no restoration has been done in relic, and the remaining of construction was demolished continuously after the flood. There is

no document saying that mentioned flood or other natural disasters have damaged other sites of the area.



Fig. 236

(iii) Visitor/tourism pressures

A few tourists coming from the city or the neighborhood visit this area because it is very far from downtown and also because of citywide tourism programs in which no emphasize is in introducing this area.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.7- Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-Power transfer lines passing present core zone of relic have disordered area's natural landscape.

2-A secondary road has been built up within the core zone for car traffic. This road has altered area's natural view in addition to damaging core zone with car traffic's impacts.

(ii)Environmental pressures (e.g., pollution, climate, change, desertification)

1-Deterioration of artificial remaining parts of relic is the most important impact of natural factors. Those remaining parts are very fragile, and natural process of erosion can completely demolish them in the near future.

2-Making whole System unclear, uncontrolled growing of the plants can aggravate the progress of deterioration in sites. Also, small and spread remaining parts are more in danger of erosion.

3-Natural area of Mâhi-bâzân (Khodâ-âfarin) bridge-Dam has been fenced in by a natural wall. The signs of erosion are seen on the wall expressing the need of studies on deterioration process and its factors in order to conserve relic's origin.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-That seems one of relic's artificial parts' demolishing factors is natural disasters, but there is no certain report proving this idea.

(iv) Visitor/tourism pressures

1-Relic is very far from the city and is, almost, inaccessible. Therefore, this factor has not noticeably affected the relic.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.8- Salâsel Castle

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-direct impacts

1-1Demolition of one canal's inlets under the citadel is the most direct impact on relic. In order to upgrade the level of water supply to downtown some new equipment has been replaced at the historic inlet and the route of canal has been covered with cement concrete.

1-2Engine vehicles traffic in the city and in core zone of relic has been damaged the remaining constructions and under ground sites in the past years, but it has stopped by ICHHTO base for conservation of SHHS at the time of establishment.

2-indirect impacts

2-1- constructing some dams at the uptown has increased the water's deteriorating force which in turn aggravates the process of erosion at the northern side of citadel, for this side is very fragile due to the river's shape in that area.

(ii)Environmental pressures (e.g., pollution, climate, change, desertification)

1-As some parts of citadel have been demolished, existing remaining sections in core zone are in a very exposed position of natural deteriorating factors such as wind, rainfalls, and sunshine. Those factors strongly deteriorate the remaining parts of citadel. Amongst all

natural factors, rainfall is more important because of its double impact in demolishing under ground sites and left remaining parts within the core zone.

(iv) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

The main reasons behind demolition of citadel were two natural disasters in the past century:

1-a strong flood which has happened in 1920s was the first demolishing factor

2-five years after the flood, a strong earthquake has destroyed other parts of citadel

(iv) Visitor/tourism pressures

1-There was no monitoring system on people's activities within the relic before establishing the ICHHTO conservation base for SHHS. Despite the fact that there is no specific report speaking about any damages caused by tourists, definitely some partial damages have occurred for System's sites. This factor is presently under the control.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.9-Dâriun Canal

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-The most important effect of modern technology on the monument is the reconstruction of Dâriun Canal as well as installing new irrigation equipments on one of its intake with significant effect on its landscape and utilization.

2-The entrance of motor vehicles into the town and their usage by local people has increased the loads upon the bridges. As envisaged in the conservation plan, after the reorganization of Car routes, the bridges will only be used by pedestrians.

(ii)Environmental pressures (e.g., pollution, climate, change, desertification)

1-One-mouthed bridges are relatively stable and have been repaired and restored regularly. Therefore, the effect of environmental factors on them is only gradual.

2-Historical parts of Dâriun Canal and their relevant monuments, include restored and unrestored monuments. The latter are heavily eroded and vulnerable against environmental factors. Therefore, appropriate approaches must be taken for their conservation as well as to slow down the erosion process in the near future.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

So far no historical evidence indicating bridge damage due to floods or other natural disasters has been found. But according to some reports Dâriun Canal flowing has stopped formerly several times due to destruction and damage of other monuments including Shâdorvân bridge Dam and Band-e Mizân Dam.



Fig. 237

(iv) Visitor/tourism pressures

1-The course of Dâriun Canal and the position of its bridges is such that the presence of visitors or locals on foot is no threat to them.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.10- Polband-e Shâdorvân Bridge-Dam

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

Technological advances have had multiple direct and indirect effects on Shâdorvân bridge Dam; the most significant of them are as follows:

1-The construction of a new bridge called Azadegan and its effects including:

1-1- Changing the historical-natural landscape of the site

1-2- Separation of some northern stone monuments from the whole System

1-3- Passage of power transfer lines from its buffer zone

1-3- The construction of a dam on the up Canal of the bridge and the intensification of the erosive power of water

1-4- Town expansion and change of the historical-natural landscape of the monument

1-5- Environmental pollution (water and air) as well as intensification of the erosion process on the monument

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

The position of Shâdorvân bridge Dam is such that it is always under the threat of damages caused by natural factors specially the erosive power of water current, In addition, extreme body instability and damage as well as the erosion of all external protective layers of its fabric has led to its intense structural instability against environmental factors.

Rain, sun, frequent wetting and drying of its materials, freezing, wind as well as the ongoing effect of water current on the sections above the river, results in the destruction of the monument remains rapidly and extensively. Therefore, one of the principals of conservative management plans is to envisage an appropriate approach for the environmental protection of the monument as well as to decrease the effect of natural factors on Shâdorvân bridge Dam.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

According to historical reports, Shâdorvân bridge Dam has been repeatedly destructed by floods but reconstructed afterwards. Nevertheless, most operations aiming at the reconstruction and revitalization of the bridge during later Qajar rule (late 19th century) were not successful, so finally the bridge was abandoned to deteriorate gradually. No evidence is at hand about bridge damage due to other natural disasters like: quakes.

(iv) Visitor/tourism pressures

1-As to the absence of a specific plan or any arrangements in the past for the conservation of the monument, various people including tourists and citizens had access to the building which led to two major damages:

2-Graffiti and engravings on the monument fabric

3-Traffic of people on unstable parts of the structure and the intensification of its instability.

But according to the management plan of water system conservation, direct access to the building by the visitors will be only permitted via the visitors route outside of it and in the future, such damages will be prevented and controlled.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.11-Band-e-Khâk Dam

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1- Into two parts and, as a result, has altered its functions and character.

As mentioned before, constructing a road for car traffic has divided the core zone

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1-Natural environmental factors deteriorate the Dam as well as other historic sites. Amongst all those factors, rainfall is more important because it might change relic's foundation and make it unclear within the area.

2-Growing the plants in core zone aggravates the process of erosion of relic.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-There is no report saying anything about impacts of natural disasters on demolition of relic.

(iv) Visitor/tourism pressures

1-Because of the abandonment of relic which makes it unknown for the people, so visiting the relic is very limited and its only visitors are ICHHTO's experts. Therefore, this factor doesn't strongly affect Khâk Dam.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.12-Lashkar Bridge-Dam

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-DIRECT EFFECTS

The road built near the monument which requires investigation to change its direction.

2-INDIRECT EFFECTS

1-As the bridge was not used to enter the town, it was abandoned and not repaired which resulted in the gradual depreciation of the monument as well as changing the relation of it with daily life of the citizens.

2-Change of utilization of water resources has transformed the initial state of Dâriun Canal (Raghat branch) leading to a change in its function as a water structure as well as the landscape of the monument.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1-Erosion due to the elements is one of the most distinct damages on the structure

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-So far no evidence indicating bridge damage due to natural disasters has been found.

(iv) Visitor/tourism pressures

1-Owing to its position in the town and its less popularity compared with monuments like water mills or Salâsel Castle, few people visit it which has led to no damage or destruction.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.12.a -Imamzade Abdollah

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-The most important change having resulted from modernization is city's expansion and the change happened in original and natural base of relic. Road making policies and development of residential areas especially at the south of area have altered those areas' landscape.

2-The other change which occurred is the bulks of new equipments added to the building and to its surrounding limits to facilitate utilization of the building while have not followed any specific regulations.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

1- No natural environmental factor has damaged the stability of building in general, but some small problems such as scum on the bricks, weathering, and cracks are seen in whole construction.



Fig. 238

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-According to historical reports, no damage occurred by natural disasters for the building so far.

(iv) Visitor/tourism pressures

1-Emamzade Abdollah is a very important building in Shushtar and has many pilgrims, and number of tourists going there to visit the historic relic must be added to that number. Unawareness of the people and lack of appropriate conservative regulations caused the relic to be damaged. Majority of those damages are written words and inscriptions done by ordinary people.

2-In addition to mentioned damages, tourists always expose their wastes in the area and pollute its environment. This problem must be solved through regulations and raising people's awareness, and also by implementing some periodic cleaning programs within core zone and limits of relic.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.12.b – Shâh- Ali Bridge

(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)

1-The most important effect caused by technological advances has been the construction of a road in its core zone area which has led to:

1-1: Destruction of parts of the bridge especially at the end points of the structure.

1-2: Changing the historical-natural landscape of the site

1-3: Furthermore, different development projects inside the core zone and buffer zone of the monument, has influenced the historical landscape of the site and its functions.

(ii) Environmental pressures (e.g., pollution, climate, change, desertification)

Erosion caused by natural factors has had a significant effect on the fabric of the monument. Due to the destruction of external layers of the bridge by erosion process, the monument has become very vulnerable against environmental factors. Within the comprehensive studies envisaged in the monuments conservation plan, a proper approach must be taken for protecting the monument against environmental factors to slow down the erosion process.



Fig. 239

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-Natural disasters have not been mentioned as a cause of bridge destruction in historical reports.

(iv) Visitor/tourism pressures

1-So far as Shâhali Bridge and its adjacent monuments have not been included in introduction programs for Shushtar historical water monuments, no major damage has been inflicted due to its limited visitors. But as mentioned earlier according to new monuments conservation plans, direct access to the monument will be limited and controlled.

(v) Number of inhabitants within the properties and the buffer zones

The statistic of inhabitants is included in the end of 4.b

4.b.13-Band-e Sharâbdâr Dam**(i).Development pressures (e.g., encroachment, adaptation, agriculture, mining)**

1-Changes in life styles are the most important reason of demolition in Band-e Sharâbdâr Dam. Although this factor has not directly affected the relic, but all changes in life styles caused people to neglect the relic and then resulted demolition of parts that.

(ii)Environmental pressures (e.g., pollution, climate, change, desertification)

1-Abandonment of relic has strongly aggravated the process of erosion which is the impacts of natural factors. It is essential that some policies to be planed for lessening those impacts and for preserving the relic and its environment in the near future.

2-Uncontrolled growing of plants on remaining parts of Dam has also aggravated the process of relic's erosion.

(iii) Natural disasters and risk preparedness (earthquakes, floods, fires, etc.)

1-There is no report about the impacts of natural disasters on demolition of relic.

(iv) Visitor/tourism pressures

1-Because of the abandonment of relic which makes it unknown for the people, so visiting the relic is very limited and its only visitors are ICHHTO's experts. Therefore, this factor doesn't strongly affect Band-e Sharâbdâr Dam.

According to mentioned results, number of most important factors that affecting the Shushtar Historical Hydraulic System is as follows:

- Sewage & surface water ,which is meanwhile being led towards the waterfalls or onto the hydro systems.
- Lack of technical equipments in order to operate the protective program.
- Transportation passing on some of the bridge-Dams which some day was used for human and animals and not for vehicles.
- Lack of strength in the natural walls of the SHHS after rainfall

For eliminating these effective factors has been planned scheduled programs in management plan of SHHS.

(vi) Number of inhabitants within the properties and the buffer zones

Shushtar Historical Hydraulic System	Population	Remarks
Core zone	410	Statistics in 2007
Buffer Zones:		Statistics in 2007
- Built up areas	150500	
- Agricultural areas	1368	
Total	151868	
Landscape zone	187337	Statistics in 2006

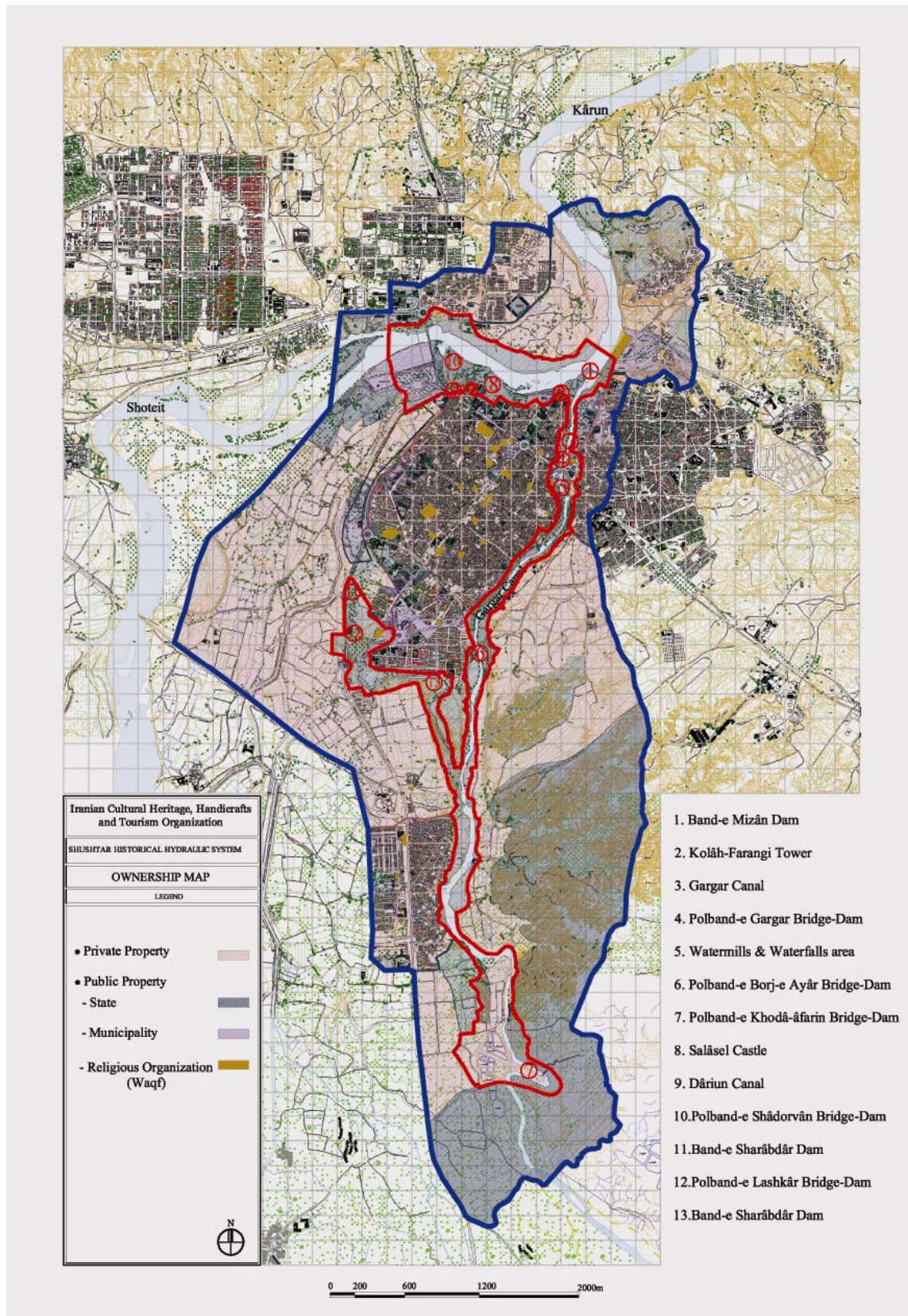
5

PROTECTION AND MANENAGMENT OF THE PROPERTY

5. a. Ownership

The public organizations of the Islamic Republic of Iran own the core zone of the nominated property. These organizations include, ICHHTO, the Shushtar Municipality, the religious organizations (*waqf*) and other State organizations. Private and public sectors own shares of the lands within the buffer and landscape zones.

The map below shows the different ownership within the core and buffer zones of the nominated property:



5. b. Protective designation

The protection of all historical sites and monuments of Iran is ensured by ICHHTO. According to the *Law of Conservation of National Monuments and Sites* (3rd November, 1930). All the monuments and sites registered in the National Heritage List are under the Government's protection and supervision. The legal implementation of these regulations is ensured by Clause 2 of the *Decree of the National Security Council* as well as Paragraph 'C' of Article 166 of the *Law for the Third Five Year Development Plan* reiterated under Articles 114 and 115 of the *Law for the Fourth Five Year Development Plan*. These articles emphasize the protection of ancient remains within modern settlements.

Shushtar Historical Hydraulic System involves 13 main properties, as indicated in the map III. All 13 properties have been registered on the List of the National Heritage Monument of Iran. The names of these properties and their registration dates and numbers are as follows:

1. Band-e Mizân Dam (Registration date: 1999 Registration number: 2331)
2. Kolâh-Farangi Tower (Registration date: 1999 Registration number: 2611)
3. Gargar Canal (Registration date: 2005 Registration number: 17599)
4. Polband-e Gargar Bridge-Dam (Registration date: 2000 Registration number: 2914)
5. Watermills and Waterfalls area (Registration date: 1998 Registration number: 2180)
6. Borj-e 'Ayâr Bridge-Dam and Sâbe'in Sanctuary (Registration date: 2000 Registration number: 2940)
7. Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam (Registration date: 2001 Registration number: 4207)
8. Salâsel Castle Registration (Registration date: 1975 Registration number: 1117)
9. Dâriun Canal Registration (Registration date: 2001 Registration number: 4141)
 - 9 – 1. Single arch bridges (Registration date: 2005 Registration number: 11959)
10. Polband-e Shâdorvân Bridge-Dam (Registration date: 1931 Registration number: 78)
11. Band-e Khâk Dam Registration (Registration date: 2002 Registration number: 10874)
12. Lashkar Bridge-Dam (Registration date: 1999 Registration number: 2359)
 - 12 - 1. Imâmzâdeh Abdollâh Shrine (Registration date: 1942 Registration number: 364)
 - 12 - 2. Pol-e Shâh-Ali Bridge (Registration date: 2002 Registration number: 7938)
13. Band-e Sharâbdâr Dam Registration (Registration date: 2001 Registration number: 4218)

By registering these properties on the National Heritage List of Iran, these properties enjoy special protection and conservation legislation.

Physical protection of the properties is ensured by the ICHHTO corps of guards. The guards employed by the local office of the ICHHTO are present on the sites, ensuring a permanent surveillance of the properties. Another effective means of protection is secured by the inhabitants of this property and respective NGOs.

The ICHHTO Shushtar Historical Hydraulic System Base was established in 1999. Since then, all protection, preservation, restoration, research and tourism management actions have been planned and implemented with the approval of the Base, and also closely monitored by the supervisory bodies explained below. Notification of the national registration of the cultural heritage properties of SHHS has been transmitted by ICHHTO to all relevant State authorities and bodies, informing them of the laws which are applicable to these properties [Annex VI]. This notification is to ensure that any actions which may impact upon the properties are authorized by ICHHTO prior to planning and implementation.

Relevant legal, regulatory, planning and institutional mechanisms to protect the proposed property are described in detail below.

Cultural Heritage Laws in Iran

There are different laws and regulations for protection and conservation of cultural heritage in Iran. These are in the following broad categories:

- A. Legislation governing general cases in the country, including cultural heritage;
- B. Legislation specifically treating cultural heritage;
- C. International legal instruments, recommendations and guidelines which is integrated within the national legislation; and
- D. Other regulations for cultural heritage.

A. General Regulation

Samples of the general laws and regulations relevant to cultural heritage include, *inter alia*:

1. Article 83 of the *Constitution Law of Islamic Republic of Iran* (1920) recognizes the importance of cultural properties. Transferring the ownership of public monuments and

properties considered to be part of the national heritage, is forbidden, unless approved by the Parliament. However, transfer of ownership of monuments and cultural properties officially recognized as insignificant is possible.

2. Article (26) of the Iranian *Civil Law* (1939) prohibits private ownership of significant cultural property.
3. The *Islamic Penal Law* is an effective law for practical protection of cultural heritage. A full chapter deals with crimes regarding cultural heritage (from Article 588-569) in the *Islamic Penal Law*, (1996). This law recognizes the following as a crime subject to punishment:
 1. Damaging, theft, selling or buying stolen historical property (Article 559);
 2. Violation of the regulations of ICHHTO resulting in deterioration, defect, or damage in the heritage property (Article 560);
 3. Illicit export or smuggle of heritage property (Article 561);
 4. Any unauthorized excavation in an effort to find historical properties (Article 562.1);
 5. Selling or buying properties discovered from unauthorized excavations (Article 562.2);
 6. Encroachment on historical or religious land, property or sites registered on the National Heritage List with no private ownership (Article 563);
 7. Restoration, repair, converting, renovation and extension of cultural or historical monuments or their decoration, registered on the National Heritage List without the ICHHTO approval (Article 564);
 8. Transferring parts of immovable properties registered on the National Heritage List without the ICHHTO consent (Article 565).
 9. Converting the functions of monuments and sites registered on the National Heritage List denigrating the identity of the property and/or without ICHHTO consent.
4. The *Law for Punishment of Those Interfering in the National Economic System* (1991), article (1), paragraph d, considers any effort towards export of national property, even though not successful, a crime. All such property intended for export is confiscated.
5. *Property acquisition law for implementing public development and military projects of the Government* (1979) allows the acquisition of any historic property, in case a project is prepared for this property. This law has a streamlined procedure which also guarantees the rights of the private owners.

B. Specific Regulation for Cultural Heritage

Samples of the regulations specifically dealing with cultural heritage are explained below:

1. The *Law for Protection of National Heritage* (1930) is the first comprehensive law concerning various aspects cultural heritage. This Law defines the procedure for identification of cultural heritage property (Article 1). It further mandates the Government to prepare a National Heritage List (Article 2), sets the criteria and legal protection for properties on this List, and stipulates legal provisions for archaeological excavations.
2. The *Bylaw Concerning Prevention of Unauthorized Excavation* (1980) stipulates punishments for excavation and/or purchase of excavated historic objects. The provisions of this Law are further elaborated in the *Islamic Penal Law* mentioned above. There is further regulation limiting production, purchase, use or advertisement of metal detectors
3. The *Law Concerning Acquisition of Land, Building and Premises for Protection of Historic Properties* (1969) stipulates further regulations for acquiring property with historic or cultural significance.
4. The *Law for Establishing Iranian Cultural Heritage Organization* (1979) is another powerful legal instrument depicting a comprehensive picture for managing cultural heritage of the country.

C. International Legal Instruments

In the I.R. of Iran, the requirements of any international convention are integrated with the national legislation, upon accession to that international convention. Thereafter, it will be compulsory to abide with the requirements of these conventions. The I. R. of Iran has acceded to several UNESCO conventions concerning the conservation and protection of cultural heritage, as well as other conventions and charters. Some of important conventions which are acceded by the I. R. Iran include, *inter alia*:

1. *Convention Concerning the Protection of the World Cultural and Natural Heritage* (1972)
2. *Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property* (1954) and its *Protocol I* (1954) and *Protocol II* (1999)
3. *Convention for the Safeguarding of the Intangible Cultural Heritage* (2003)

D. Other Regulations

In addition to the legal instruments mentioned above, there are other types of regulations for protection and conservation of cultural and historic property in the I. R. of Iran. For example, according to a cabinet decision adopted in 2001, all public organizations must conduct studies to assess the cultural/historic impacts of major development projects at the earliest feasibility study stage and to comply with the recommendations of such studies during design and implementation.

5. c. Means of implementing protective regulations:

The legal designation of the protective boundaries of the Shushtar Historical Hydraulic System (SHHS) (as indicated on the maps I, II) is as follows:

GENERAL REGULATIONS

All individuals or legal bodies, whether governmental or non-governmental, are obliged to inform ICHHTO and acquire its prior agreement regarding any program, project or intervention which can somehow change the natural, environmental, historical and cultural status of the entire area within the protected zones of SHHS, especially in the following cases:

- macro-scale developmental projects including construction of:
 - bridges;
 - roads and highways;
 - new townships or high-rises;
 - infrastructural facilities;
 - power transfer plans;
 - Dams and irrigation networks in the entire Karun River which can significantly change the natural river bed, its output and water balance.

CORE ZONE REGULATIONS

- 1-Any new construction work in the core zone is prohibited.
- 2-Any action in the core zone to identify, conserve or present any historical properties, develop green space, tourist facilities, provide urban services or buildings develop as well as to equip, restore, rehabilitate, or reuse historical properties or to install advertisements is subject to the approval of ICHHTO.
- 3-Vegetation and natural landscape of the core zone must be protected and conserved in its

present form.

4-Actions potentially or actually endangering the function, structure or visual integrity of any historical property are strictly forbidden in the core zone both in short and long term.

5-All unharmonious structures present in the core zone must be removed. All the elements not compatible with the natural-historical identity of Shushtar Historical Hydraulic System must be managed based on the approval of the ICHHTO.

BUFFER ZONE REGULATIONS:

The buffer zone of Shushtar Historical Hydraulic System (SHHS) comprises of two types of areas: the built up area and agricultural area (see map II). Different sets of regulations apply in these two different areas as follows:

I- Built up areas:

1-Actions potentially or actually endangering the function, structure or visual integrity of Shushtar Historical Hydraulic System are prohibited.

2-Any action adversely affecting environment of health is forbidden. Such actions include: the dumping garbage, disposal of surface water carrying chemical agents or other hazardous materials into the historical sites or river.

3-All the elements not compatible with the natural-historical identity of Shushtar Historical Hydraulic System must be managed based on the approved plan of the ICHHTO.

4-Any developmental or constructural activity or management plan, tourist services develop, making or developing urban or regional facilities, restoration, rehabilitation, urban development, renovation or reconstruction of buildings, development and generation of green spaces, repairing or changing the function of part or whole of buildings are only permitted with the approval of ICHHTO.

5- Any excavation is only permitted with the approval of the organization.

6- All historical monuments should be restored and conserved under ICHHTO supervision.

7- Any kind of intervention activities in historical monuments and all places that have a view of the SHHS must be carried out base on the approval of ICHHTO.

8- Maximum allowable height of building in all places that have a view of SHHS is two floors or 7.5m above the level of adjacent passageway and other building are included in ICHHTO approved regulation related to Shushtar historical town.

II- AGRICULTURAL AREAS:

- 1-Actions potentially or actually endangering the function, structure or visual integrity of Shushtar Historical Hydraulic System are prohibited.
- 2-Any action adversely affecting environmental health is forbidden such actions include: dumping garbage, disposal of surface water carrying chemical agents, or other hazardous materials into the historical sites or river.
- 3-Any excavation is only permitted after confirmation of ICHHTO.
- 4-The only allowable utilizations in this area are agriculture and animal husbandry.
- 5-Any construction work in the area must only aim to procure the needs of farming or animal husbandry with the approval of the organization provided that building area does not surpass 10% of the property area (or 70 square meters) and its height is not more than 4.5m or one floor.

LANDSCAPE ZONE REGULATIONS

- 1-According to the regulations of the landscape zone, any program, project or intervention which can somehow change the natural, environmental, historical or cultural status of the Landscape (especially macro scale development projects, e.g., construction of bridges, roads and highways, new town or high-rises as well as infrastructural facilities, power transfer plans, etc) must be approved by ICHHTO at all stages of planning and implementation.
- 2-Construction of any macro scale industry establishments which may pollute the environment including, soil, water, air, vegetation, etc. as well as projects which significantly change the landscape, are forbidden.

Supervisory systems:

Shushtar Historical Hydraulic System benefits from three levels of supervision, described below.

1- ICHHTO High Technical Council

All plans and programs affecting the property should be approved by the High Technical Council of ICHHTO established in Tehran. This Council meets periodically at the property. It provides overall supervision ensuring that the plans and programs are implemented. This Council decides on all major conservation interventions in cultural property as well the allocation of financial resources for the Bases. Members of this Council include ICHHTO

Deputy for Conservation, four ICHHTO Director-Generals for Conservation, Fabrics, Registration, and Movable Properties, and five national experts.

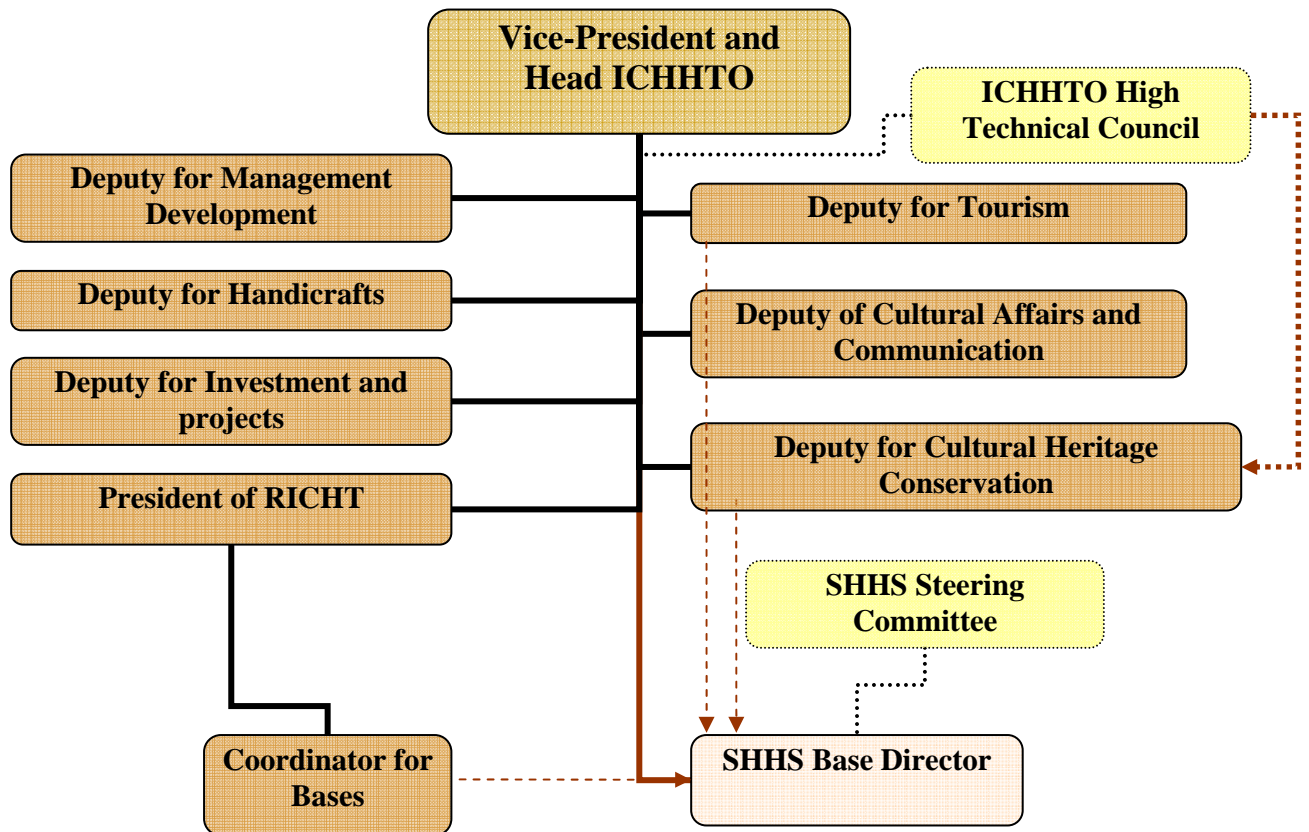
2 - Steering Committee:

Each Base has a steering committee of renowned experts who advises and adopts overall policies. The Committee approves the technical decisions for conservation interventions at the property. For technical matters, the Bases co-ordinate with respective deputies of ICHHTO, especially the Deputy for Conservation.

The members of this SHHS Steering Committee are as follows.

<i>Name</i>	<i>Academic field</i>	<i>post</i>
Dr .A. Behnia	Doctorate in Hydrology	Member
Dr .A. Shah-karami	Doctorate in Hydrology and foundation	Member
M-H. Moheb-ali	M.S. in Architecture	Member
M-H. Abrisham-baf	M.S. in Architecture	member
M. Rahbar	M.S. in Archeology	member
S. Mohammadi	M.S. in urban programming	Member and Director of Khuzestan province cultural heritage, handicraft and tourism organization
B. Hoseini	Doctorate in Industry	member
M-H. Arastu-zadeh	M.S. in Architecture	Director of Shushtar hydro structures system base

SHHS Steering Committee chart



3- Local Supervision Council:

A Local Supervision Council has been established, which is a stakeholders' group coordinating the development and conservation process in the property. The Secretariat of this Council has been established within the Office of the Local Governor of Shushtar.

The members of the **Local Supervision Council** of Shushtar Historical Hydraulic System, who meets on a monthly basis, include:

- The Developmental Deputy of Khuzestan Province Governor (Chairperson)
- The Director of ICHHTO Shushtar Historical Hydraulic System(SHHS) Base (Secretary)
- The Head of Khuzestan Province ICHHTO
- Shushtar representative in Islamic Parliament.
- Shushtar Governor
- The Head of Shushtar City Islamic Council

- The Head of Khuzestan Province Residence and Urbanism Organization
- Managing director of Khuzestan Province Water and Electricity Organization
- Managing director of Khuzestan Province Water and Wastewater Company
- The Head of Khuzestan Province Police force
- The Director of Khuzestan Province Radio and TV Organization

5. d. Existing plans related to municipality and region in which the proposed property is located (e.g., regional or local plan, conservation plan, tourism development plan).

1. all water supply plans within the area such as Gotvand dam located at the uptown
Storing water in those dams has increased deteriorating impact of the water, and this in turn has aggravated the progress of materials' erosion
2. constructing urban sewerage network
Completing urban sewerage network is one of the most essential needs of the city and of SHHS. According to conservation regulations and management plan for the System, urban sewerage network's plan within the historic areas and sites should be designed due to the especial conservation requirements of historical areas and must be approved by ICHHTO.
3. reviewing master plan
Shushtar's master plan is being reviewed while the present plan is clarified. The new regulations for conservation of the site and whole System of SHHS was given to the experts working on master plan at the beginning of the reviewing process to enable them to take into consideration the requirements for appropriate conservation and utilization of SHHS in reviewing the master plan.
4. small scale urban plans
All urban small plans having started before providing SHHS management plan within the SHHS boundary would be stopped by the present management plan. Local authorities agreed that from present time onward only the SHHS management plan is the base for planning and implementing such urban programs.

5. e. Property management plan or other management system

All SHHS sites will be managed under an integrated system which is mentioned below:

- MHUD Master plan

-Organization chart of Shushtar Historical Hydraulic System (SHHS)

-Main goals

-Swot tables**-Strategic****-Scheduled Programs****- MHUD Master plan**

There are various councils established at ministerial level dealing with inter-ministerial issues at national level. Two councils whose decisions affect SHHS property include the Higher Council for Architecture and Urban Planning (HCAUP) and Higher Council for Environmental Protection (HCEP).

Higher Council for Architecture and Urban Planning [HCAUP]

Higher Council for Architecture and Urban Planning (HCAUP) was established under the law of February 1973. Ministry of Housing and Urban Development [MHUD] is responsible for managing housing development as well as for developing master plans for urban and semi-urban areas. This includes the historic urban areas, where a large proportion of the Iranian cultural heritage is located. The HCAUP is presided by the Minister of MHUD. The Deputy Minister for Urban Development and Architecture is the Secretary of HCAUP, under whom a Director-General manages the Secretariat. Other members of HCAUP include the Ministers of Interior; Economy and Finance; Culture and Islamic Guidance; Education; Power; Jihad Agriculture; and Defence.

In addition to these ministers, three Vice-Presidents are voting members of the HCAUP: (i) Head of Management and Planning Organization, (ii) Head of ICHHTO, and (iii) Head of Department of Environment. HCAUP has four main functions:

- Overall urban development policies.
- commenting on by-laws affecting zoning, land use, and determining main functions;
- adoption of urban master plans; and
- Adoption of urban criteria, regulations, by-laws, etc.

The approval of master plans by HCAUP has an established process. A qualified consultant is commissioned by the provincial Housing and Urban Development Organization (HUDO), which is the provincial office of MHUD. After the plan is prepared must be approved by the Provincial Planning Council. It is then reviewed concurrently by the HCAUP's technical

committee and the office of Physical Plans at MHUD, before final submission to HCAUP. The figure below shows the procedure for approval of physical plans by HCAUP.

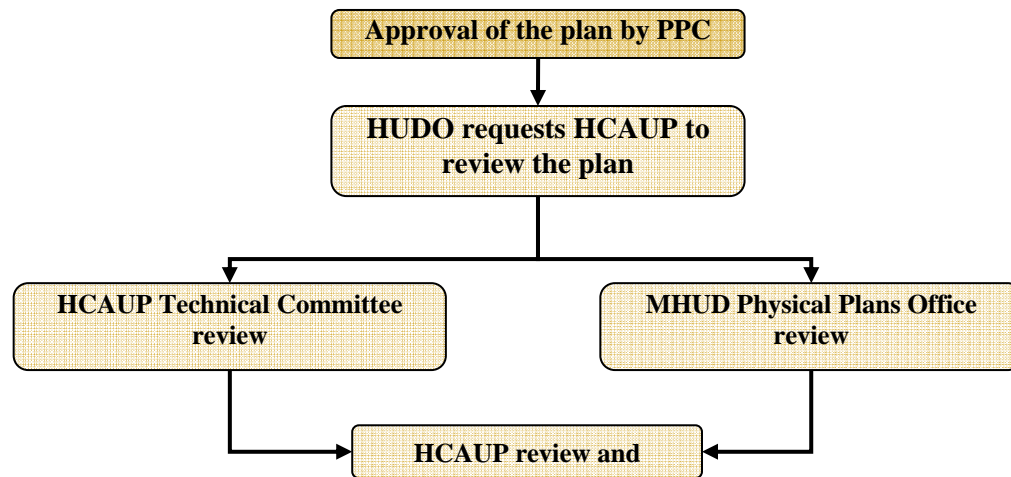


Diagram1. The procedure for approval of development plans by HCAUP

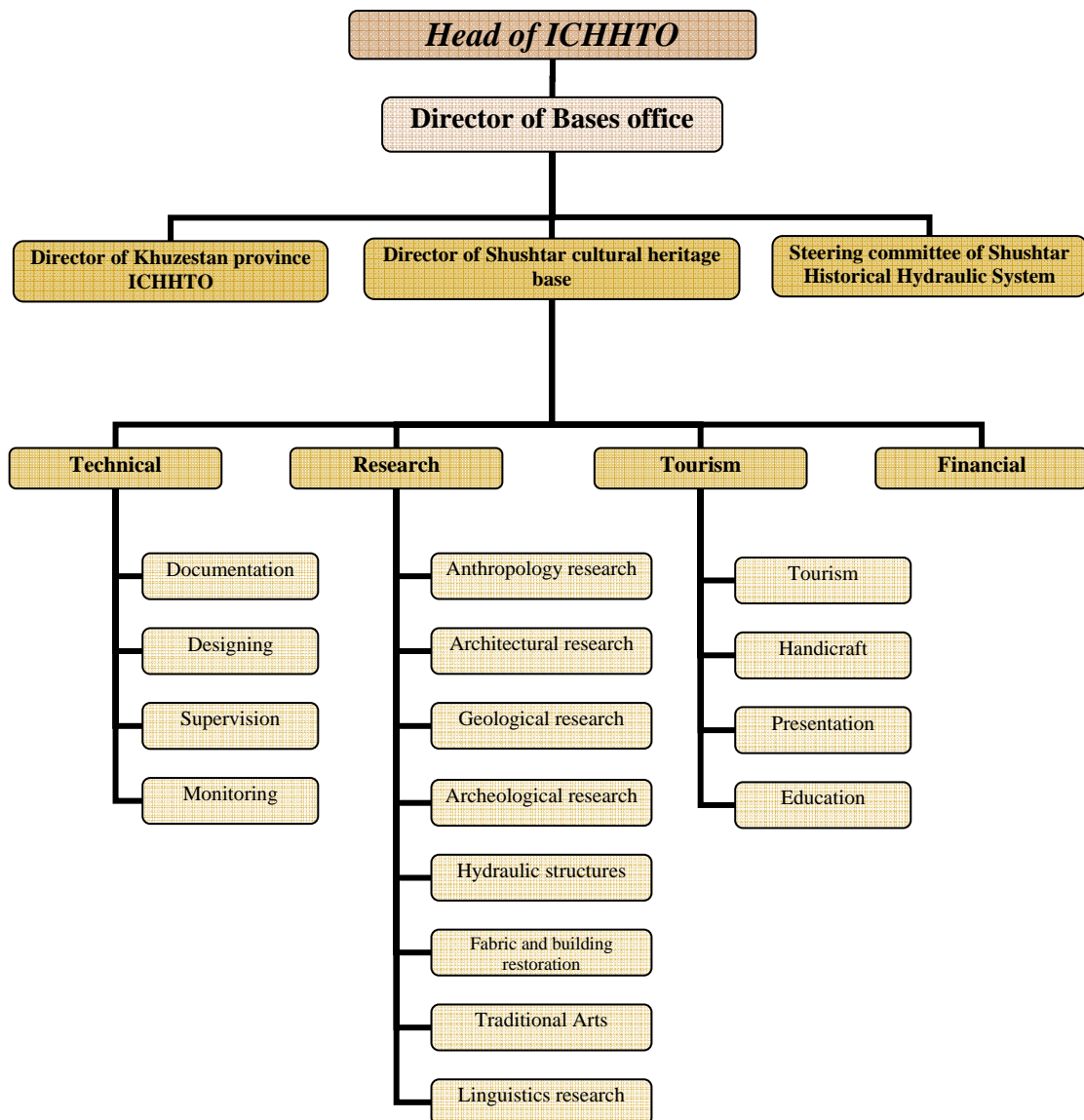
In principle, HCAUP does not examine the detailed plans. Such plans, as well as modifications which do not essentially change the existing Master Plan, are adopted by a commission presided by the provincial or county governor-general, head of City Council, Mayor, representatives of MHUD and some other ministries and (also called Commission for Article 5). The Secretariat of Commission for Article 5 is established at HUDO. In case of Shushtar, the Commission for Article 5 in Khuzestan Province is responsible for adopting urban development control regulations.

The first master plan of Shushtar dates back to the year 1364 AH (1985) which was drawn up and approved by Zista consulting engineers in about 600 pages largely concerning the preservation of Shushtar historical monuments. Afterwards, the same consulting organization prepared another master plan in 1367AH (1988) and drew up the 400 paged Rehabilitation and Maintenance Plan of Historical Fabric of Shushtar in 1371AH (1992) which was ratified by the high council of Iranian Ministry for Housing and Urban Development. Among its specifications is documentation of historical elements as well as giving special attention to historical conservation which effectively prevented damages inflicted upon Shushtar historical monuments. In this plan, preservation of the historical visual characteristics of the city is emphasized.

Since 1384 AH (2005) reconsideration of Shushtar master plan by Iranian Ministry for Housing and Urban Development has started and will be ratified during the next six months. Among its specifications is the observance of legal regulations regarding cultural heritage buffer zones declared by ICHHTO. The final ratification of this plan will be done by a committee consisted of representatives of ICHHTO, Shushtar Municipality, Environment Protection Organization, Ministry of Agriculture and Natural Resources as well as Khuzestan province office.

The operational unit for the conservation and management of SHHS is the ICHHTO SHHS Base, described below in the organization chart:

Organization chart of Shushtar Historical Hydraulic System (SHHS)



Main goals:

- To prepare a master plan for conservation and restoration of SHHS.
- To prepare educational programs
- Monument inspections, survey, preparation of records, examination of reports.
- To follow up legal matters.
- To carry out scientific surveys and archaeological research.
- To prepare conservation plans restoration of monuments in the SHHS.
- To organize training programs for experts on exploration, research, preservation, and conservation.
- To encourage local population and visitors; to continue a permanent training for the preservation of monuments and core zones, cleaning, conservation; exchange of scholars and experts for cultural activities in national and international levels for a better understanding of Hydraulic System; to prepare annual reports in a permanent way.
- To introduce the site with brochures, books, and etc.
- To equip technical office of SHHS.
- To improve tourism facilities.
- To collect documents, including photos, maps, articles, and books about the site.
- To train staff and guards of the site for cleaning, preservation, and visitor assistance.
- To train guards and local people to prevent damages that may occur by the misuse or abuse of monuments; to document the monuments; to prepare regularly reports.
- To establish contact with scientific and research centers in the country for cooperation of universities in research on multidisciplinary topics.

Due to reaching the appropriate scheduled programs for SHHS, the SWOT tables have been prepared as follows:

SWOT tables:

Threats	Opportunity	Weakness	Strength	Field
<ul style="list-style-type: none"> - Transportation passing on some of the bridge-Dams which some day was used for human and animals and not for vehicles - Not designing a schematic project for vehicle circulation on the monuments and about them - Motorcycle circulations inside the buffer zone 	<ul style="list-style-type: none"> - Establishing the Allameh Sheikh Bridge in the Gargar area for vehicle purposes - The existence of a ring road around the city 	<ul style="list-style-type: none"> - Unsuitable access path for pedestrian walk 	<ul style="list-style-type: none"> - Centric hydraulic structures and being accessible - The main urban fabric being available, is small & there is a possibility of reaching to all parts on foot in the district 	Urban Transportation

Threats	Opportunity	Weakness	Strength	Field
<ul style="list-style-type: none"> - The existence of earthquake fissures underneath the SHHS - Having short raining seasons along with torrential rains - The existence of supplemental buildings to some of the Hydro structures in the buffer zone -Threats due to city development - Threats due to removing the element "Water" from the authenticity of the monuments and their functions - Not having sufficient information about the physical features of water - Destroyable effects due to repetitive water force over time - Lack of strength in the natural walls of the SHHS after rainfall 	<ul style="list-style-type: none"> - The existence of great deals of gardens around the streams & on the SHHS 's border - River passing through the city & it's boroughs ,with a high visual quality - Rich landscapes such as mountains & gardens around the SHHS - Many potentials for visitor attraction 	<ul style="list-style-type: none"> - The existence of lamp posts and revealing an unpleasant scenery on the SHHS 	<ul style="list-style-type: none"> - Clean & fresh air at autumn - Fertile soil for farming - Having special animals & birds related to the climate - Appropriate slopes & water being directed through these slopes - Enough water for making greenery - A variety of plant life - A difference in altitude between the old fabric & the SHHS as a value in visual aspects 	Bio-Environmental & Urban Landscape Issues

Threats	Opportunity	Weakness	Strength	Field
<ul style="list-style-type: none"> - Sewage & surface water ,which is meanwhile being led towards the waterfalls or onto the hydro systems - Lack of technical equipments in order to operate the protective programs 	<ul style="list-style-type: none"> - Many open green areas and the opportunity of using them as a place for setting the installations 	<ul style="list-style-type: none"> - Old pipe network, made from steel & cast iron - Meanwhile the electricity network available inside the SHHS has lost its function - Old sewage system not responding to the residents' needs - The SHHS 's bridges are damaged on the stone pillars - Creating visual chaos because of the lamp posts - Lack of recreational facilities in the system - Unsuitable quality & quantity for urban furniture, such as public phones & trash cans 	<ul style="list-style-type: none"> - Using the natural land slope and the gravity to transfer water all over the site - Water Distributing all through the urban fabric ,responding to all unit needs - All dwelling units have access to electricity - Observing safety regulations in electrical interconnections - A suitable slope for releasing surface waters & the sewage - Being attentive towards city furniture & its proper distribution - Preparing an acceptable lightening over some of the hydro structures with the cooperation of the electricity company of the district 	<p>Urban Installations</p>

Threats	Opportunity	Weakness	Strength	Field
<p>- Social & Human damages due to lack of attention and knowledge from the regional groups around & inside the SHHS</p>		<p>- Risk of life dangers due to cliffs and deep canals.</p> <p>-Abandoned community centers around</p>	<p>- Settlement satisfaction from their security in the area</p> <p>- Regional groups mostly agree with conservation issues in the urban fabric & the SHHS</p> <p>- Elder fathers are still dependable for people in the fabrics</p> <p>- A high percentage of education among settlements</p> <p>- Higher economical budgets near the Hydro Structures because of some recreational chances</p> <p>- People 's desire & dependency towards water because of many traditions that has to do with water</p> <p>- Forming many traditions and cultures related to water</p> <p>- Forming many temples near the water which certainly has common origins with ancient Iranian water sanctuary</p> <p>- A direct relationship of water ,canals, bridges, tunnels and Dams with a n active economy(Agriculture)</p> <p>- A precise reason for a strong authenticity among people in choosing their last names & jobs ,ones basically using the word water in them</p>	<p>Cultural , Social & Economical issues in the SHHS</p>

Threats	Opportunity	Weakness	Strength	Field
	<ul style="list-style-type: none"> - City formation & its development based on the SHHS - The historical importance of the Shadorvan bridge-Dam because of a hypothesis due to this path being a part of the old access paths(Kings' Path) - The existence of many bridges belonging to different historical eras in the SHHS 	<ul style="list-style-type: none"> - Increase in the amount of enemy attacks to the city in the past because of the bridge Dam - Many of the existing water structures at the moment have no special function & are left abandoned 	<ul style="list-style-type: none"> -The existence of the Sâbe'in sanctuary & the Kollah Farangi Tower -The existence of the old paths & Sabats -The existence of the trenches & canals on the governor part of the old city (Salâsel castle) - The existence of the customhouse on the bridge-Dams as an entrance & a control over comings and goings - The existence of stairs leading to the water to facilitate the access to water - The existence of basements(Shovadune) in most houses ,6 meters under the ground, as a direct access to water canals - The existence of a great deal of bridge-Dams as city entrances in different orientations & at different historical eras 	<p>Historical Background of the SHHS</p>

General strategies:

- Preparing & distributing "Introduction & Educational schemes based on the site's values.
- Preparing & executing "Restoration & Civil schemes (installations such as water & sewages).
- Preparing & distributing research programs in the SHHS.
- Assembling & executing Visitors' Programs in the SHHS.
- A comprehensive programming for stakeholders & ones responsible to cooperate according to the management chart.

- According to these general strategies and mentioned main goals, we have planned scheduled programs for every site in the Shushtar Historical Hydraulic System (SHHS) which is included in below tables:

In these tables rate of required budget is indicated as follow:

- Budget less than 3000.000.000 Rls
- Budget between 3000.000.000-8000.000.000 Rls
- Budget more than 8000.000.000 Rls

Scheduled Programs

Site name: *Band-e Mizân Dam and Kolâh-Farangi Tower*

Type of Activities	No	Activities	Timeframe (2008 - 2022)													Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
Documentation	14	Completing and updating documentations constantly														<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly														<input checked="" type="radio"/>	

Scheduled Programs

Site name: 3. *Gargar Canal*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Documentation	14	Completing documentations on the Canal and the historical elements around it.															<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly															<input type="radio"/>	

Scheduled Programs

Site name: 4. *Polband-e Gargar Bridge-Dam*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Documentation	14	Completing documentations on the Canal and the historical elements around it.															○	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly															●	

Scheduled Programs

Site name: 5. *Watermills and Waterfalls area*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities			
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021			2022		
Tourism	15	Clarifying the site & preparing a visitor path																		<input type="radio"/>	All authorities in Conservation part
Documentation	16	Completing and updating documentations constantly																		<input type="radio"/>	All authorities in Conservation part
	17	Compiling & Executing monitoring projects constantly																		<input type="radio"/>	

Scheduled Programs

Site name: 6. *Borj-e 'Ayâr Bridge-Dam and Sâbe'in Temple*

Type of Activities	No	Activities	Timeframe (2008 - 2022)												Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
Documentation	14	Completing documentations on the Canal and the historical elements around it.													<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly													<input type="radio"/>	

Scheduled Programs

Site name: **7. Mâhi-bâzân (Khodâ-âfarin (God-Created) Bridge-Dam**

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities		
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021			2022	
Documentation	14	Completing documentations on the Canal and the historical elements around it.																	<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly																	<input type="radio"/>	

Scheduled Programs

Site name: 8-9. *Salâsel Castle and Dâriun Canal*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities		
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021			2022	
	14	Starting & Equipping an information science office for the relic																	●	All authorities in Conservation part
Tourism	15	Clarifying the site & preparing a visitor path																	●	All authorities in Conservation part
Documentation	16	Completing documentations on the Canal and the historical elements around it.																	●	All authorities in Conservation part
	17	Compiling & Executing monitoring projects constantly																	●	

Scheduled Programs

Site name: 10. *Polband-e-Shâdorvân Bridge-Dam and One-Opening Bridges*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Documentation	14	Completing documentations on the Bridge and the historical elements around it.															<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly															<input type="radio"/>	

Scheduled Programs

Site name: 11. *Band-e-Khâk Dam*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Documentation	14	Completing documentations on the Bridge and the historical elements around it.															<input type="radio"/>	All authorities in Conservation part
	15	Compiling & Executing monitoring projects constantly															<input checked="" type="radio"/>	

Scheduled Programs

Site name: 12. *Lashkar Bridge-Dam and Imam-zadeh Abdollah Shrine*

Type of Activities	No	Activities	Timeframe (2008 - 2022)															Budget Rate	Responsible Authorities	
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Research	1	Investigation & Digging up in the buffer zone in order to identify the skeleton and role of the SHHS	█																○	The Base of SHHS, Water and Wastewater Co, NGOs and Private cultural heritage Clubs
	2	Researches on identifying materials and substances		█														○		
	3	Chronology and identifying eras of the site		█														○		
	4	Study on the Authenticity and integrity of this damaged site		█														○		
Conservation and Developmental	5	Regulating and Executing the area, buffer zone and urban, historical, religious, cultural and natural landscapes reorganization plan, in order to identify the Sites	█															●	The Base of SHHS, Municipality, Residence Foundation, Water and Wastewater Co, Residence and Urbanism office, Environmental Protection office, NGOs and Private cultural heritage Clubs	
	6	Cleansing and removing undesirable plants and scraps from the buffer zone & core zone	█															○		
	7	Cleansing the buffer zone and core zone constantly	█															○		
	8	Preparing & Putting the Conservation Restoration Project into operation	█																	●
	9	Ownership and releasing the buffer zone and core zone from inappropriate functions	█																	●
Presentation and Training	10	Lightings for the site	█															○	The Base of SHHS, Municipality, Electricity Co, NGOs And cultural Clubs Radio and TV Org.	
	11	Setting guide signs	█															○		
Tourism	12	Clarifying the site & preparing a visitor path	█															○	All authorities in Conservation part	

Scheduled Programs

Site name: 12. *Lashkar Bridge-Dam and Imam-zadeh Abdollah Shrine*

Type of Activities	No	Activities	Timeframe (2008 - 2022)														Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
Documentation	13	Completing documentations on the Bridge and the historical elements around it.															<input type="radio"/>	All authorities in Conservation part
	14	Compiling & Executing monitoring projects constantly															<input type="radio"/>	

Scheduled Programs

Site name: 13. *Band-e Sharâbdâr Dam*

Type of Activities	No	Activities	Timeframe (2008 - 2022)																Budget Rate	Responsible Authorities
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022			
Documentation	12	Completing documentations on the Dam and the historical elements around it.																<input type="radio"/>	All authorities in Conservation part	
	13	Compiling & Executing monitoring projects constantly																<input checked="" type="radio"/>		

5. f. Sources and levels of finance

The present financial and credit resources of Shushtar Historical Hydraulic System are provided by the Iranian Cultural Heritage, handicraft and tourism organization (ICHHTO) and the development budget of Shushtar municipality and Khuzestan province Water and Electricity organization approved by Iranian Ministry of Energy.

Credit resources of Historical Hydraulic System base from 1998 till 2007

<i>Year</i>	<i>ICHHTO National and Provincial budgets (Million RLS)</i>	<i>Ministry of Energy Budgets (Million RLS)</i>	<i>Shushtar Municipality budgets (Million RLS)</i>
1998	300	-	-
1999	500	-	-
2000	600	-	300
2001	600	800	300
2002	600	1000	500
2003	1600	4000	500
2004	3200	4000	-
2005	5000	4000	500
2006	6000	-	600
2007	6000	-	1000

In addition, due to respect of state to world heritage sites, there is an especial & permanent budget for WHS's approved by national parliament of IRAN which increased annually. The amount of this budget was about 6 million \$ for 8 WHS's of IRAN in 2007 and this amount has been suggested about 8 million \$ in 2008. For example the annual amount of this budgets were 1.7 million \$ for Persepolis and Pasargadae WHS's and 0.5 million \$ for Choghazanbil in 2007.

5. g. Sources of expertise and training in conservation and management technique

Sources of expertise and training in conservation and management techniques are included as follows:

1- Research Organization of Cultural heritage and Tourism

ROCHT is responsible for multidisciplinary researches and training of young experts of ICHHTO.

2- Local and national universities

There are some local universities such as Shushtar and Ahwaz University which at present their students work and study in SHHS. There are several jointed projects between SHHS and these universities based on training goals, for example Ahwaz University has suggested the monitoring projects for SHHS.

And also in national level, high educational centre of ICHHTO and other national universities provide sources of expertise and training in conservation and management techniques.

3- The exchange of expertise between WHS's

At present there is a close cooperation between SHHS and other bases such as Choghazanbil WHS that has 35 kilometres distance from it.

4- Short term training and workshops

Short term training and workshops are being held in local, national and regional levels with cooperation of UNESCO and Universities for providing sources of expertise and training in conservation and management techniques. For example these workshops have been held in regional and national levels during the two past years which the SHHS experts are participated in it.

- Cultural Landscape workshop held in Persepolis
- Management and conservation of historical sites held in Choghazanbil
- Training workshop for restoration of earthen architecture held in Meyboud.

5- Use of traditional craftsmen and masons for training young

One of the most important sources of expertise and training in conservation and management technique is applying the traditional craftsmen and masons. Fortunately, this kind of training is alive in Iran yet.

6- Training courses for guards, members of NGO's, people and local authorities:

The regularly courses are been held on site for training different persons by experts of SHHS.

5. h. Visitor facilities and statistics:

All tourism facilities for the nominated System (SHHS) are limited to some small local services in watermills System's entrance and Salâsel castle. Also, the experts of ICHHTO's base for conservation of SHHS are settled at the historic house overlooking to Watermills and Waterfalls area in order to give information to the tourists.

Site's tourism facilities including tourism services and accommodation are not satisfactory. Providing those kinds of facilities will be taken into consideration in the new conservation regulation.

- Statistics on the number of visitors:

<i>Year</i>	<i>Iranian visitors</i>	<i>Foreign visitors</i>	<i>Total of visitors</i>
2001	136582	643	137225
2002	141941	248	142189
2003	124033	161	124194
2004	148339	382	148721
2005	136186	220	136406
2006	142262	300	142562

5. i. Policies and programmes related to the presentation and promotion of the property

According to conservation management plan for SHHS, presentation programs of the sites are base on three principles as following:

1. attracting more tourists to flourish local economy
2. increasing public knowledge in both extent and depth about historical, cultural, and technical values of relic
3. preserving relic's authenticity and integrity

Regarding above mentioned factors, all plans and approaches anticipated for introducing the relic in different levels are as following:

1. Local scale:

- Providing various guide-books for different readers and tourists and for different purposes
- Training some skillful local tour guides through research base's training courses
- Holding periodic scientific conferences on the topic of SHHS and their sites (in expertise, managing, and public levels)
- Providing especial plan for developing city's museums according to management plan
- Defining all anticipated plans for organizing and clarifying especial subheads for introduction of SHHS and all stop points and pedestrian routes anticipated in management plan in higher level policies such as master plan and detailed (action) plan
- Preparing the System and equipping it as an open water museum
- Holding different open-air programs in various related occasions to cultural heritage and to the water
- Running some training workshops in the schools on the topic of cultural heritage and hydro heritage

2. Regional scale:

- Distributing some guide-books about tourism attractions in Shushtar by information and tourism centers of cities in the region
- Providing and playing some documentary films about SHHS in provincial TV channels
- Supporting tourism agencies to improve the quality and quantity of their tours to Shushtar

3. National scale (nationwide):

- Running various scientific conferences for information exchange about conservation and renovation plans for SHHS
- Supporting and motivating tourism agencies to run some especial tours to Khuzestan and Shushtar

- Providing and playing some documentary films about SHHS in national TV channels
- Providing and distributing some cultural products such as film, photo, etc. on the topic of SHHS
- Planning for holding cultural and scientific programs in Shushtar to increase the possibility of introduction of city and its historic sites

4. International scale (worldwide):

- Presenting some scientific articles in international conferences about SHHS, their historical values, and conservation and renovation plans for them
- Providing and playing some documentary films about SHHS in international TV channels
- Motivating different tourism agencies having incoming tours to take their tourist to Shushtar to visit the city and its unique historical sites
- Improving the quality and quantity of cultural products such as films, photos, etc. about Shushtar and distributing them in destination markets
- Holding some visiting programs for cultural and administrative guests in Iran to visit Shushtar

5. j. Staffing level (professional, technical, maintenance)

The members of Cultural and Tourism Base of Shushtar Historical Hydraulic System is responsible for monitoring and managing all preservation, restoration and research activities which their tasks and personnel posts are included in below tables:

<i>Task</i>	<i>Number of person</i>
Director	1
Chief architect	3
Architect	2
Archaeologist	3
Restoration expert	2
Structure engineer	1
Electrical engineer	1
Legal expert	1
Architect technician	8
Mason	4
Skilled worker	2
Guide	2

Accountant	1
Gardener	1
Guard	12
Driver	2
Total:	46

-Experts and their personnel posts in Shushtar historical hydraulic System base

<i>No</i>	<i>Name</i>	<i>Academic field</i>	<i>post</i>
1	M-H. Arastoo-zadeh	M.S. in Architecture	Director
2	A. Chahar-mahali	B. of restoration of Architecture	Charge of technical office
3	A. Afshar	M.S. in Architecture	Charge of Shushtar fabric research and documentation team
4	A. Shokoh-nia	B. of civil engineering	Executive charge of mills and waterfalls workshop
5	S. Pishdadi	M.S. in restoration of relicts	Charge of conservation lab
6	M. Askari	B. of archeology	Member of research team
7	E. Ali-zadeh	M.S. in archeology	Member of research team
8	F. Ali-zadeh	M.S. in ancient history	Charge of library and archive
9	R. Saffari	B. in architecture	Charge of computer affaires and digital archive
10	E. Alshali	Expert in official and financial affaires	Charge of financial and official affaires
11	M. Nik-maram	B. of electronic	Responsible for internet site and communication
12	H. Yosefi-far	Architect technician	Tourism affaires
13	H. Sotudeh	M.S. in Architecture	Member of research and design team
14	M-A. Tarbiatju	M.S. in Architecture	Member of research and design team
15	M. Froogh-mand	B. of law	Charge of legal affairs
16	A. Hizom-bor	Architect technician	Executive charge of Salas castle workshop
17	H-A. Aghaiian	Architect technician	Executive charge of Shâdorvan bridge-Dam workshop
18	D. Najjar-Asiaban	Architect technician	Member of documentation team
19	M. Pasalar	Architect technician	Member of documentation team
20	S. Meêmâr-nia	Architect technician	Member of documentation team

21	M-S. Pur-khaiiat	Art technician	Member of documentation team
22	G. Behdar-vand	Expert in architecture	Member of documentation team
23	M-A. Sarmast	Architect technician	Member of documentation team
24	B. Jelo-dar	Architect technician	Member of documentation team
25	M. Saâdi	B. of English language	Tour leader
26	A. Rashidi	Foreign Languages expert	Tour leader

Craftsmen and traditional experts in Shushtar historical hydraulic System base

1. M-H. Meêmarian	Traditional architect
2. H. Meêmarian	Traditional architect
3. H. Fardi-neghad	Traditional architect
4. M-H. Maleki-zadeh	Traditional architect
5. A. Monjezi	Technical craftsman
6. M. Ghasemi	Technical craftsman

6

MONITORING



6. a. Key indicators for measuring state of conservation

In the waterworks of Shushtar, due to diversity of monuments and permanent and historical presence of water and branches of this hydraulic system in the heart of human activities within an old urban fabric, conservation of these remains, preservation of historical structures and their monitoring are implemented through a network of cooperation between the responsible authorities in water and civil affairs, scientific centres, labs and especially the Base and office of Iranian Cultural Heritage, Handicraft and Tourism Organization (ICHHTO) in Shushtar.

Therefore according to structural conservation and restoration of remains and location of these structures in hydraulic environment, a number of most important indicators of this hydraulic system of waterworks that are monitored by the responsible authorities can be categorized in the table below:

CATEGORY	INDICATORS	PERIODICITY	RESPONSIBLE AUTHORITIES
Water	Difference in water level in different seasons	Every Week	Base of ICHHTO in Shushtar- Ministry of Energy
	Difference in water pressure in sluices and openings.	Every Week	Base of ICHHTO in Shushtar- Ministry of Energy
	Pollutions	Every Week	Base of ICHHTO in Shushtar- The Environmental Protection Agency
	Hygroscopic moisture	Every Day	Base of ICHHTO in Shushtar- Shushtar Meteorology Office
Conservation and restoration	Regular examination of chalk or metal markers	Every 2 Weeks	Base of ICHHTO in Shushtar.
	A mount of materials erosion, effected by seasonal rains	Every Month	
	Plants and animals that make damages	Every Month	
	Geological research at the site	Every Year	
	Exploration/inspection of piers, bridge-dams and other hydro structures and the degree of erosion on these structures	Every Month	
	Regular surveys on boat	Every Week	
Tourism	Account of travellers and visitors on the site	Every Year	Base of ICHHTO in Shushtar.
	Setting up visitor facilities for tourists	-	
	Interviewing visitors to sample their opinions on the monitoring by questionnaires	Every Day	
Buffer zone	Landscape controlling , especially for the height and façades of the structures	Every 3 Days	Base of ICHHTO in Shushtar – Shushtar Municipality
	All the installations should be taken under permission and monitoring of ICHHTO	-	
Core zone	Construction activities are forbidden	-	Base of ICHHTO in Shushtar – Shushtar Municipality
Documentation	Maps Regular Photographic documentation Photogrammetry and laser scanning	-	Base of ICHHTO in Shushtar.

The most significant common key indicator among the waterworks includes erosion on rock walls .The reason for such a chemical action is due to the climate of the region. Meanwhile the Base of Shushtar experts inspect the conditions of erosion daily, weekly and monthly, and provide regular reports. Studies for stabilizing the walls are in progress by a multidisciplinary team of competent trainers in the following fields; geology, petrology and foundation, structure, architecture and restoration.



Fig. 270. The Western parts of the Watermills and Waterfalls area

For instance, the wall on the western part of the Waterfalls area, which is made of clay, stone and sandstone, is examined and photographed for examining its erosion (fig. 125). There are also some chalk markers positioned on the cracks, and are inspected regularly.

In the Waterfalls area, especially in the sikas, many deep and active cracks can be seen on the ceiling and walls. Cyclic humidity and dry intensify the erosion on the walls; this problem is, however, in control by the chalk markers and regular weekly photography and daily inspections. Through a weekly observation & photographing, it was understood that the south-west side of the waterfall has suffered earthquakes and dislocation of its materials as well.

The Salâsel Castle has also faced lots of intensified erosions due to rainfalls. The periodical (daily, weekly and monthly) photography in rainy months, inspections and reports done by Shushtar base experts has had a great impact on the Restoration & Reorganization program.

The openings of the Band-e Mizân Dam are examined especially in torrential seasons. One of the useful ways of monitoring is diving in order to control the northern foundations of the dam. The Base also proceeds to inspections on boats.

The dislocation of the lower part of the piers in the Polband-e-Shâdorvân Bridge-dam is examined through photogrammetric surveys and other changes are controlled through regular photography. The conservation and restoration plan is prepared based on these results. The monitoring on botanical damages on the stability of the bridge-dam is done by

photography. All conservation programs are based on these inspections and studies, and the given results will be taken into account in the new programme.

One of the common key indicators among the waterworks in Shushtar is the regular control of their buffer zones that can be the subject of violation and/or construction activities, or urban activities such as the use of the area for waste disposal.

To obtain these purposes, a team at the Base of Shushtar experts investigate the buffer and core zones regularly and give daily, weekly and monthly reports to the management. The ICHHTO group under the Base of Shushtar checks the buffer zone and core zone in order to control it from rubbish and sewage. To examine construction developments, a group of experts from the Base of Shushtar in cooperation with the municipality are in charge of controlling and orientating the constructions based on the national buffer zone and core zone guidelines.

6. b. Administrative arrangements for monitoring property

The main source of expertise is the expert unit of the Iranian Cultural Heritage, Handicrafts and Tourism Organization (ICHHTO), and expertise of Committee for Preservation of Historical Hydraulic System of Shushtar.

Also the Cultural and Tourism Base of Shushtar Historical Hydraulic System in cooperation and consultation with the authorities mentioned above are responsible for monitoring and managing all preservation, restoration, research activities.

6. c. Results of previous reporting exercises

The results obtained from the previous monitoring indicate that the urban development must be controlled on rocky surfaces and parts of the city that have been built and established on water canals. After a series of experimental operations, stabilizing the surfaces and walls they must be shielded by protective coverings. Meanwhile a multidisciplinary group is carrying out research on the issue to protect and conserve these walls.

The monitoring on the Waterfalls area shows the Sika area studies and stabilization of layers is prior to the other parts, therefore it is in advance in the restoration programs.

Since the piers of Polband-e-Shâdorvân Bridge-dam are sinking and parts of them dams have already collapsed, its restoration is a high priority and is in progress.

The results of the monitoring at the Band-e Mizân Dam reveal that its openings, especially in torrential seasons must be evacuated. The restoration on the lower part of the bridge is in progress.

Due to an increase in the number of visitors, having sufficient information about the quality and quantity of visitors, reorganizing their access and monitoring them is in progress.

In the core and buffer zones constructions activities have increased; the monitoring in these areas is a key factor for the conservation of the sites. To prevent waste disposal is also another factor in the monitoring; to design an appropriate wastewater system is also essential to the preservation of the sites.

The conservation and restoration of the Shushtar Historical Hydraulic System (SHHC) have been implemented in three periods, 1951-1981 (The National Conservation Office), 1982-1996 (The Cultural Heritage office), and 1996-2005 (The Base of Shushtar Historical Hydraulic System):

' 1951-1981(The National Conservation office):

Band e Mizân Dam:

- Restoration of the damaged Band e Mizân Dam in 1952
- Consolidation of the northern walls in 1952
- Covering 9 of the north openings and the western opening in 1952
- Clearing and reorganizing the Dam's area in 1976

From 1982-1996 (The Cultural Heritage office):

Band e Mizân:

- Restoration of the southern parts in 2002

The Waterfalls and Mills area:

- Stone and brick paving on the west part in 1991
- Restoration of the two bridges leading to the Sika (*Dopolun*) in 1991
- Erecting a parapet on the west side of the area in 1992
- Removing debris from the openings and the Sika in 1992

The Shâdorvân Bridge:

- Reconstructing the openings 1 – 3 in 1998

1996-2005 (The Base of Shushtar Historical Hydro System):**The Waterfalls & Mills area:**

- Clearing & removing debris from the west side of the canals and from the main canals as well, which include the Dahan-e Shahr, Sekureh and the Boleyti opening in 1998
- Restoration of the west staircases sited in the area in 2001
- Restoration of the mills located on the north side of the site in 2001
- Starting up one mill in 2002
- Removing debris from underneath the east wall of the site in 2001
- Doing Conservation & Restoration acts at the Boleyti tunnel in 2005
- Clearing the other part of the site, located on the west side in 2007
- Restoration & starting up a mill on the north end of the site in 2007
- Removing debris from the Shovadunes inside the castle in 2006 clearing the area in 2006
- Conservation Implementations on the tower and rampart in 2007
- Constructing visitor paths in the Castle site in 2006
- Installing guide signs for visitors in the site in 2006
- Preparing suitable lightings especially on the north side of the castle in 2006
- Restoration on the ventilation canals and the Shovadunes' ventilation shafts in 2007
- Restoration on other parts of the barrack rooms in the castle

The Dâriun Canal:

- Restoration of some of the brick arches in 2000
- Clearing and removing debris from one of the water canals on the Dâriun canal in 2000
- Restoration of the other fallen part of the Dâriun arch, at the beginning of the arch and under the barrack

The Polband-e-Shâdorvân Bridge-dam:

- Restoration of the 14th and 15th openings; and the *kanepush* (empty space between vaults for the installation of ceiling lights) in 2000
- Restoration work on the 9th,10th,11th,12th 13th openings ; and the *kanepush* in 2006
- Restoration on the 8, 9 & 14th openings & the *kanepoosh* in between in 2006
- Reorganizing the site of Polband-e-Shâdorvân Bridge-dam in 2006
- Topographic and Photogrammetric surveys in 2007

The Band e Ayyâr Dam:

- Removing debris from the area in 2007
- Topography operation in 2007

The Mâhibâzân (Khodâ-âfarin) Bridge-dam:

- Clearing the area from harmful plants in 2007
- Topographic survey in 2007

The Band e Khâk Dam:

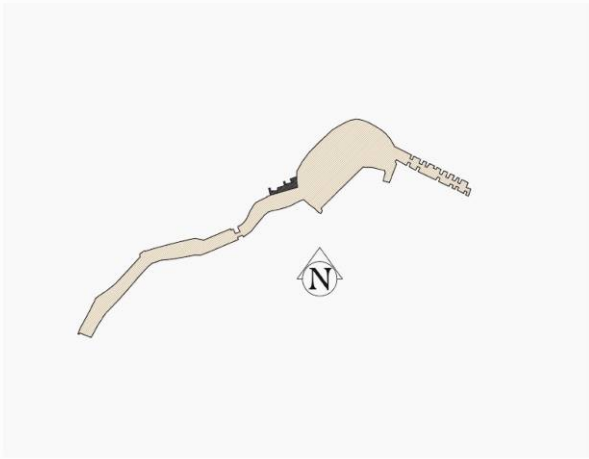


- Clearing the area from harmful plants in 2005
- Topographic survey in 2005

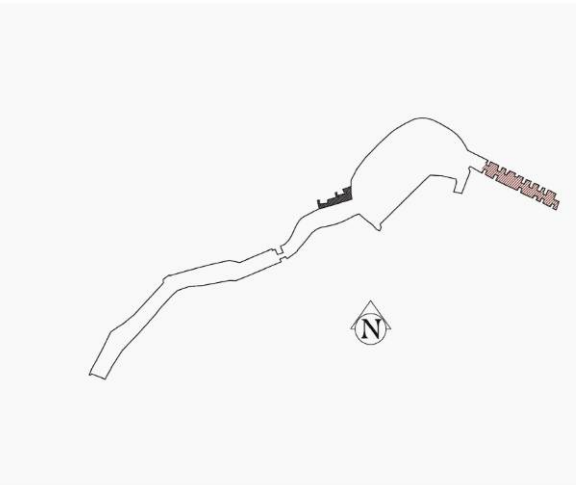


The Pol Band e Lashkar Bridge -Dam:


- Clearing the area in 2007
- Topographic survey in 2007

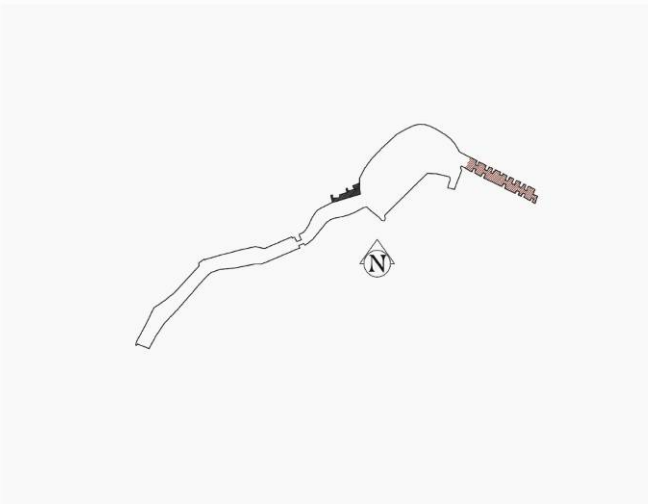
The data obtained from the monitoring 13 sites are summarized in the following tables:

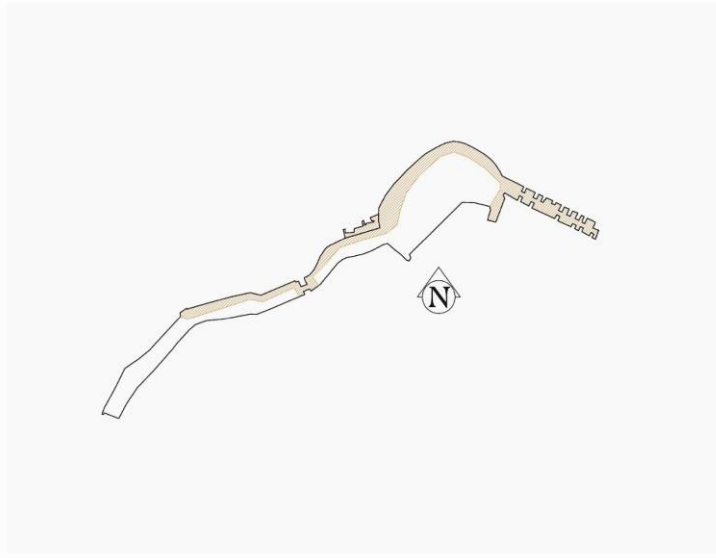


6. c.T.1- Band e Mizân Dam

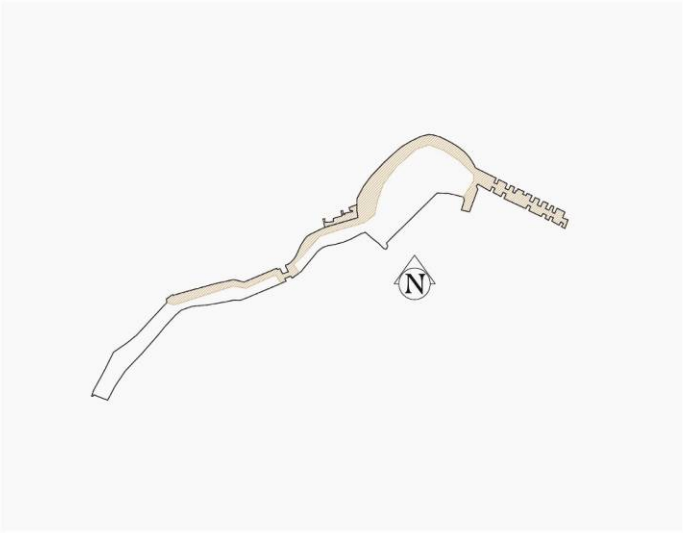


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Sassani	Shapur the 1st, Valerian the architect	The whole Site	3-7 years	-	<p>“Shapur the 1st had gotten Valerian as captivity said if you want your freedom you must make a Dam on the Shâdorvan in Shushtar so that the lands near it turn green...”</p> <p>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</p>  <p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Safavids	Fath Ali Khân	Openings on the north part of the Dam	-	Human elements	<p>“And that was why Fath Ali Khân attempted to increase the water in the stream and commanded make openings to lead the water towards the Dodângeh River.”</p> <p>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</p>  <p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Afshâr	Nâder Shah Afshâr & Esfandyâr Beig	The damaged parts	–	Human disruptive factors & the river flood water	<p>“The expense for building the Dam was estimated to 1470 Toman and after Nâder’s leaving, Esfandyâr Beik sent someone to Kashan, received that amount and the year after started to work on the Dam. And that was how water came on to the Dâriun Stream.”</p> <p><i>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</i></p> 

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Afshâr	Nâder Shah Afshâr & Esfandyâr Beig	The north part of the Dam	–	The river flood water in torrential seasons	<p>“In those years, there was another floodwater on the Band e Mizân and since no one dared to tell Nâder Shâh about it, it was left destroyed.”</p> 

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Qajar	Mohammad Ali Mirza Dolat Shâh	The whole Site	3 years	-	<p>“Shushtar had heard about Dolat Shah’s fame and asked for his help when he came to Shushtar and complained about the Dam to him so the Dam would be repaired. Dolat Shah accepted their favor and sent his architect in Kerman shah to Shushtar and the architect started work right that summer as soon as he got there. He finished work after 3 years of hard work.”</p> <p>500 years of Khuzestan History, Ahmad Kasravi</p>
						<p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Pahlavi (1952)	Shushtar Municipality	Parts of the Dam’s surface	-	Erosions & damages on the Dam framework	<p>In 1951, a part of the 9 north openings & the single west opening (Dareh Zanoon) and the top north part of the surface was restored and renovated by the municipality.</p>
						<p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Contemporary (2003)	Base of Shushtar historical hydro structure	-	-	-	In 2003, archeological acts were done beneath the Gargar & Band e Mizân water by Dr. Mireskandari's group. Through this implementation a part of the past closed openings were cleansed.


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Mizân	Contemporary (2004)	Base of Shushtar historical hydro structure	-	-	-	In 2004, a geodesic program was done on the Band e Mizân Dam, whereas its objective was to define more than before, the framework of the Dam. This was done by the Base of Shushtar historical hydro structure & Ministry of Energy. In this project there is 11 dowsing with 158 meter length.


6.c.T.2- Kolah Farangi


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Kolla Farangi	Sassani	Shapur	The whole Site	-	-	This tower is sited beside the Band e Mizan Dam and relates to the Sassani era. It is said it said to be a minaret or tower aside the Mahyarian gate or used as a monumental platform beside the Mizan Dam. This tower is a hexagonal and is based on a 3 meter platform.

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Kolla Farangi	Pahlavi	Shushtar Municipality	Lower parts of the tower & it's base	-	Repetitive erosions	In the Pahlavi era, at the time the park beside the Kollah Farangi tower was based, many unskillful implementations were done on the Site.


6.c.T.3- Gargar Canal

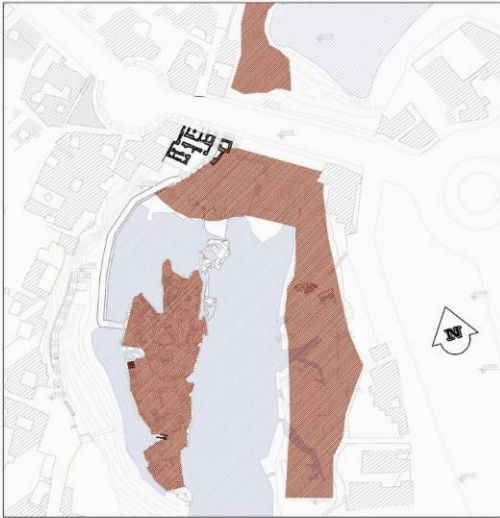
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Gargar Canal	Sassani	Ardeshir Babakan	Parts of the Site	-	-	In some historical writings it is said the digging & establishment of the Gargar Canal belongs to Ardeshir Babakan Ahmad Mostofi writes as follows in his book: " Ardeshir Babakan dug up a Canal established a Canal & founded a city..."
						Nehzat ol Gholob, Hamdollah Mostofi


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Gargar Canal	Sassani	Shapur	The whole Site	-	-	According to the ancient texts after the Ardeshir Babakan ,Shapur finished the Gargar by the help of the Romanian capturers.
						The 500 years History of Khuzestan, <i>Tarikh Pansad Saleh Khuzestan</i> , Ahmad Kasravi


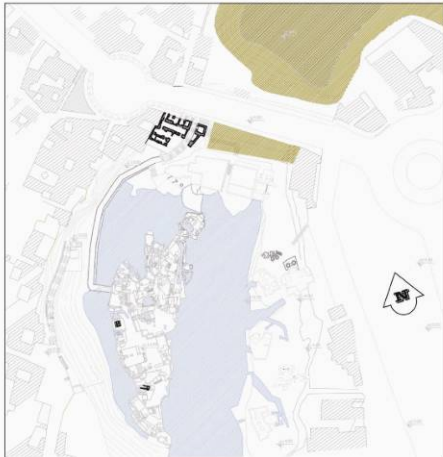
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Gargar Canal	5 th & 6 th century	Shushtar Municipality	End parts of the Canal	-	-	At first the Gargar Canal just like the Shoteit ended up to the sea .The early 5 th & 6 th century it changes its direction and at the present location of the Band e Qir Dam, they joined each other once again.
						<p>The 500 years History of Khuzestan, <i>Tarikh Pansad Saleh Khuzestan</i>, Ahmad Kasravi</p>


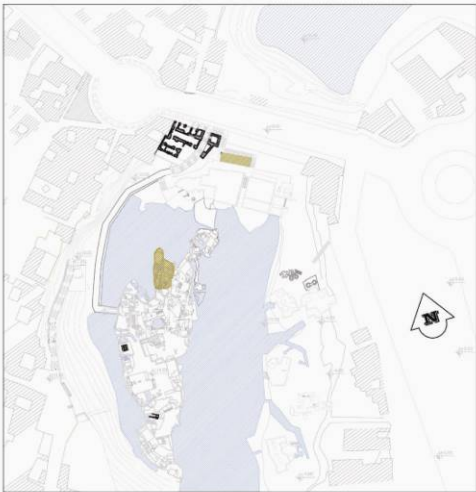
6.c.T.4and 5 - Polband-e Gargar Bridge-Dam and Waterfalls and Watermills area


Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Safavids	Soltan Tahmasb	The whole Site	3 years	-	After him, Tahmasb Soltan the son of Mohammad Soltan ,governed for 3 years. At his time Gargar Bridge came to an end and before that people crossed over Band e Mizân Bridge-Dam.”
						<p>Tazkereh Shushtar, written by Abdollah Jazayeri</p> <p style="text-align: right;">Restored </p>

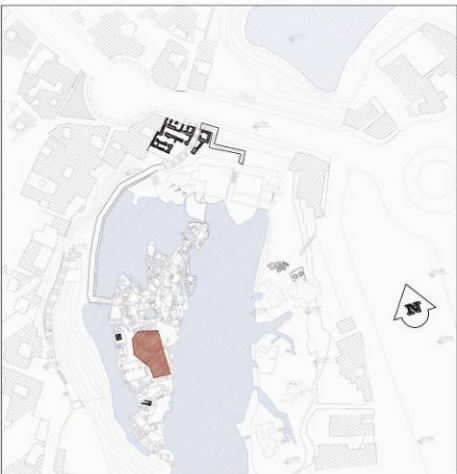
Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Safavids	-	The Watermills & maybe the Gargar Bridge	-	The overflow of the river	In those years, the water overflowed and the opening in Band e Mizân Bridge –Dam became bigger and the Dam went wrong and the Watermills around dried.
						<p>Tazkereh Shushtar, written by Abdollah Jazayeri</p>

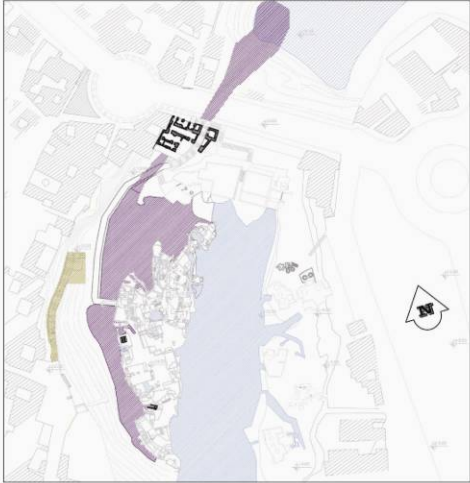

Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Qajar (1850)	-	The Watermills	-	-	The first Shushtar map was done by Preskoryakof in 1850, just by walking and measuring. This is how he described Shushtar:” On the north east on the Shoteit river side on a stone hill, is a small castle .On the river there is a permanent dam and a few water Watermills. The number of these Watermills reaches to 15 and 1500 toman income is gained per year from the Watermills.
						<p>Tehran cities, pictured documentation in the Qajar era</p>

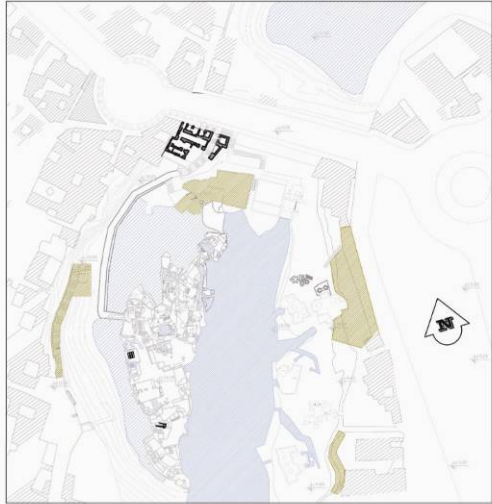

Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Qajar	-	The Watermills	-	-	<p>In the Tehran cities, pictured documentation in the Qajar era Preskoryakof mentions there are 15 Watermills and a few years later Nezam o Saltaneh Hussein Gholi Khan Mafi the governor of the time in Shushtar mentions the number of the Watermills as 21 in his diary, this shows the number of the Watermills have increased from 15 to 21 through these years.</p> <p>Tehran cities, pictured documentation in the Qajar era Nezam O Saltaneh mafi, Masoumeh Mafi & Mansourch ,Nezam Mafi Association</p> <p>Restored </p>
						

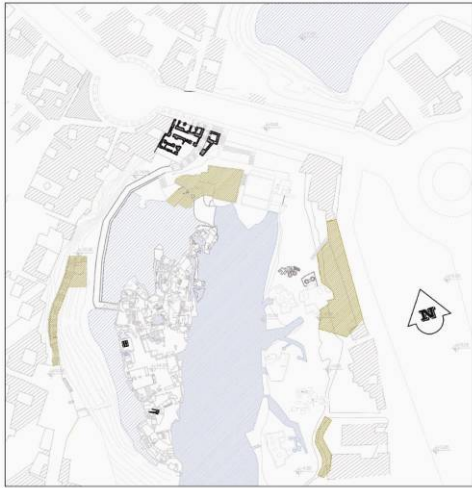
Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Pahlavi (1933)	Haj MohammadAli Namakizadeh	The power plant & Water Pump House were built	-	Human Factors	<p>In 1933, Mr.Haj Mohammad Ali Namakizadeh destroyed two of the mill doors and built the power plant ministry, which was the second water power plant in the country, at its place. In addition he built the Shushtar pump house in the mill area.</p> <p>Restored </p>
						


Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Pahlavi(1953)	Mr.Mostofizadeh and the mayor of time	The power plant & north staircases were built	2 years	-	During 1950 to 1952 Mr. Mostofizadeh built the second power plant in the north side of the site. In 1950 before the formal opening of this power plant which was done by Shah (King of Iran), the municipality of Shushtar started to build the north stairs.
						Restored

Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Pahlavi(1973)	Mr.Jolazadeh	Destroying 4 Watermills in Seka and building ice factory instead	2 years	Human factors	During 1950 to 1952 4 Watermills among the ones settled on the west part (In Seka) were destroyed by Mr.Jolazadeh and instead 4 Ice Factory rings for the Watermills were installed.
						Damaged




Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Year 1998	Base of Shushtar historical hydro structure	Dredging the channels and resorting some of the Watermills	-	Sediments piling in front of the channels	In 1998 the Base of Shushtar Historical Hydro structures in its primer implementations started the removal of debris in the canals and openings. During this action two of the openings in Sekooreh and Shahr was obstructed and all the Gargar water was transferred to the Boleyti opening, afterwards the Sekooreh & Shahr canals were removed from debris .In that year plus the removal ,there was restoration in the western part of the staircases and on the east side Watermills.
						Restored 




Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Year 2000	Base of Shushtar historical hydro structure	Removing debris from underneath the east wall ,restoration in the prayer room and the mill under, restoration of the northern side Watermills and adding enclosure walls	-	-	In 1980, restoration on Watermills, on the north part, finishing on the west staircases and restorations in the prayer room and the mill underneath was done. Also plenty of debris and remains under the east wall was removed and cleaned. Adding enclosure walls around the site for more security in the area, was also done in these years.
						Restored 

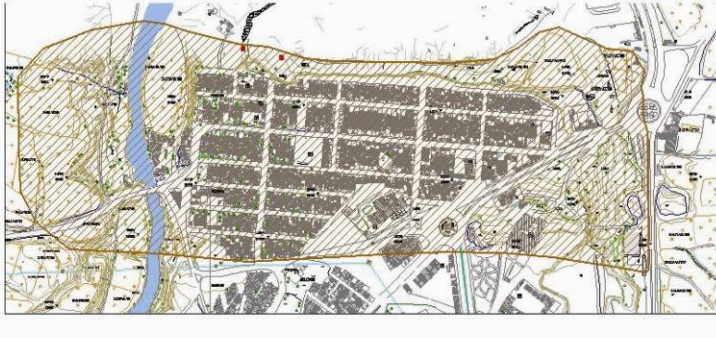
Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Gargar Watermills & Bridge-Dams	Year 2005	Base of Shushtar historical hydro structure & Ministry of Energy	Reorganization in the north staircases & Restoration on the Boleyti tunnel	-	-	In 2005, the northern staircases which had an improper situation in form and number were reorganized. Also in addition to this implementation, Base of Shushtar historical hydro structure with the cooperation of Ministry of Energy was able to do a few protective & restorative acts.
						Restored

Name of Site	Era	Executives & Founders	Restoration & development activities	Duration of Work	Events of damage & factors	Description
Watermills & Gargar Bridge-Dam	Year 2006	Base of Shushtar historical hydro structure & Ministry of Energy	Starting 2 Watermills	-	-	In 2006 two of the Watermills, one on the west and the other on the north side were started by Mr.Ahmad Sharbati with the finances of Base of Shushtar historical hydro structure.
						Restored

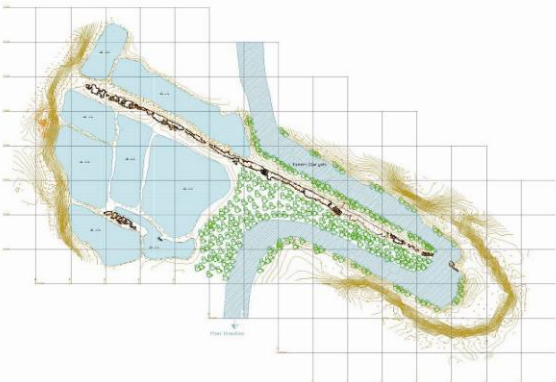
6.c.T.6-Borje-e ‘Ayâr Bridge-Dam and Sâbe‘in Sanctuary

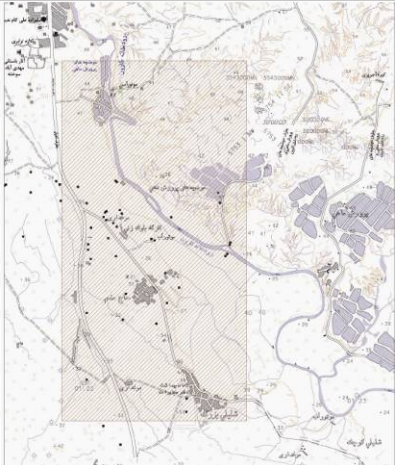
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Borje Ayyar Dam	Sassani	Shapur	The whole Site	-	-	<p>This great Site is located on the Gar gar river and lowers than the historical mills area. Around this Site, there are many other valuable Sites such as the Sabein installations, where this group used to do their occasions at this place. This Dam goes back to the Sassani era.</p>
 <p>Restored </p> <p>Damaged </p>						

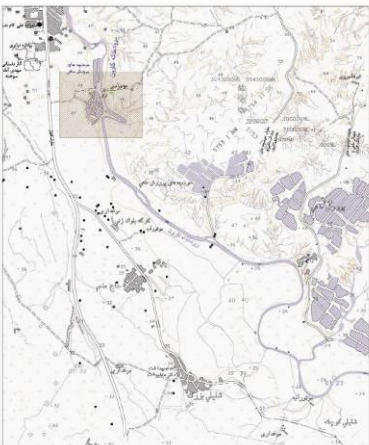
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Borje Ayyar Dam	Safavids 1106 (lunar date)	-	-	-	The flood water of the river	<p>In that year, the river over flood and the water behind the Dam increased. The amount of increased water pushed towards the Dodangeh river and all the gardens which were irrigated by this river, such as the Salem Abad, the Borje Ayyar garden etc received plenty of water.</p>
 <p>Restored </p> <p>Damaged </p>						<p>Tazkereh Shushtar, written by Abdollah Jazayeri</p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Borje Ayyar Dam	1111 (lunar date)	-	-	-	The flood water of the river	<p>“The inside city gardens such as the Salem Abad ,Golabi , the Balagardan & the local gardens of Seyyed Hossein were ruined by the damage the Borje Ayar Dam faced. The eastern gardens in the city as Bolbol garden,Feizollah,Tash Olia & Tash Sofla were destroyed influenced by the same reason.”</p> <p>Khuzestan History of Geography, Seyyed Mohammad Ali Shushtari</p>
						

6. c.T.7- Mâhi-bâzân (Khodâ-âfarin) Bridge-Dam

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Mahi Bazan Dam	Sassani	Shapur	The whole Site	-	-	<p>This Site due to its architectural form and some ancient texts relates to the Sassani era. One of its objectives was to increase the amount of water in the Gargar for cultivated lands and irrigation.</p>
						


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Mahi Bazan Dam	Safavids 1041 (lunar date)	Haj Mohammad Taghi Kalantar	The qanat beside the Mahi Bazan Dam	-	The seabed fall apart	
						

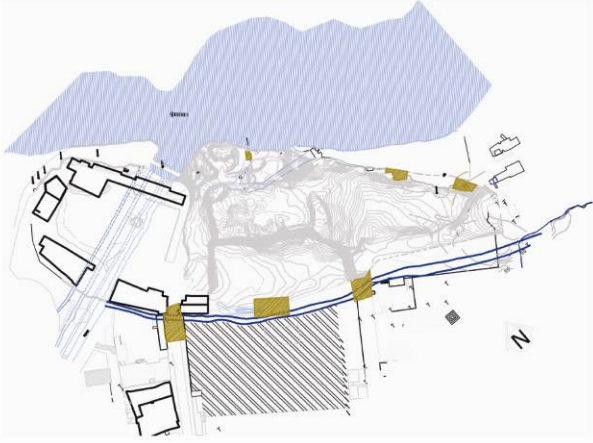
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Mahi Bazan Dam	Safavids	Fat h Ali Khan	The mills around the Mahi Bazan area	-	River water flood	"The Aghili Baghe Khan, the mills in the Mahi Bazan area, the Hesam Abad seat, the Gheisar Bridge, were all repaired.
						
						Tazkereh Shushtar, written by Abdollah Jazayeri




6. c.T.8- Salâsel Castle

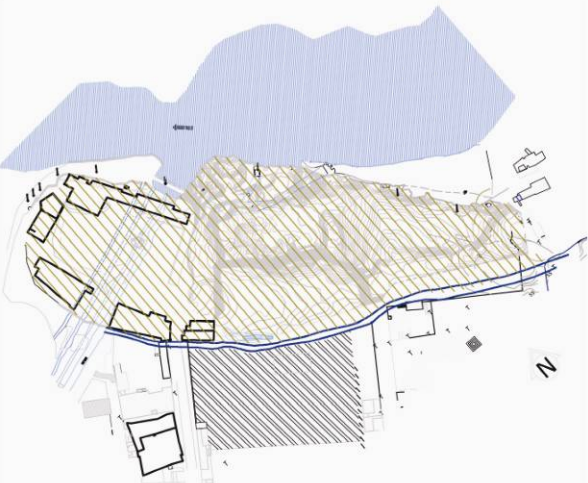


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Pahlavi	Nabavi ,the head of the Finance office	Many parts of the Site	-	Earthquake & Flood water	<p>“In 1961, many parts of the Salâsel Castle was destroyed by the Finance officer, Mr. Nabavi by the command of Mr. Zargham .People also had a part in ruining the castle.”</p> <p>Mr.Mohammad Ali Sharafedin ‘s manuscripts</p>




Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Sassani	Shapur the 1 st ,Valerianus Baranoosh’s architect	The whole Site	3-7 years	Human factors	<p>“In 260 A.D Valerian, Rome’s Caesar became the 2nd Sassani king and as historians write during the 7 years which he was captivated, was busy building the big Shâdorvan Dam”.</p> <p>Geographic History,<i>Joghrafiyaye Tarikhi</i>,Guy Lestrangle</p> <p>Abolghasem Ferdosi,The Shhnameh</p>

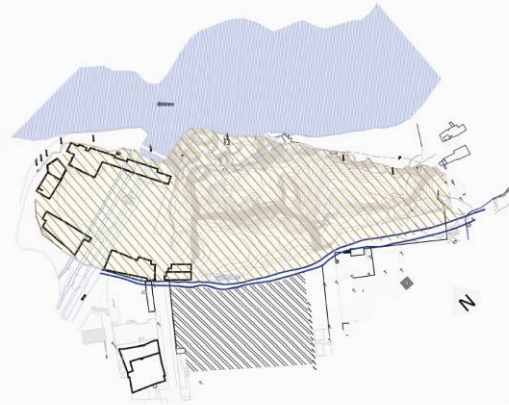


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	4 th century (lunar date)	Abi Salâsel	The whole Site	—	—	Abdolmalek Husseini Shushtari says:” Maybe the origin of the myth is from when the Arabs dominated the castle and Abi Salâsel who was the governor of Shushtar at the time, flourished the city once more, therefore it was named after Abi Salâsel.”
						

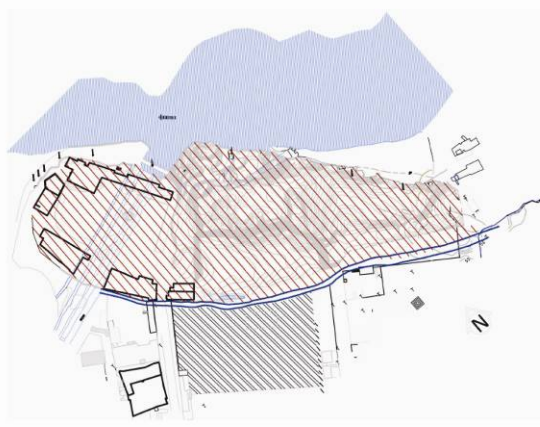
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	8 th century Hejira	—	The central parts of the bridge	—	Human factors & water flood	<p>“Mahdi Gholi Khan stayed in Shushtar for 6 years and many good deeds has been left from his time, such as Barebn Malek estate, the out door of the Salâsel Castle & the Shushtar’s bazaar design.”</p> <p>“Mohammad Ali Khan passed over the water with his troop ,entered the castle and cared for each one of the castle attendants even the architect .He also divided his own lands among them.”</p> <p><i>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</i></p>
						


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Safavids	Vâkhshoto Khan ,the governor of Shushtar	The whole Site	37 years	Being careless to the Site	<p>“Vâkhshoto Khan governed for 37 years and died in Kers which was his country land. Most of the old country estates belong to him. “</p> <p><i>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</i></p>  <p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Safavids	Fath Ali Khan	The whole Site	–	–	<p>“Fath Ali Khan was a well known man who repaired many of the big monuments, such as Aghili Garden, Hesam Abad building , many of the buildings of the Salâsel Castle and the Gheisar Bridge .”</p> <p><i>Tazkareh Shushtar-Seyyed Abdollah Jazâyeri</i></p>  <p>Restored </p> <p>Damaged </p>

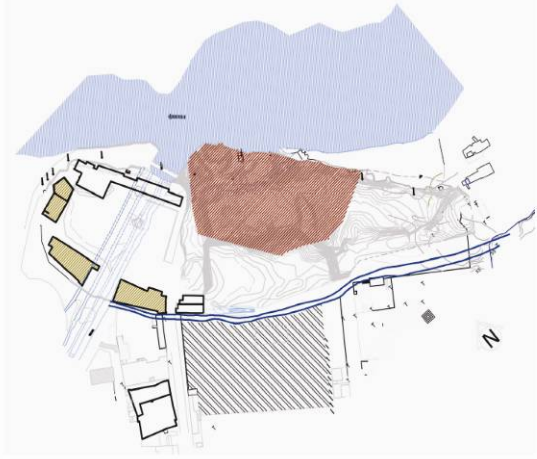
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Qajar	Mohammad Ali Mirza Dolat Shah	The whole Site	-	-	<p>“This castle always faced damages and was repaired many times once by Fath Ali Khan and another by Mohammad Ali Mirza.”</p> <p>Geographic History of Khuzestan, <i>Tarikh Joghrafiyaye Khuzestan</i>, Mohammad Ali Shushtari</p>
						<p>Restored </p> <p>Damaged </p>


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Qajar	Nezam o Saltaneh Hussein Gholi Khani Mafi I	The whole Site	-	Being careless to the Site	<p>“This year I spent 3000 Tomans for repairing the Salâsel Castle from my own spending, which no fool has ever done.”</p> <p>Nezam O Saltaneh Hussein Gholi Khan Mafi (his memories), Masoumeh Mafi & Mansoureh ,Nezam Mafi Association</p>
						<p>Restored </p> <p>Damaged </p>


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Qajar	-	Many parts of the Site	-	Earthquake & Flood water	<p>“Once more it was repaired completely by Nezam O Saltaneh, yet many damages occurred after the rain in 1963 & earthquake in 1968.”</p> <p>Geographic History of Khuzestan, <i>Tarikh Joghrafiyaye Khuzestan</i>, Mohammad Ali Shushtari</p>
						

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Pahlavi	The Cossack gang placed in Salâsel Castle	General repairs	-	-	<p>“At Reza Khan’s time the first hang in Khuzestan barracks made some general repairs.”</p> <p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p>
						

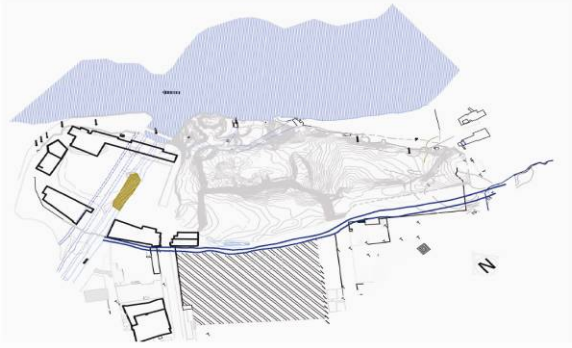
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Pahlavi	Nabavi ,the head of the Finance office	Many parts of the Site	–	Earthquake & Flood water	<p>“In 1961, many parts of the Salâsel Castle was destroyed by the Finance officer, Mr. Nabavi by the command of Mr. Zargham .People also had a part in ruining the castle.”</p> <p>Mr.Mohammad Ali Sharafedin ‘s manuscripts</p>





Restored 


Damaged 

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Contemporary 1949	Cultural Heritage Office	Covering the Dâriun vaults	–	–	<p>In 2003, a part of the Dâriun tunnel vault which had been destroyed over time, was restored by the cultural heritage office.</p>

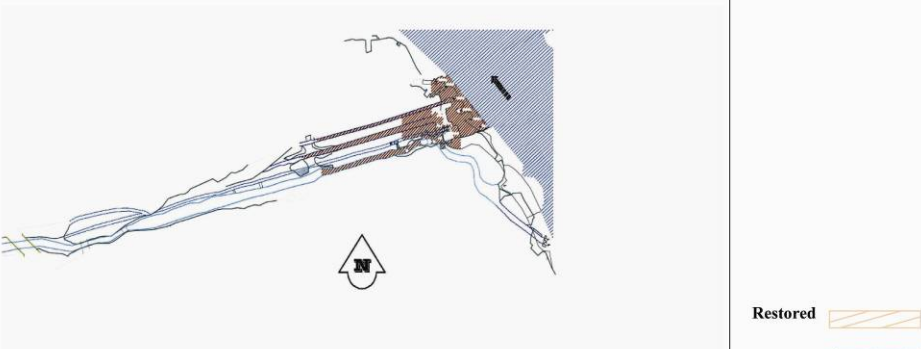


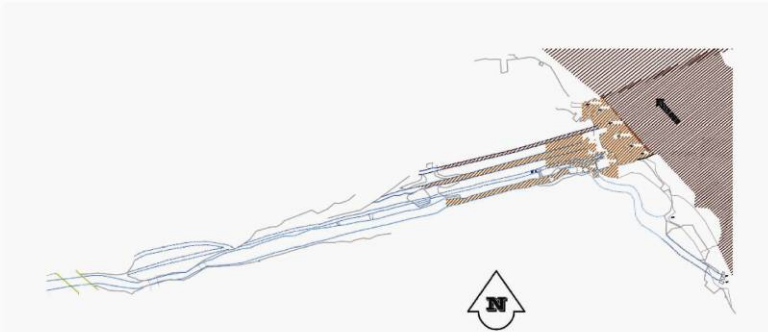


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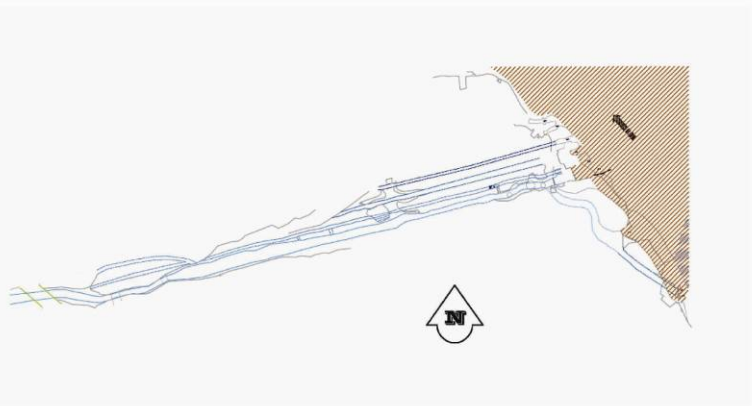


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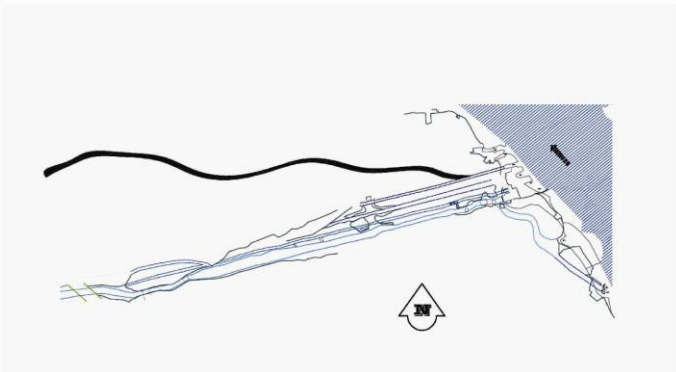


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Salâsel Castle	Contemporary 2006	Base of Shushtar historical hydro structure	A part of the barrack rooms was cleansed and a tour route was placed in the site	–	Earthquake & Flood	“From the beginning of year 2006, the restoration was started in some parts of the castle such as the rooms, the barrack underground, cleansing and restoring some parts of the towers and the execution of the tour route by Haj Mohammad Ali Maleki Abi Mohem.”
						

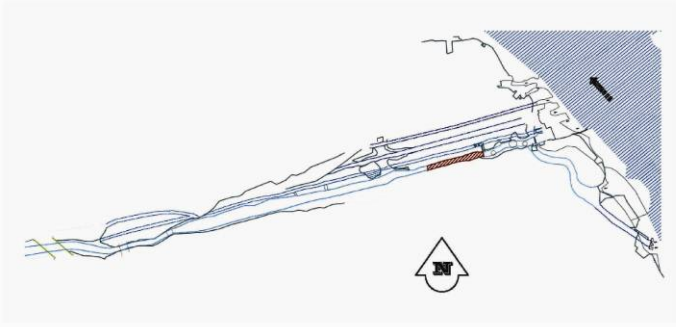


6. c.T.9- Dâriun Canal (beginning point)

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Dâriun Canal	Achamenian	–	–	–	–	Firstly Dara Akbar (Darius Achamenian the 1 st) and after Dara ebn Dar (his son) finished the Dâriun canal and lead the water towards the Asgar Desert ,planted trees and crops and this was all before the reveal of Eskandar (Alexander) Zolgharnain.
						<p>Tazkareh Shushtar-Seyyed Abdollah Ja</p>

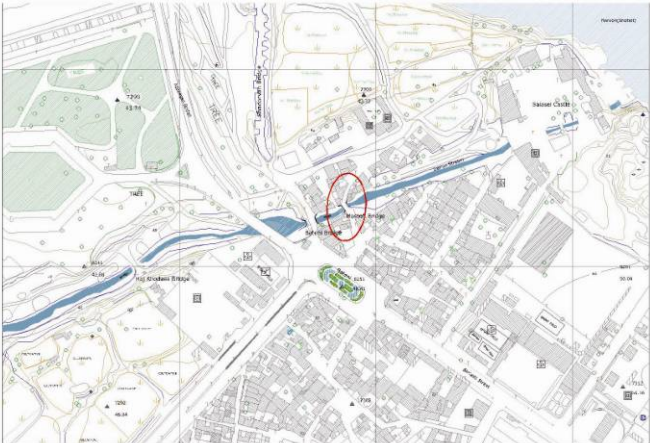
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Dâriun Canal	Sassani	Ardeshir Sassani	Restoration on the Chardangeh seabed for a better irrigation in the Dâriun Canal	—	Break on the river seabed	<p>As time passed the canal got deeper (the front part of the Dâriun opening) and the water from the canal was stopped, the cultivating lands and farms went dry. All this happened at the Ashcan era, since no one cared on this issue, the situation was left the same for a while. Until Hardship Babakan came over and decided to build a dam over the Dâriun Canal in order to heighten the water and lead it to the canal.</p> <p><i>Tazkareh Shushtar-Seyyed Abdullah Jazayeri</i></p>  <p>Restored </p> <p>Damaged </p>

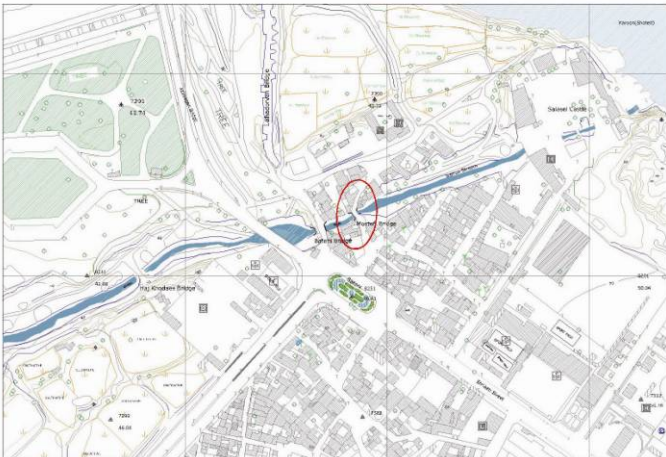
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Dâriun Canal	Sâssani	Shâhpur Sâssani	Finishing in the Shâdorvan in order to irrigate Dâriun Canal	—	Erosion on the seabed	<p>Before the finishes on the Shâdorvan, Ardeshir died until his grand grandson Shâhpur governed. He paid lots of attention to the rebuilt in Shushtar. When he dominated Geyser, first he arrested him and afterwards told him if you want to be released you must build a dam over Shâdorvan canal in Shushtar so the lands near it live again and farming could be started once more.</p>  <p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Dâriun Canal	End of Qajar-start of Pahlavi	-	Dareh Jangi Canals and Mills	-	River flood and human factors	<p>On the far south end of the Shâdorvan bridge-dam there were many canals and mills called Dareh Jangi canal and mill .These canals received their water from the Dam opening and after passing Mostofi's house and supplying the water for Dareh Jangi Mill, once again went towards the Dâriun.</p> <p>Tazkareh Shushtar- Seyyed Abdullah Jazayeri</p>  <p>Restored </p> <p>Damaged </p>

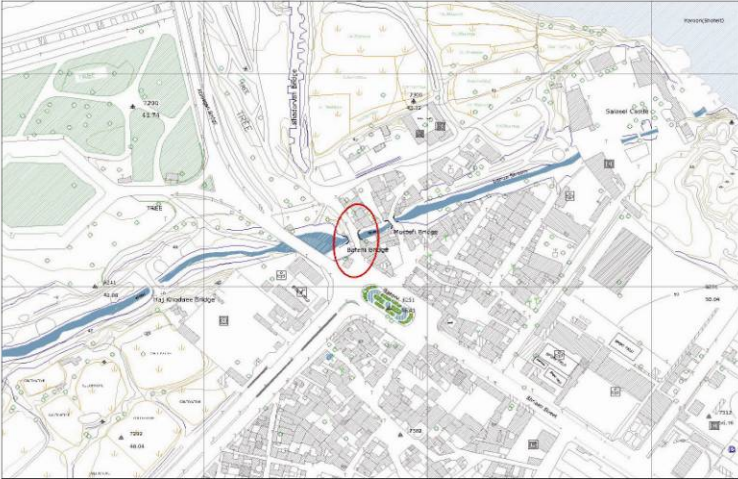
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Dâriun Canal	Contemporary(2003)	Cultural Heritage Office	A part of Dâriun Canal arch	-	Repetitive erosion in rocks	<p>On the far south end of the Shâdorvan bridge-dam there were many canals and mills called Dareh Jangi canal and mill .These canals received their water from the Dam opening and after passing Mostofi's house and supplying the water for Dareh Jangi Mill, once again went towards the Dâriun.</p>  <p>Restored </p> <p>Damaged </p>

6. c.T.9-1- Single Arch Bridges
a. Mostofi

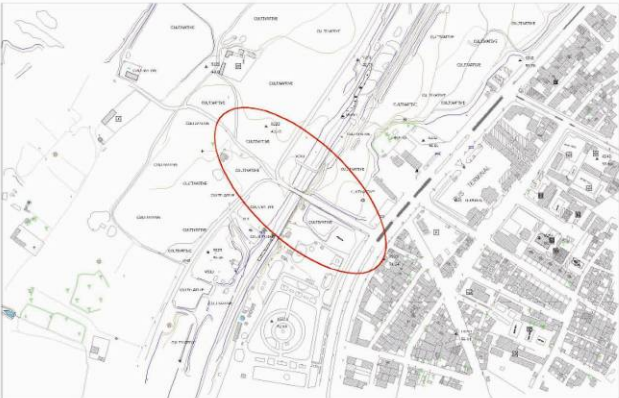
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Mostofi Bridge	Qajar	The Mostofi Family	The whole Site	-	-	This bridge is the first bridge built on the Dariun stream by the Mostofi family at Qajar era. This bridge is one of the Mostofi System parts which is located aside the other elements of this System.
						

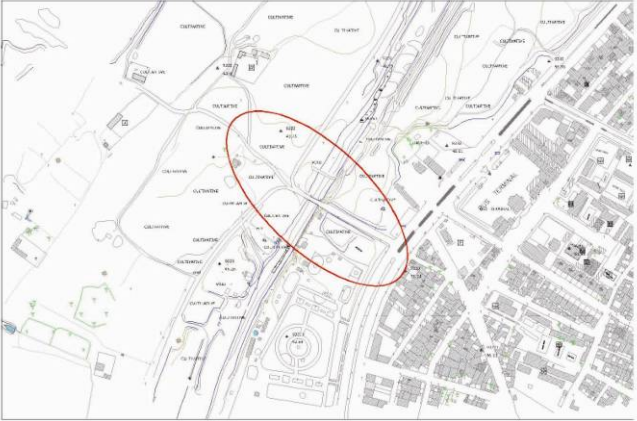
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Mostofi Bridge	2003	SHHS	The whole Site	1 year	-	In 2003, the SHHS made many restoring & protective implementations.
						


b. Sangboron Bridge

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Sangboron Bridge	Qajar	The people	The whole Site	-	-	This bridge is the 2 nd bridge on the Dariun stream, sited aside the Reza mosque and on the way to the Shadorvan Bridge Dam.
						

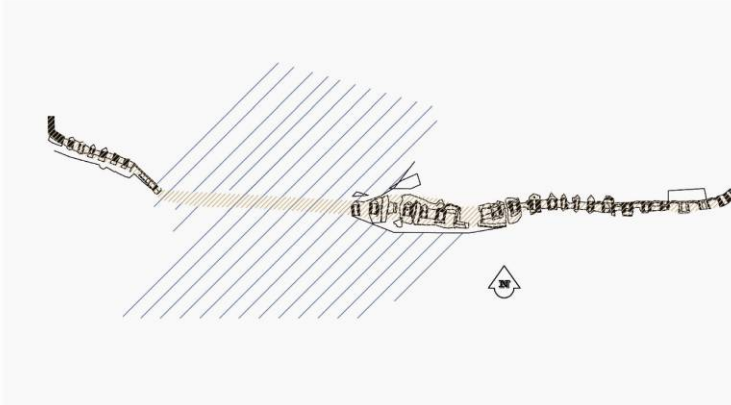


c. Haj Khodaii Bridge

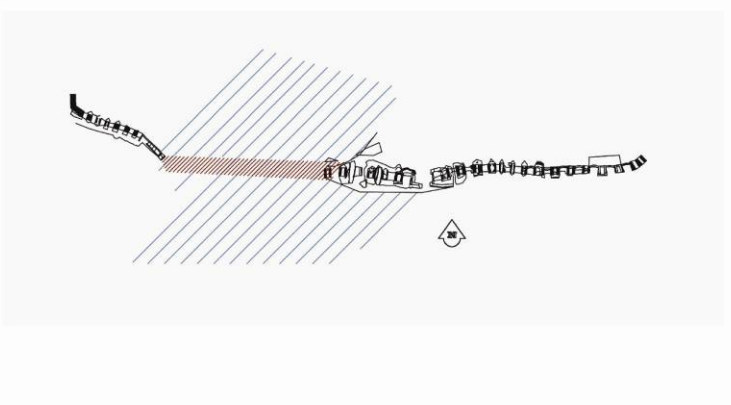


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Haj Khodaiee Bridge	Pahlavi the 1 st	Haj Khodaiee	The whole Site	-	-	The Haj Khodaiee Bridge is the 3 rd bridge settled on the Dariun Canal. It has been built by Haj Hossein Haj Khodaiee at the Pahlavi era for the farmer and peoples' passage. The architect of this beautiful bridge is a person named Haj Shah Ali.
						

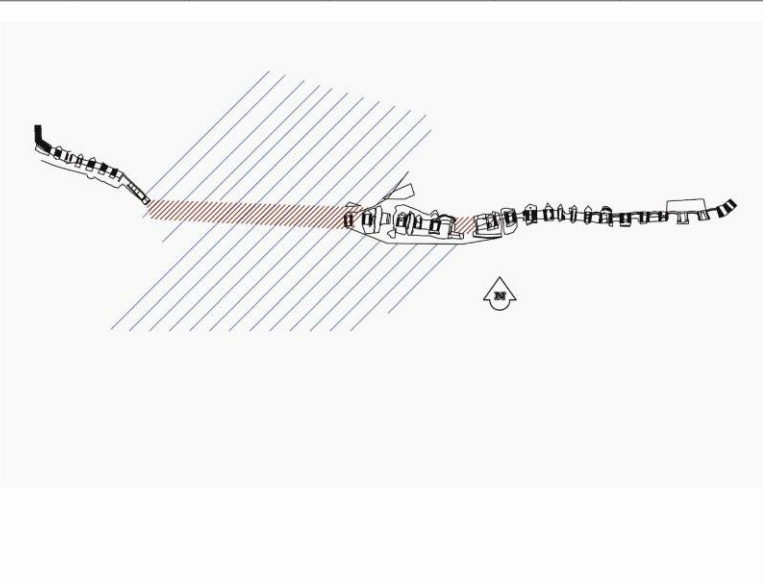
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Haj Khodaiee Bridge	2003	SHHS	The whole Site	1 year	-	In 2003 the SHHS did some implementation operations on the bridge including conservation & restoration ones.
						


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Haj Khodaiee Bridge	2005	SHHS	Parts of the Site	Less than 1 year	-	In 2005 there were other implementations done on the bridge including : Completing the bridge's parapet and other protective operations which some is incomplete.
						

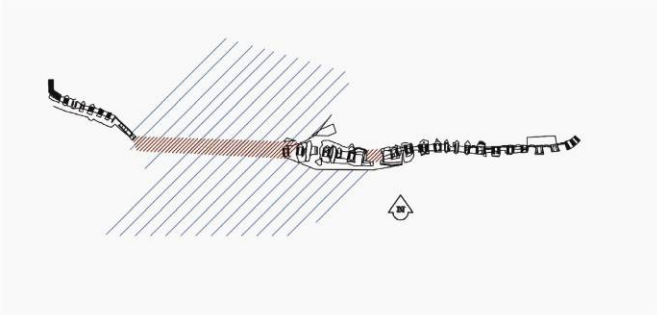


6. c.T.10- Polband-e-Shâdorvân Bridge-Dam

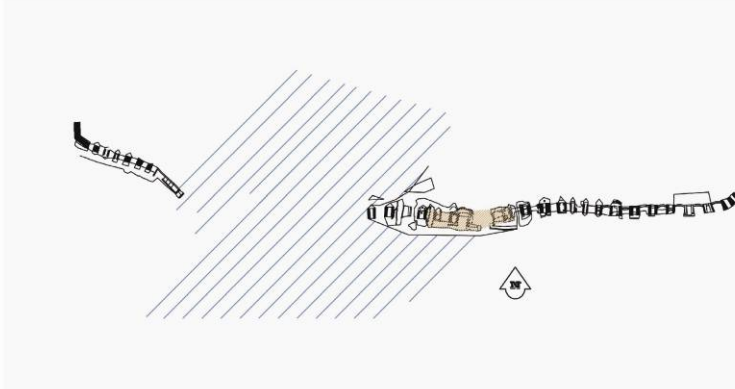


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Sassani	Shapur the 1 st , Valerianus Baranoosh's architect	The whole Site	3-7 years	Human factors	<p>"In 260 A.D Valerian, Rome's Caesar became the 2nd Sassani king and as historians write during the 7 years which he was captivated, was busy building the big Shâdorvan Dam".</p> <p>Geographic History, <i>Joghrafiyaye Tarikhi</i>, Guy Lestrangle</p> <p>Abolghasem Ferdosi, The Shhnameh</p>
						<p>Restored </p> <p>Damaged </p>

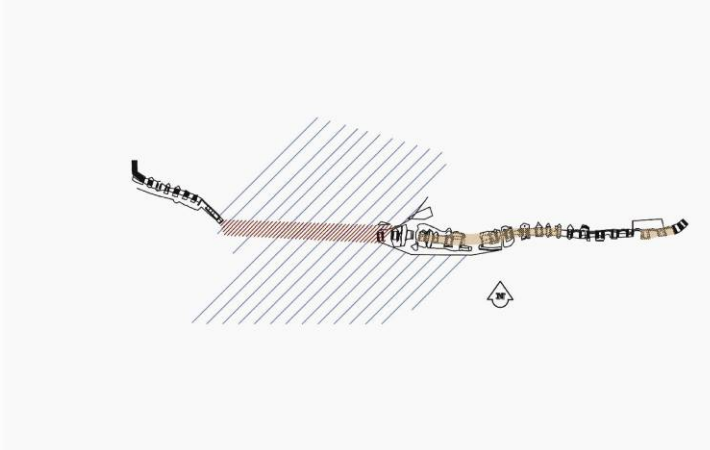


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Omavi	Hojaj Ebn Yousef	Middle parts of the bridge	—	Human factors	<p>"At Bani Omayyeh & Hojaj Ebn Yousef's time one called Shabib Khareji rose and entered the city. At daytime he would fight against Hojaj and at night he would go back to the city, until one day he drowned in the water. When Hojaj entered the city he commanded to destroy the bridge so no one could enter the city."</p> <p><i>Tazkareh Shushtar</i>-Seyyed Abdullah Jazayeri</p>
						<p>Restored </p> <p>Damaged </p>

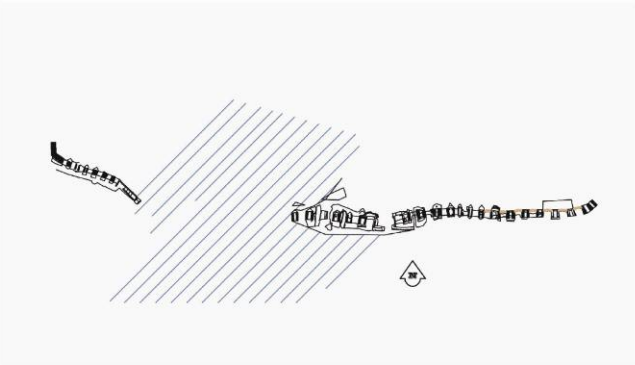


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	8 th century Hejira	-	The central parts of the bridge	—	Human factors & water flood	In the 8 th century Hejira, the bridge was already ruined since this is what is said:” The river is deep and around the entry, there is a wooden bridge made of small boats.”
 <p>The diagram shows a plan view of the bridge structure. A central section is highlighted with diagonal hatching, indicating it is the focus of restoration or development. A legend at the bottom right identifies the hatching: orange diagonal lines for 'Restored' and red diagonal lines for 'Damaged'. A north arrow is also present.</p>						<p>Ebn Batuteh Travel account, Mohammad Ali Movahed</p>

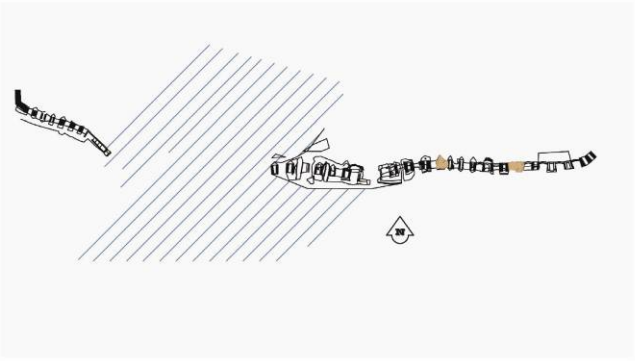
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Safavid(1106 lunar date)	Fath Ali khan ,Shushtar’s governor of time	The whole Site	14 years	The water flood of Karun River	According to the vaults and arches which are located on the south part of the bridge, and the usage of brick instead of rock in all the openings, in this era there has been a complete restoration on the monument.
 <p>The diagram shows a plan view of the bridge structure. A central section is highlighted with diagonal hatching, indicating it is the focus of restoration or development. A legend at the bottom right identifies the hatching: orange diagonal lines for 'Restored' and red diagonal lines for 'Damaged'. A north arrow is also present.</p>						<p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p>


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Qajar(Mohammad Ali Qajar)	Manoochehr Khan Etemad o Dolleh	-	-	Human factors & water flood	<p>At the beginning of Mohammad Shah's government and Manoochehr Khan Motamed O Dolleh's state's few of the openings were ruined and in order to reconstruct the bridge, the water was moved to the other side of the bridge.</p> <p>Nezam O Saltaneh Hussein Gholi Khan Mafi (his memories), Masoumeh Mafi & Mansoureh ,Nezam Mafi Association</p>
						<p>Restored </p> <p>Damaged </p>

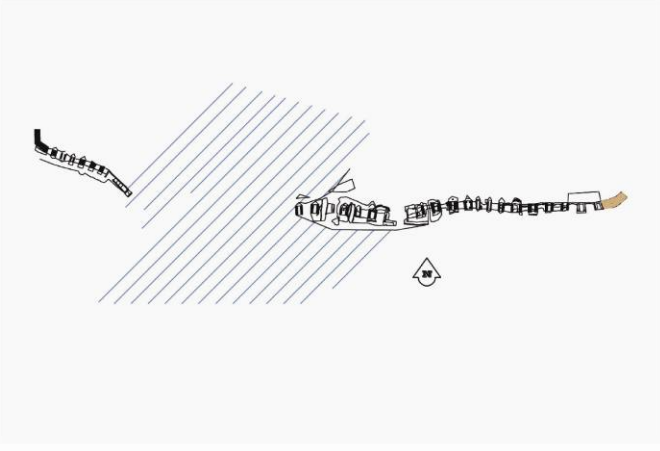


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Qajar(Naser eden Shah Qajar)	Haj Sheikh Jafar Shushtari and the people's funds	4 southern openings	-	River water flood in torrential seasons	<p>The Shapuri dam has been destroyed many times during its existence and has been reconstructed again and again. The last time it has been repaired was by Haj Sheikh Jafar Shushtari, with people's encouragement and their funds.</p>
						<p>At Naser eden Shah's time, four of the openings of the bridge were ruined. They went to Haj Sheikh Jafar, whereas he led the water towards the central part and repaired the openings.</p> <p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p> <p>Nezam O Saltaneh Hussein Gholi Khan Mafi (his memories), Masoumeh Mafi & Mansoureh ,Nezam Mafi Association</p> <p>Restored </p> <p>Damaged </p>

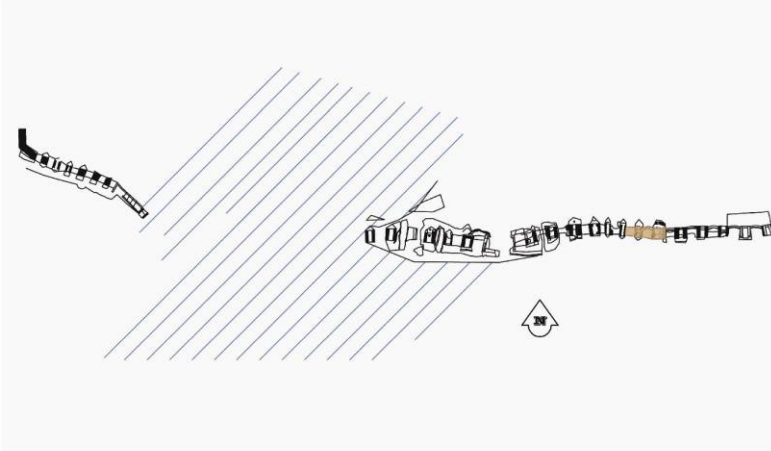


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Qajar(Naser eden Shah Qajar 1928)	Nezam O Saltaneh Hussein Gholi Khan Mafi & Haj Ali Abbas Gholi Khan Mohandesi	Some of the middle openings	3 months	River water flood in torrential seasons	<p>“Hussein Gholi Khan Nezam O Sataneh was one of the well named governors of Naser eden Shah Qajar and the governor of Khuzestan who decided to obstruct the Dam and build a bridge over it. He had so much self confidence on this job that he started to repair the parts of the bridge before even closing the Dam.</p> <p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p> <p>Nezam O Saltaneh Hussein Gholi Khan Mafi (his memories), Masoumeh Mafi & Mansoureh ,Nezam Mafi Association</p>  <p>Restored </p> <p>Damaged </p>

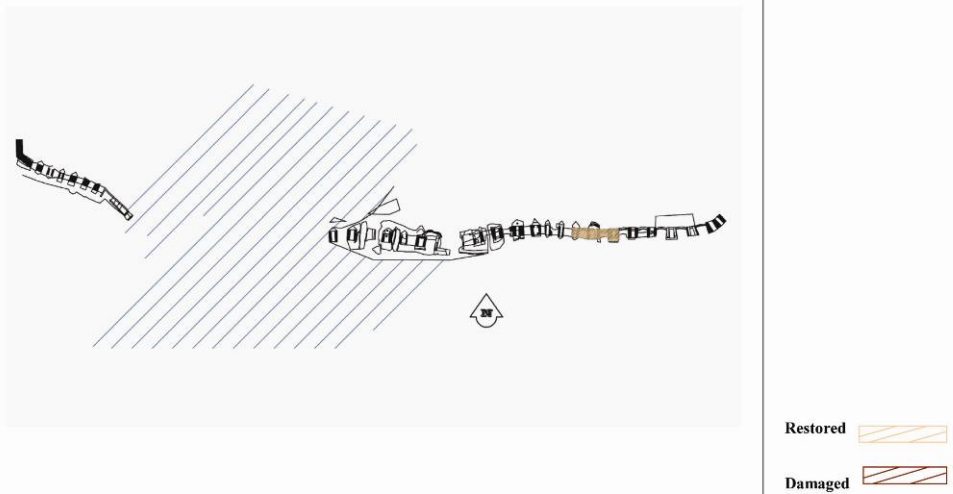
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Pahlavi the 1 st	Base of Shushtar historical hydro structure	Southern parts of the bridge	–	–	<p>“At the 2nd World War time, an office named Shushtar Irrigation was established. The objective of this was to irrigate the cultivating lands. The encourager was an English man called Colonel Noel. The objective was to increase water for a better water reservoir</p> <p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p>  <p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Pahlavi the 1 st	Profiteers	-	-	Human factors	In the Pahlavi the 1 st era, a part of the central openings was destroyed by Englishmen and the profiteers. The objective of the Englishmen was to prevent the workmen from leaving Shushtar and invite them to work for the petroleum areas in the south.
						<p>A remembrance of Shushtar, <i>Yadi az Shushtar</i>, Mohammad Bagher Niromand</p>

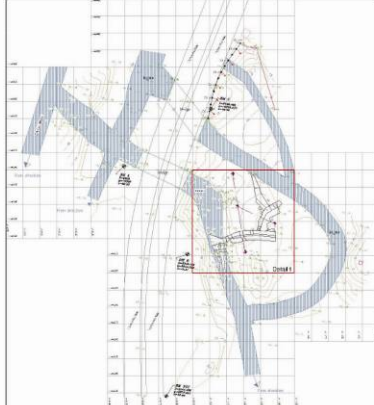
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Contemporary 1998	Base of Shushtar historical hydro structure	Openings 1-3	1 year	-	Openings 1 – 3 were restored by the Base of Shushtar historical hydro structure, in 1998.
						

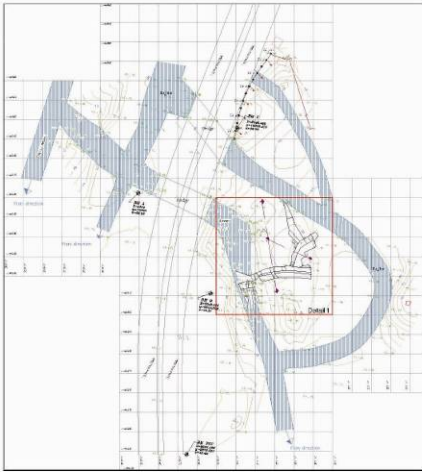
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Contemporary 2000	Base of Shushtar historical hydro structure	Openings 14 & 15 and the minor adjacent canals	6 months	-	In 2000 these two openings & the minor adjacent canals were restored by Yazdi masters.
						<p>Restored </p> <p>Damaged </p>

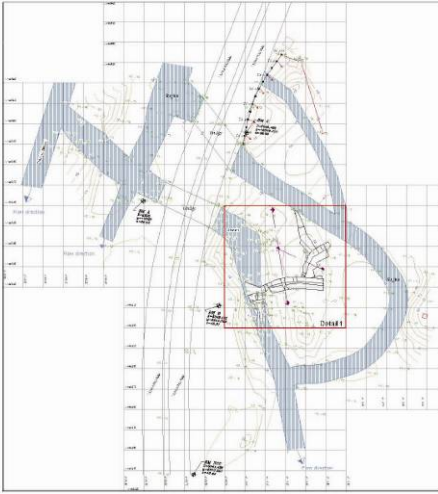
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Contemporary 2003	Base of Shushtar historical hydro structure	Openings 9 and 13	1 year	-	In these years, the openings 9, 10, 11, 12 & 13 were repaired by Hussein Mamarian & Haj Hassan Fardinejad under the control of the Base of Shushtar historical hydro structure
						<p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Shadorvan Dam bridge	Contemporary 2006	Base of Shushtar historital hydro structure	The 8,9 and 14 opening	-	-	In 2006, the openings 8, 9 and 14 were restored by Mr.Shirdel a contractor from Azarbayejan. It was attempted to restore the damaged openings with the Complete Restoration style.
						

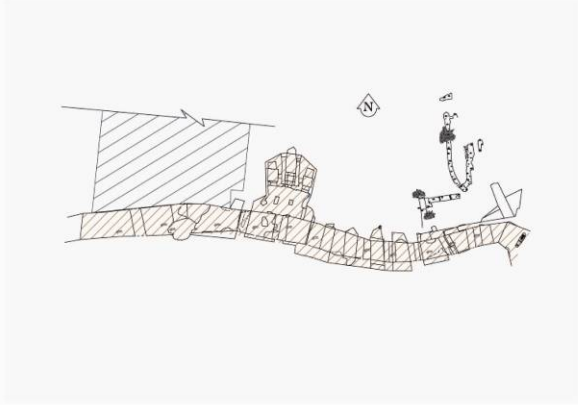


6. C.T.11- Band-e-Khâk Dam

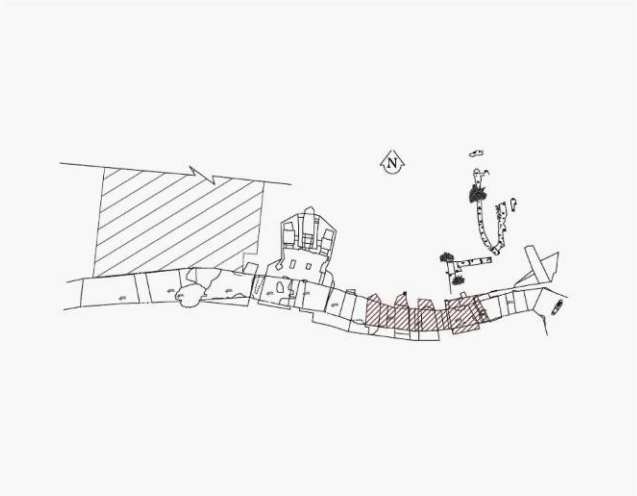


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Khak	Sassani	Shapur	The whole Site	-	-	The date of which this Site has been built relates to the Sassani era just as all the other hydro systems in Shushtar .This Site is one of the elements which divides the Dariun into 3 parts.
						<p>Nezhat ol Gholob,Hamdollah Mostofi</p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band -e Khak	Qajar	-	Central parts of the Site	-	The flood water of the Dariun & the sewage	Tazkereh Shushtar, written by Abdollah Jazayeri
						

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Band e Khak	Contemporary 1982	Shushtar Municipality	Western parts of the Site	-	Human factors	Constructing a route at 1982 in this area ruined many parts of this beautiful Site & buried it under the street. Tazkereh Shushtar, written by Abdollah Jazayeri
						

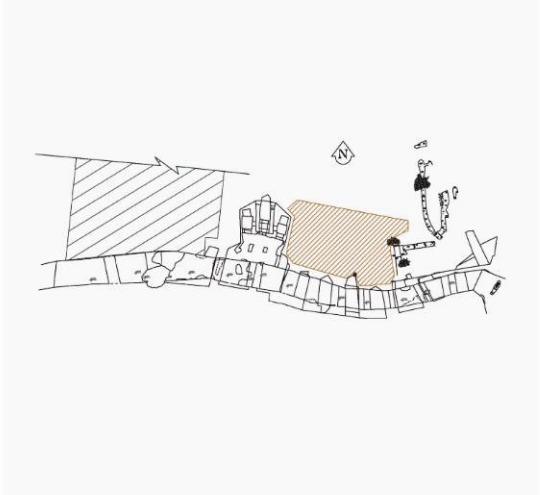


6. C.T.12-Lashkar Bridge-Dam

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Lashkar Bridge-Dam	Safavid	FathAli Khân	Approximately the whole Site	-	-	<p>“According to the type of arches & vaults and the brick works used in different parts of the bridge –Dam which is believed belongs to the Safavid era besides the other implementations done by Fathali Khan, it is said this Site has been done by him as well.”</p>
 <p>Restored </p> <p>Damaged </p>						

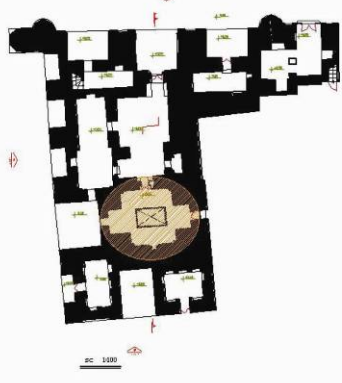


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Lashkar Bridge-Dam	Ehtesham -o Dolleh Qajarieh	-	5 openings of the Pol Band e Lashkar Bridge-Dam	-	Perhaps the overflow of the river	<p>“The Pol Band e Lashkar Bridge-Dam has 13 openings, which 5 are destroyed. The amount has been mentioned in the government of Ehtesham o Dolleh yet has not been built. The people themselves, such as Kamal have built it with materials in hand as wood since they needed the bridge however the flow took it away.</p> <p>” Khuzestan Travel account, <i>Safarnameh Khuzestan</i>, Abdolghafar Najmolmolok</p>
 <p>Restored </p> <p>Damaged </p>						

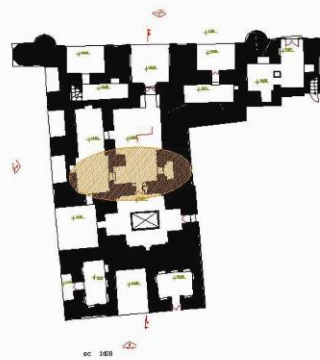


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Lashkar Bridge-Dam	Qajar	-	5 Openings of the Site	-	-	<p>“In the Haj Najmolmolck commentary, 5 openings of the Pol Band e Lashkar Bridge- Dam have been destroyed at the Ehtesham o Dolleh era. According to the openings which are totally complete at the time, it seems these 5 openings have been restored at the Qajar era.”</p>

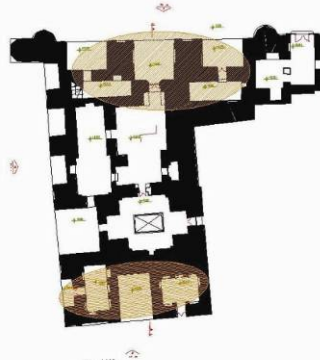


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Lashkar Bridge-Dam	Qajar	-	2 openings from the east	-	Human interferences	<p>According to the Haj Najmolmolck commentary of the Pol Band e Lashkar Bridge- Dam, the number of openings indicates that: meanwhile there are 12 openings left whereas one of them is obstructed.</p>

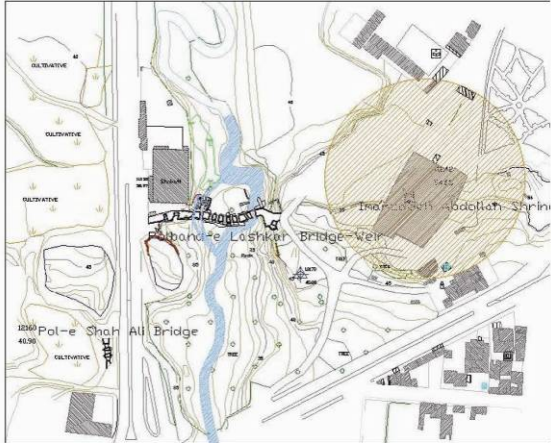


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Pol Band e Lashkar Bridge-Dam	1979	Cultural Heritage Office	The removal of the sediments of Pol Band e Lashkar Bridge-Dam	-	Sediment gathering of the river	“In 1979 the implementation of removals around the Pol Band e Lashkar Bridge- Dam a basic part of the sediments which had been piled over years, was done.
						<p>Restored </p> <p>Damaged </p>

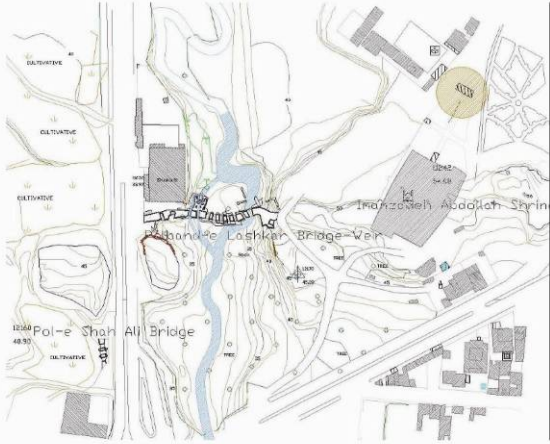


6. c.T.12-1- Emamzade Abdollâh

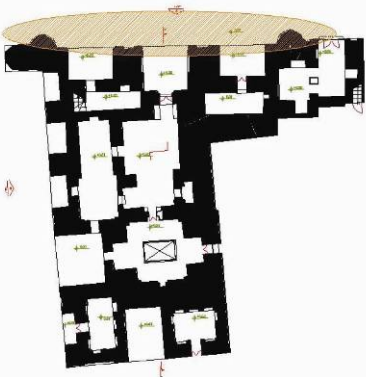


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Abbassi	Behnam Nabavi – the Shushtar - governor	The holy shrine	-	-	The primitive part of the Imamzadeh ' Abdollah building relates to the Abbassi era. The reason for this is the Kufic inscription on the top part of the holy shrine entrance. In this inscription it is said to build this monument by the governor's command in the Abbassi era ,a person named Behanm Nabavi Almostansari .
						<p>The great mosque & Imamzadeh Abdollah inscription</p> <p>Restored </p> <p>Damaged </p>

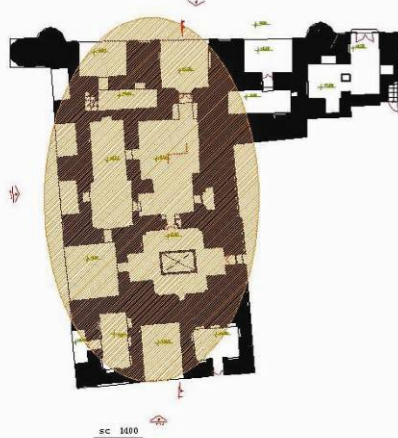


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	669 lunar date	-	Some parts such as the Ahmad Moayer Mosafer 's temple	-	-	On the upper part of the Ahmad Moayer Mosafer's temple an engraving is revealed. Which shows the date of Imamzadeh's construction which shows 48 years after the shrine has been built, this part has been added to the System.
 <p style="text-align: right;">Restored  Damaged </p>						

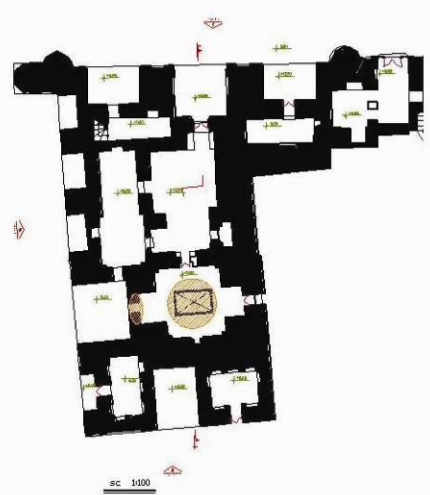


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Safavids(1002 lunar date)	Mahdi Gholi Khan	The northern part of the Site	6 years	-	Mahdi Gholi Kha spent 6 years in Shushtar and has done many good deeds such as the previous mansion of the Imamzadeh Abdollah and the Mahdi Abad village and the scheme of the Shushtar Bazaar
 <p style="text-align: right;">Restored  Damaged </p>						Tazkereh Shushtar, written by Abdollah Jazayeri

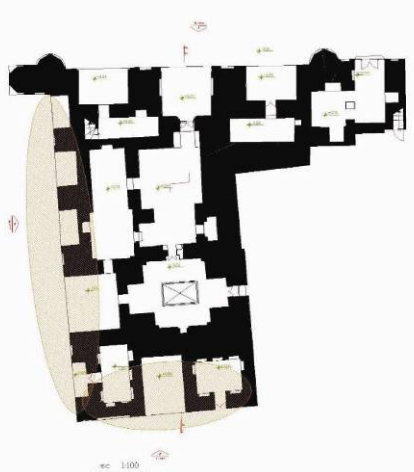


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Safavid	Local governors	Building some spaces for the Site	-	-	At the Safavid's era around the Imamzadeh Abdollah's site ,a few spaces were added such as school, library kitchen and khan for pilgrim .These still existed till the Qajar era ,yet do not exist at the moment .
						<p>Restored </p> <p>Damaged </p>

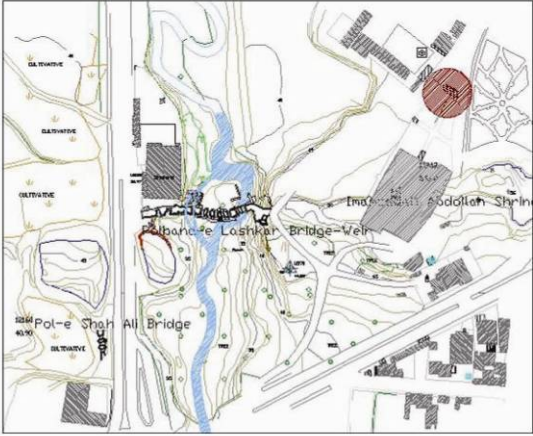


Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Safavids	Sheikh Mohammad Vakilo dolleh	The entrance front piece	-	-	At the time of Sheikh Mohammad Vakilo Dolleh's government, one of the local governors of Shushtar, a beautiful stone front piece was added to the north part of the Site for the Imamzade's entrance.
						<p>Restored </p> <p>Damaged </p>




Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Afshars 1142(lunar date)	Local governors	The north minarets	-	-	<p>The north minarets of the Imamzadeh Abdollah have been added to the dome at the Afshars period .The reason for this is the points written in the inscriptions engraved on the minarets. On the eastern part of the minaret there is a nice poem engraved in Persian</p>
						<p>Restored </p> <p>Damaged </p>

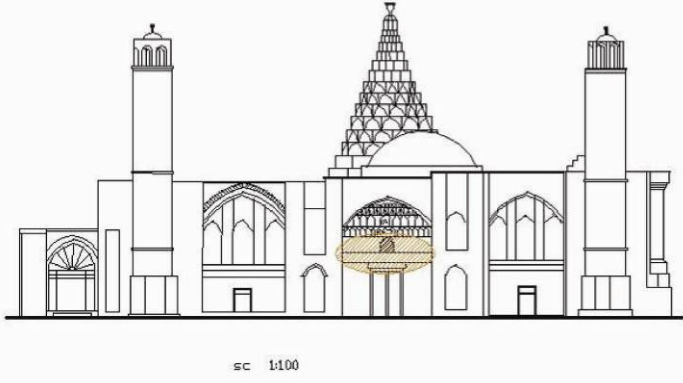
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Qajar	Saedo Saltaneh Sardar	Restored the whole Site	-	-	<p>In the Qajar era there has been a complete restoration on the monument by Saedo Saltane Sardar, the Shushtar's governor of the time.</p>
						<p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Qajar 1270 (lunar date)	Haj Karamali	The shrine	-	-	The Imamzadeh Abdollah shrine was built by Karamali in the Qajar era (Naser eden Shah), and some of the paintings remained in the room relate to that era as well.
						<p>Restored </p> <p>Damaged </p>

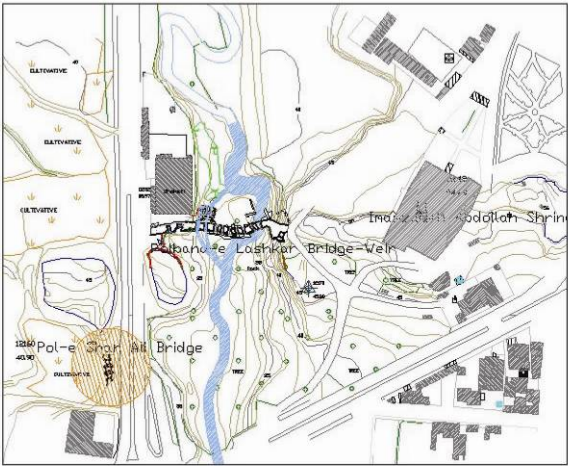
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	Pahlavi	The people	The east & north porches	-	-	At the Pahlavi era the east & north parts of the Imamzadeh were restored by the old grave stones remained.
						<p>Restored </p> <p>Damaged </p>

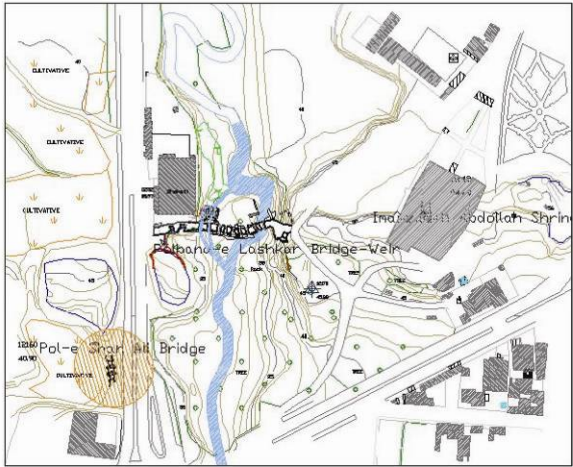
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	1990	The board members of the Site	The entrance	-	Human factors	In 1990 improving implementations on the entrance part were done (the parts which were built at the Safavid time) by the board members
						<p>Restored </p> <p>Damaged </p>

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	1990-1997	The board members	The site ' minarets ,interior spaces ,shrine & the dome	8 years	-	During 1990-1997 implementations such as restoration, renovation and revitalization was done on the dome, shrine, minarets etc by the board members under the control of the ISHHC.
						<p>Restored </p> <p>Damaged </p>

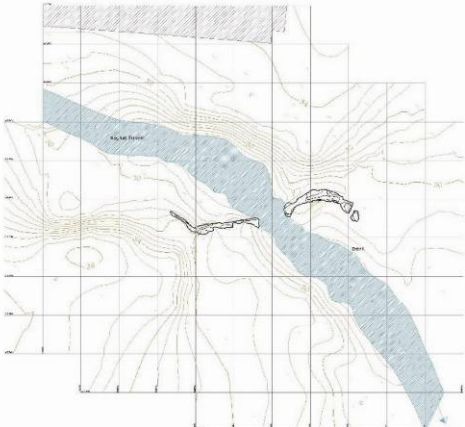
Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Imamzadeh Abdollah	1998	SHHC	The entrance inscriptions	1 year	-	In 1998 some implementations were done by the SHHC in order to restore the inscriptions & plaster moldings.
						

6. c.T.12-2- Shâh Ali Bridge

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Shah Ali	Safavids 1020 (lunar date)	Ali Soltan	The whole Site	-	-	In 1008 Mohammad Soltan Joghatay became king. He ruled for 12 years, and after his death Ali Soltan, his brother ruled for 15 years. It was at his time when the Bridge was built.
						

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Shah Ali	Qajar 1232 (lunar date)	Haj Abdollah Sharafodin	The whole Site	-	-	The famous Shah Ali Bridge is near the Do Hesaran and has been wrecked for a long time. Until in 1232(lunar date),at the time of Mohammad Ali Mirza Dolat Shah ,it was repaired b the hands of Haj Abdollah Sharafodin
						<p>The Tazkareh Shushtar margin inscription-Sheikh Mohammad Mahdi Sharafodin</p>

6.c.T.13- Band-e Sharâbdâr Dam

Name of Site	Era	Executives & Founders	Restoration & Development activities	Duration of Work	Events of damage & factors	Description
Sharabdar Dam	Sassani	Shapur	-	-	-	This Site is sited on the Raghat stream which is of the Dariun's branches. In the past there were grape gardens in this area and Sharabdar's fame was because of this gardens.This Site's history goes back to the Sassani era.
						

Statistic on the Meteorology of Shushtar

Max Wind Speed			Rate of Frost Days	Max Rainfall during a Day millimeter	Amount of Rainfall (millimeter)			Relative Humidity (Percent)		Temperature (Centigrade)					Year: 2005
Direction (Degree)	Speed (m/sec)	Number of Days				Sunny Days (Per year)	Evaporation	Min Absolute	Max Absolute	General Mean	Min Absolute	Max Absolute	Min Average	Max Average	Month
60	15	-	-	4.6	5.2	274.0	247.9	13	79	23.4	7.6	36.0	17.0	29.8	April
330	14	-	-	6.6	6.6	274.0	336.1	8	87	30.8	17.6	42.6	24	37.6	May
360	22	-	-	00.0	00.0	358.3	488.8	8	38	34.4	24.4	49.2	26.7	42.1	June
150	10	-	-	00.0	00.0	322.4	489.8	5	68	37.8	26.4	50.0	29.7	45.9	July
280	7	-	-	00.0	00.0	305.1	463.8	7	58	38.8	28.0	50.2	31.6	46.0	August
270	14	-	-	00.0	00.0	342.7	364.9	7	68	35.0	22.6	47.8	27.0	43.0	September
150	8	-	-	00.0	00.0	291.0	284.0	10	70	28.9	16.0	42.0	23	32.7	October
150	9	-	-	13	35.7	214.2	153.2	9	95	21.8	11.8	35.0	16.3	27.3	November
90	7	-	-	10.7	20.7	213.8	92.2	21	95	18.3	10.6	28.6	14.0	25.5	December
90	9	-	-	27.5	57	166.2	50.1	25	99	34.0	2.8	21.8	9.5	17.4	January
150	20	-	-	52.4	150.5	116.5	54.3	35	96	14.5	4.0	24.2	11.0	18.1	February
150	7	-	-	0.5	0.5	258.5	129.3	21	89	19.4	8.0	29.0	13.2	25.5	March
360	22	-	-	52.4	276.2	3136.7	3154.4	5	99	28.0	2.8	50.2	20.3	32.6	Annual

Statistic on the Meteorology of Shushtar

Longitude: 48-50

Latitude: 30-32

Altitude: 67 m

Max Wind Speed			Rate of Frost Days	Max Rainfall during a Day Millimeter	Amount of Rainfall (millimeter)			Relative Humidity (Percent)		Temperature (Centigrade)					Year: 2006
Direction (Degree)	Speed (m/sec)	Number of Days				Sunny Days (Per year)	Evaporation	Min Absolute	Max Absolute	General Mean	Min Absolute	Max Absolute	Min Average	Max Average	Month
180	20	1	-	14.9	37.0	269.3	210.4	31	63	24.1	12.8	36.2	18.3	29.9	April
300	10	1	-	15.3	15.3	252.7	334.2	20.1	39.5	31.2	17.0	43.0	24.4	38.1	May
280	08	2	-	00.0	00.0	371.5	449.9	11.1	26.0	37.0	24.0	47.8	28.8	45.2	June
280	10	1	-	00.0	00.0	359.7	450.8	10.3	26.2	38.3	27.0	49.6	30.2	46.4	July
150	10	1	-	00.0	00.0	348.0	448.9	10.9	31.4	39.5	28.8	49.8	32.0	47.0	August
240	06	3	-	00.0	00.0	332.6	409.8	12.2	33.0	36.4	22.8	47.6	29.2	43.6	September
360	12	1	-	00.0	00.0	268.9	320.0	17.4	34.2	31.4	20.4	43.0	25.1	37.7	October
090	15	1	-	19.6	50.1	171.7	158.8	33.0	64.6	23.4	08.8	36.2	18.8	28.1	November
150	15	1	-	46.6	91.4	165.7	57.4	50.9	77.3	13.7	05.2	24.6	09.6	17.8	December
300	10	1	-	13.9	43.8	129.5	34.1	67.0	93.0	09.6	00.6	17.0	06.0	13.2	January
310	10	2	-	23.7	62.4	184.8	66.3	51.7	83.6	14.6	05.0	22.0	10.1	19.2	February
300	10	1	-	07.8	11.3	220.8	124.9	34.8	67.6	18.0	08.6	28.2	12.9	23.1	March
180	20	-	-	46.6	311.3	3021.2	3065.5	29.2	53.3	26.5	0.6	49.8	20.5	32.4	Annual

Monitoring of harmful plants, to the waterworks at Shushtar: the growing plants on different parts of the structures.



Fig.241. Polband-e-Shâdorvân Bridge-Dam



Fig.242. Lashkar Bridge-Dam



Fig.243. Mâhi-bâzân (khodâ-âfarin)



Fig.244. Lashkar Bridge-Dam



Fig.245. Polband-e-Shâdorvân Bridge-Dam



Fig.246. Mâhi-bâzân (khodâ-âfarin) Bridge-Dam

Monitoring of piers, bridge-dams and other hydro structures for erosion

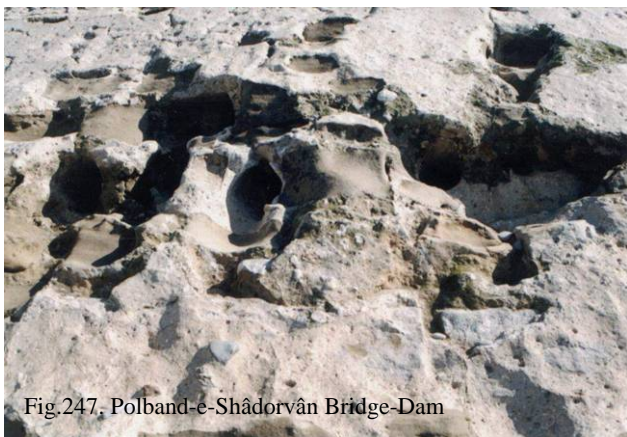


Fig.247. Polband-e-Shâdorvân Bridge-Dam

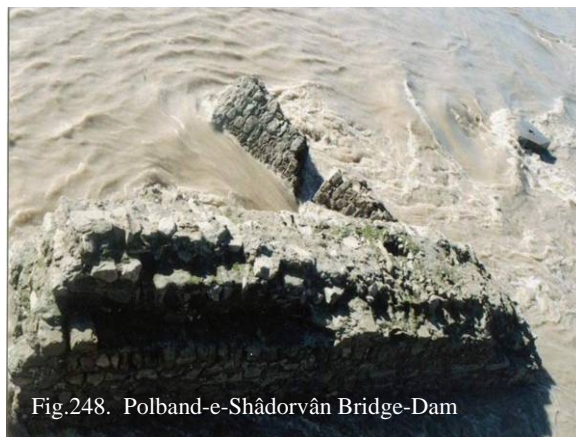


Fig.248. Polband-e-Shâdorvân Bridge-Dam



Fig.249. Polband-e-Shâdorvân Bridge-Dam



Fig.250. Mâhi-bâzân (khodâ-âfarin) Bridge-Dam

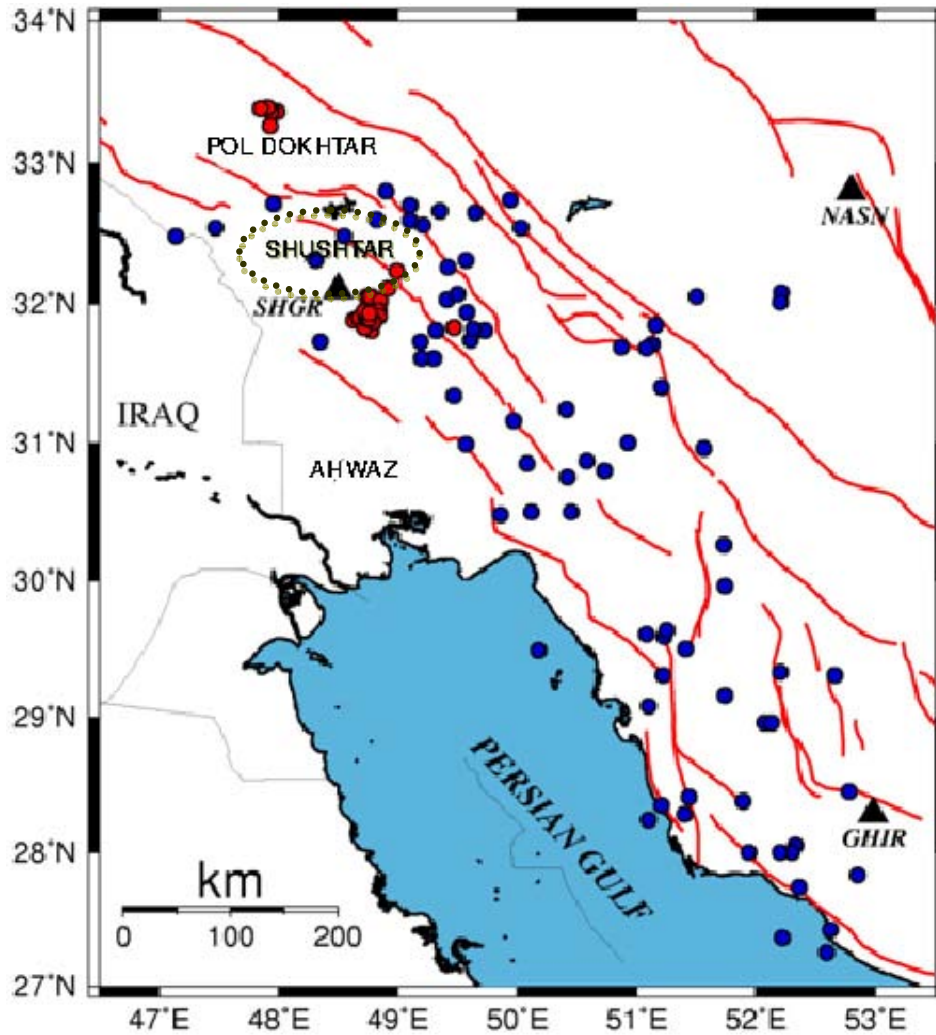


Fig.251. Waterfalls and Mills area



Fig.252. Waterfalls and Mills area

Schematic diagram of the faults in the region of Shushtar



Monitoring of Shushtar Earthquakes specifications from 1971-2001.

Date			Time			Coordinates		FD	mb	Ms	Mw	Efa	Ref	Region
Y	M	D	HH	MM	SSS	Lat.N	Lon.E							
1876	09	28	03			33.100	49.700			5.8			Arab	
1909	01	23	02	48		33.000	49.000			7.4		*	Arab	
Silakhor														
1929	07	15	07	44		32.060	49.600		6.3	6.0			Arab	
Andeka														
1929	10	27	16	42	58	32.350	48.350	33	.0	5.0			NAB	
1939	11	04	10	15		32.600	49.020		6.0	5.7			Arab	
1948	07	30	03	30	14	31.410	49.120	43	.0	5.5			NOW	
1955	12	04	14	02	12	33.370	48.800	65	6.0				NOW	
1955	12	17	00	06	30	33.500	49.000		5.7				DCIS	
1960	06	02	12	42	44	33.040	48.780	50	5.0				NOW	
1961	09	14	08	03	11	32.800	47.510	78	5.4				N. IS	
1962	06	29	22	35	40	32.340	48.800	58	5.6				NOW	
1963	06	30	07	41	07	33.200	49.200	38	5.1				NEIC	
1964	01	12	12	45	40	31.520	49.230	56	5.1				ISC	
1964	11	10	15	47	53	32.720	49.160	55	5.3				ISC	
1965	03	10	05	44	51	32.620	49.160	102	5.4	5.2			NOW	
1966	07	27	14	49	04	32.670	48.760	43	5.1				N. IS	
1968	06	04	06	49	60	32.690	48.281	40	5.2				NEIC	
1969	10	31	08	53	20	33.180	47.890	70	5.0				NEIC	
1970	01	03	16	35	49	32.642	48.710	35	5.0				NEIC	
1973	02	07	05	27	20	32.050	49.428	51	5.2				NEIC	
Shushtar														
1973	11	05	05	36	10	32.924	49.598	51	5.2				NEIC	
1974	01	07	15	24	40	33.303	47.924	32	5.0				NEIC	
1976	11	07	11	07	60	33.235	47.963	51	5.5				NEIC	
1976	11	15	08	03	20	33.246	47.931	49	5.4				NEIC	
1977	01	04	16	09	60	33.094	47.923	45	5.1				NEIC	
1977	01	18	08	48	60	33.157	47.997	48	5.2				NEIC	
1977	04	26	16	25	30	32.656	48.922	47	5.4	4.8			NEIC	
1977	06	05	04	45	10	32.636	48.086	40	5.8	5.7			Arab	
1977	06	05	05	02	40	32.631	48.329	43	5.0				NEIC	
1977	06	05	08	25	30	32.561	48.164	33	5.1				NEIC	
1978	12	14	07	05	20	32.139	49.646	33	5.9	6.1			Arab	
1980	10	19	17	24	10	32.762	48.572	42	5.3	5.8			NEIC	
1981	01	02	04	57	60	32.730	48.461	33	5.1	4.7			NEIC	
1983	05	28	11	35	60	32.594	48.581	18	5.6	5.1			NEIC	
1984	10	21	23	40	20	32.697	47.560	42	5.0	.0			NEIC	
1985	09	18	00	10	30	31.627	49.447	33	5.2	4.4			NEIC	
1989	04	02	21	24	40	32.621	47.782	33	5.4	5.0			NEIC	
1990	07	24	17	59	40	32.876	48.243	10	5.1	4.7			NEIC	
1990	00	00	11	57	10	32.750	40.210	45	5.0	4.9			NEIC	
1990	10	11	13	57		32.838	48.212	46	5.3	4.7			NEIC	
1990	12	29	15	34	10	32.602	47.896	57	5.1				NEIC	
1994	07	31	05	15	39	32.557	48.369	43	5.3	5.3	5.6		NEIC	
1994	07	31	05	22	10	32.578	48.456	72	5.2				NEIC	
1994	09	20	05	51	46	32.501	48.770	33	5.0	4.4	5.2		NEIC	
1995	06	07	23	09	47	32.460	48.737	33	5.0	4.6			NEIC	
1995	11	27	14	32	29	32.308	48.923	61	5.0				NEIC	
2001	04	03	17	36	34	32.470	47.990	33	5.1		5.2		NEIC	
2001	09	01	22	38	16	32.730	47.680	14	5.0				NEIC	

This questionnaire is prepared, due to the research of tourists and travelers issues.

Form Code: ...	Date: ...	Time: ...	Questioner Code: ...
Province: ...	City: ...	Town/village: ...	Base Code:...

Did you fill this questionnaire before? Yes <input type="radio"/> No <input type="radio"/>
--

Please enter your traveling group information:

1. Have you exited from your current living environment? Yes <input type="radio"/> No <input type="radio"/>
2. Do you travel for trading? Yes <input type="radio"/> No <input type="radio"/>
3. Start of travel Town/village: ... 4. Main destination Town/village: ... 5. Date of start: ...
6. Goal: fun <input type="radio"/> family visiting <input type="radio"/> pilgrimage <input type="radio"/> Trading activities <input type="radio"/> etc <input type="radio"/>
7. Type: stay <input type="radio"/> passing <input type="radio"/> 8. Duration of stay in Town/village: ... hour ... day
9. Place of stay: hotel <input type="radio"/> inn <input type="radio"/> Rental house <input type="radio"/> private house <input type="radio"/> family home <input type="radio"/> camp or tent <input type="radio"/> etc <input type="radio"/>
10. How long will your traveling take? ... Day 11. How many days of it has already passed ... Day
12. Number of group ... persons 13. sex: ... male ... female
14. Age of travelers: less than 7 years ... person 8-17years... person 18-54years... person more than 54 years ...person

ICHHTO

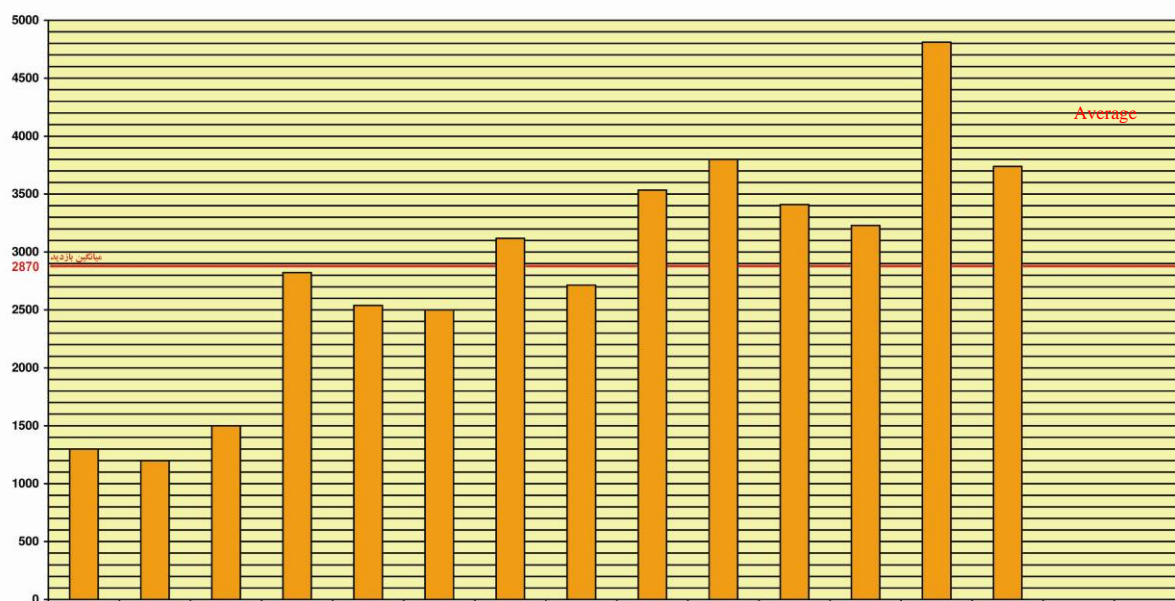
Fill this table according to the rate of your satisfactions from travel components.

Components	very good	good	poor	very poor
15. Stay and Residence:				
○ Price of residence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Access to appropriate residences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Cleanness of rooms and beds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Residence personnel attitudes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Quality of services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Alimentation:				
○ Price of foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Access to appropriate restaurants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ The cleanness of restaurants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Quality of foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Cleanness of dishes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Cleanness of hygienic services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Transportation:				
○ States of roads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ States of warnings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of vehicles and heavy carriers traffic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of hygienic services in roads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of service stations in roads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of medical services in roads	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. Attractions				
○ Price of ticket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Guidance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Personnel attitude	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ Cleanness of environment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of hygienic services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
○ State of facilities and equipments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
What is your rate of satisfaction from this traveling, in general?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Statistic on the number of visitors in SHHS from 2001-2006

Year	Iranian visitors	Foreign visitors	Total of visitors
2001	136582	643	137225
2002	141941	248	142189
2003	124033	161	124194
2004	148339	382	148721
2005	136186	220	136406
2006	142262	300	142562

Statistic on the number of visitors in Historical- Hydro structures of Shushtar during 14 days of Norooz holiday.



-Monitoring of visitors:

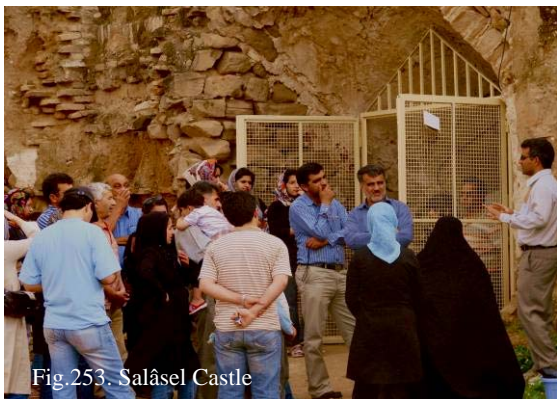


Fig.253. Salâsel Castle



Fig.254. Waterfalls and area



Fig.255. Waterfalls and area



Fig.256. Salâsel Castle

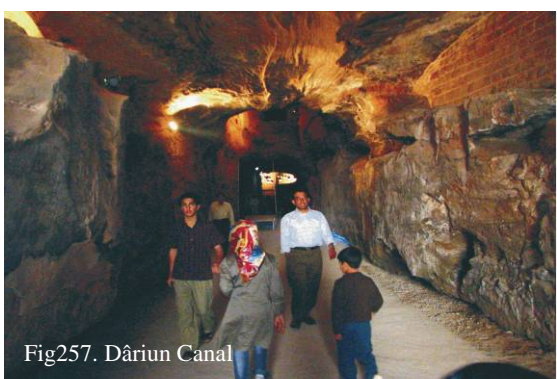


Fig257. Dâriun Canal



Fig258. Waterfalls and area

7

DOCUMENTATION

8

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9

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PARTY**

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Organization (ICHHTO)

Acknowledgment

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- The Developmental Deputy of Khuzestan Province Governor
- Shushtar representative in Islamic Parliament.
- Shushtar Governor
- The Head and members of Shushtar City Islamic Council
- The Mayor of Shushtar

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APPENDIX I

ARCHAEOLOGICAL REPORTS

A BRIEF HISTORY OF ARCHEOLOGICAL STUDIES ABOUT SHUSHTAR HISTORICAL HYDROLIC SYSTEM AND THEIR IDENTIFICATION

Many archeological investigations have been done concerning better identification of Shushtar hydraulic structures and irrigation network since long ago in which some were solely focused on this subject and some aimed to identify civilizations developing due to the presence of such a system. Miyânâb plain in Shushtar was one of the regions being investigated several times in this respect, in addition, case soundings were done on Dâriun Canal, Band-e-khâk, Salâsel fort and Mizân Dam.

Among other investigations in this regard are Adams general study of the entire Khuzestan plain which focused on the identification of civilizations developed in the region during different periods of time as well as the influence of irrigation network on their growth and expansion. Adams conducted a limited survey on the construction of Khuzestan plain dams and canal system in the winter of 1960-61. (Moghaddam, 1385 AH: 12)

MIYÂNÂB ARCHEOLOGICAL STUDIES

Miyânâb plain was investigated and excavated several times regarding the generation of civilizations and different governments ruling in various periods. Before reaching Shushtar, Karun Canal is divided into two branches named: Shoteit and Gargar by Mizân Dam, the land made in between these two branches by Canal alluvium is called Miyânâb which is very fertile with an area of over 40 thousand hectares. At the northern end of this plain is Mizân Dam and at its southern end stands Qir Dam. (Mogaddam, 1380 AH: 5)

As the level of both Canal are lower than Miyânâb fields, a Canal called Dâriun has branched off Shoteit which passes beneath Salâsel castle and reaches Miyânâb fields in order to irrigate them. Afterwards Dâriun Canal itself is divided into several smaller branches to make an integrated irrigation network in Miyânâb.



Interior section of one partian(elimaiien) tomb sample in Gelalak region



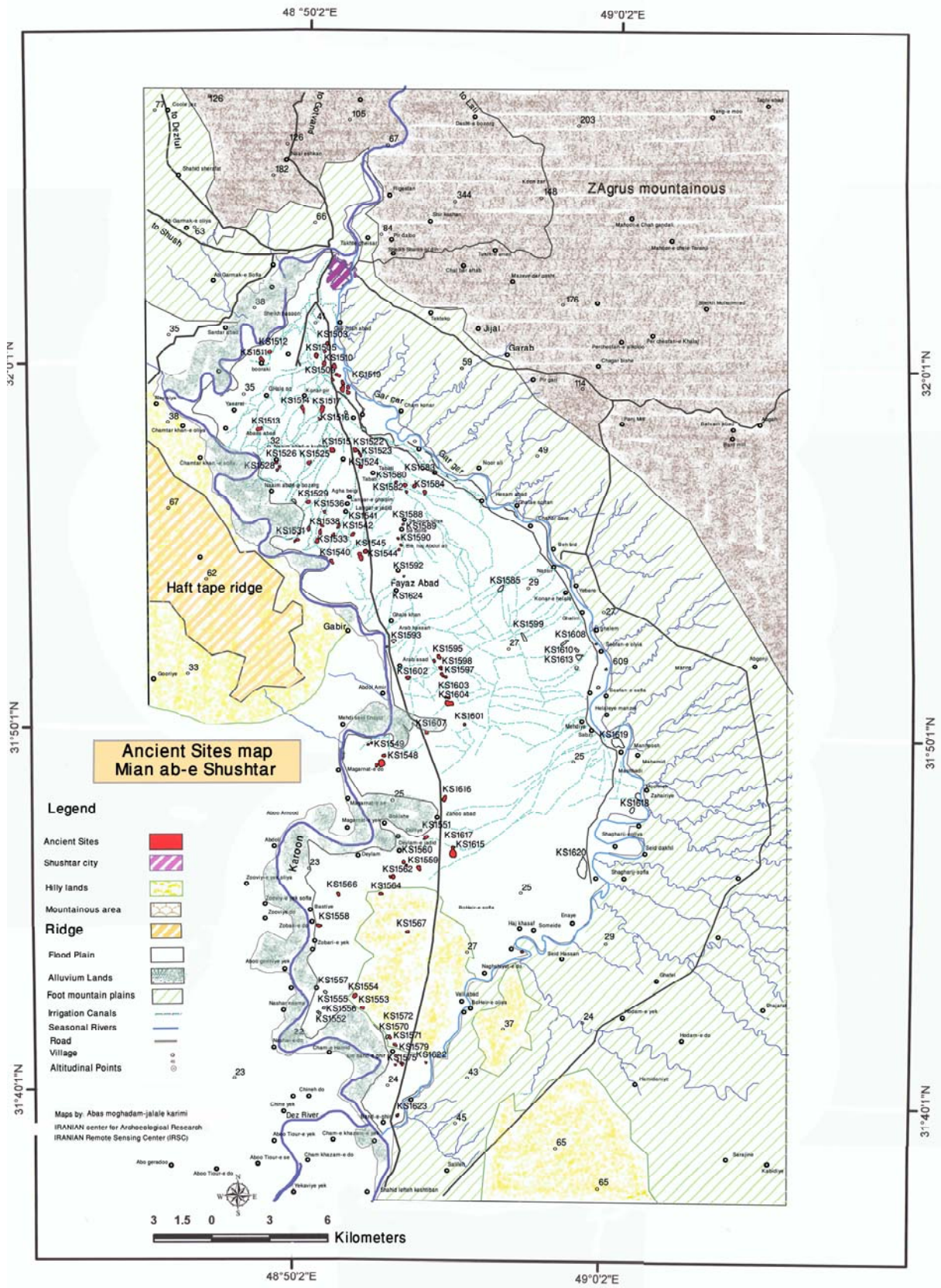
Catacomb tomb and a coffin excavated from it in Gelalak region

Mr. Aliakbar Sarfaraz was the first person who conducted a limited survey in this region in 1348 AH. In the years 1365, 1367 and 1368; Mr. Mehdi Rahbar excavated a part of Miyânâb plain called Gelalak situated near Dastova town which resulted in the identification of Dastova and its introduction as one of the most important settlements in Parthian era. Magnificent cellar-shaped tombs remaining in the town doubtlessly belong to the kings of that period.

In 1380 AH, Mr. Abbas Mogaddam conducted another general investigation in Miyânâb plain which led to the identification of 509 monuments including hills, sites, bridges and Dams as well as their registration as national monuments. Results show that this region has been inhabited since prehistoric times until Elamid era and ancient Persian dynasties (Achaemenid, Arasid and Sassanid) and later on Moreover, especially in Arasid time, many settlements appeared which denotes the construction of water system in this era. Gargar Canal was apparently digged in this time which led to its population increase. The total land area of Arasid hills and sites in Miyânâb is 737.70 hectares which is much more than the corresponding figure at former and later periods of time.

In addition to these statistics, the geomorphologic-archeological map of the site was prepared during this investigation in which all the present ideas about Miyânâb plain have also been included. For example in pre-Arasid maps, Gargar Canal and Dâriun canal are not seen. Also in the basic map, the concept of the continuance of eastern waterways from

Shushtar heights as far as Karun Canal has been represented. (Moghaddam, 1380 AH: 63)



KS1501	Tale harsi	KS1526	-	KS1551	GabibehI
KS1502	Tape baghe rostam	KS1527	-	KS1552	Hur
KS 1503	Kam dide	KS 1528	-	KS 1553	Gabibeh II
KS 1504	Dastova I	KS 1529	Tale kal abla	KS 1554	Zebari
KS1505	Gelalak	KS1530	Tale mar gheri	KS1555	Abuzbaă
KS1506	Dastova II	KS1531	Tape poshtak nazar	KS1556	Fisal
KS1507	Dasova III	KS1532	Neămati	KS1557	
KS1508	Tape pompe benzin	KS1533	Tale yebare	KS1558	Abuămud nejat
KS1509	Dastova IV	KS1534	Tale kharzar	KS1559	Mashul I
KS1510	Dastova V	KS1535	Mijuiun	KS1560	ăbdolseyed
KS1511	Tape ali shah	KS1536	Tale Nazar	KS1561	Sharhat
KS1512	Tape gozanbu	KS1537	Jili I	KS1562	MaghtehI
KS1513	Tale gachi	KS1538	Jili II	KS1563	MaghtehII
KS1514	Hăj yaghob	KS1539	Jili III	KS1564	Hărd
KS1515	Tale kalăt	KS1540	Tale yebare II	KS1565	Tăpe siah
KS1516	Jambuluva II	KS1541	Jili IV	KS1566	Basleh
KS1517	Jambuluva I	KS1542	Tale ghăbăzI	KS1567	Negini
KS1518	Mordăr gardesh	KS1543	Tale ghăbăzII	KS1568	-
KS1519	Godar mahi bazan	KS1544	Tale ghăbăzIII	KS1569	-
KS1520	Hăj monăem II	KS1545	Mohavate Ghabaz	KS1570	-
KS1521	Hăj monăem III	KS1546	Tale chamI	KS1571	-
KS1522	Poshte joye hasanI	KS1547	Tale chamII	KS1572	Sădărate chai I
KS1523	Poshte joye hasanII	KS1548	Tale dibanI	KS1573	Sădărate chai II
KS1524	Poshte joye hasanIII	KS1549	Tale dibanII	KS1574	Sădărate chai III
KS1525	Mohammad Băgher	KS1550	Tale dibanIII	KS1575	Sădărate chai IV

KS1576	Sâdârate chai V	KS1600	Ishanol Asvad III	KS1624	Emamzade hashem
KS 1577	Sâdârate chai VI	KS 1601	-	-	-
KS 1578	Sâdârate chai VII	KS 1602	Faraj	-	-
KS1579	Sâdârate chai VIII	KS1603	Bulvar I	-	-
KS1580	Tale hasan	KS1604	Bulvar II	-	-
KS1581	Tale kheirolah	KS16605	Bulvar III	-	-
KS1582	Ghole romezi I	KS1606	Bulvar IV	-	-
KS1583	Ghole romezi II	KS1607	Gol shuneh	-	-
KS1584	Ghole romezi III	KS1608	Hamian	-	-
KS1585	Tape Gheisi	KS1609	Tale deimi	-	-
KS1586	Cham	KS1610	Tale zahed	-	-
KS1587	-	KS1611	-	-	-
KS1588	Tape se bone II	KS1612	-	-	-
KS1589	-	KS1613	-	-	-
KS1590	-	KS1614	Tajajeh	-	-
KS1591	Tale mirzade	KS1615	Mashul II	-	-
KS1592	Mohavate latan	KS1616	Ishanol doleh	-	-
KS1593	Dârughe	KS1617	Mashul III	-	-
KS1594	Haj Mohammad	KS1618	Jaliâh	-	-
KS1595	Ishanol farajI	KS1619	Dolat Abâbd	-	-
KS1596	Ishanol farajII	KS1620	Shaghârij	-	-
KS1597	Ishanol Asvad I	KS1621	Naghishât	-	-
KS1598	Ishanol Asvad II	KS1622	Jaliâh	-	-
KS1599	-	KS1623	Tape band Ghir	-	-

In the years 1383-84 AH, the Miyânâb town of Dastova was surveyed and excavated yet again by Mr. Mahdi Rahbar that led to significant conclusions about regional urbanization in which this town was introduced as the government center of Elimaiid people during Parthian rule having all the characteristics of an urbanized society. Only by way of these excavations parts of the town history were revealed because no trace remains from its past.

Excellent stucco pieces and some architectural structures were found which date back to the Arasid-Sassanid era and denote the importance of Dastova in the period simultaneous with the growth and expansion of water structures in Shushtar general area.

INVESTIGATIONS CONDUCTED AT THE MAIN INTAKE OF DARIUN CANAL

This section of water System was studied by Mr. Abbas Mogaddam in 1380 AH aiming to conduct archeological investigations at the Intake head site of Dâriun historical Canal as far as Mostowfi bridge in order to reveal entrances of water intakes, tunnels and water canals built there.

During this investigation, the site was divided into four sections and studied:

- 1-water intakes
- 2-tunnels and water canals
- 3-the middle basin reservoir
- 4-the watershed ending in Dâriun canal

1-WATER INTAKES

Eight separate water intakes at the projecting cliff front inside Karun River were identified at different levels in the eastern-western direction.

2-TUNNELS AND WATER CANALS

Before soundings at the covered section of the Intake head, one main and two subsidiary tunnels (low-roofed) were visible and recognizable. But after some surveys, more excavations were conducted in different parts of tunnels leading to the discovery of three more subsidiary tunnels in between the previous ones of which the one leading to the main water canal is more distinct.

The length of this tunnel is 135m, its width is on average 4m and its average height from its mud base is approximately 4m. The water intake of it is no.2. One of the characteristics of this tunnel is its connection route to Salâsel castle which is located at the onset having two by two meters dimensions. Moreover, it is a long, winding tunnel with a

wide water intake entrance.



Excavated Gatch artistry from Dastova ancient town

3-THE MIDDLE BASIN OR RESERVOIR

The distal section of these tunnels reaches a vast area with a length of 211m which from east to west is confined to stone walls and residential homes. Soundings were done in the middle basin or reservoir in-between the end of main tunnels no.1 & 2 and Mostofi Bridge in order to identify its structures.

4-THE WATERSHED BASIN

Extensions of two tunnels as well as the main water canal passing under Bateni bridge are united in this section ending in the plain. The approximate length of the basin is 48m and its width is 40m.

Added together, these investigations led to the following results:

- 1-Considering the water current and the cliff projection at water intakes; ancient engineers used the length of the cliff front overlooking the Canal and built numerous water intakes to increase water volume.
- 2-All four parts of the Intake head act together like different members of a body.
- 3-The presence of water control system during floods whether by positioning angles of water intakes or via perpendicular spots of the main water canals no.1&2.
- 4-All tunnels as well as the above-mentioned four parts are ancient and have historical value.(Moghaddam,1380 AH:2,5-8)

SURVEYING, SOUNDING AND IDENTIFYING MIZAN DAM UNDERWATER

Surveying and identification of Mizân Dam started in 1382 AH under the supervision of Mr. Mireskandari in order to reorganize it as well as to recognize the pathology of its underside leading to the following results:

Soundings at the southern front of Mizân Dam led to the determination of the Dam projection under the alluvial mound and the real limits of the Dam, moreover it proved the absence of monuments and annexations under the southern sediments of the Dam. Specifically, the high slope of its southern front which is the water spillage spot was discovered. This is why no other structure or building is located there.

Surveying and identification of Mizân Dam underwater was conducted aiming the pathology of its most eastern as far as its most western parts with the following results: After the survey, in addition to underwater identification of Mizân Dam as well as calculation of its underside damage rate, some unknown parts of it were discovered by divers.



Under water Archaeology in Band-e Mizan hydraulic site

Surveys at the northern front of the Dam led to the discovery of a water delivery tunnel at its eastern margin 2m under the water surface through which water passed forcefully and entered the mill at the other side of the Dam and was probably the only water resource of the mill.

Another tunnel was identified at a depth of 5-6m east of the great Dam arch several meters long in the north-south direction. Among other unknown parts of the Dam which were identified were the high and short walls built perpendicular to the Dam in a spiral manner. These water-proofed mortar and stone walls act as the roots of this water structure and play a central role in its strengthening.

Generally, surveying and identification of Gargar and Shoteit riverbeds showed that the base of the former was made by scraping bed stones, also mid-Canal projections served as measuring rods for the water flowing through the Dam. The floor of Shoteit was prepared at some parts by big stones and in most sections is covered by sediments. (Mireskandari, 1382 AH: 17-19)

BAND-E-KHAK SURVEY REPORT IN 1383 AH

The required soundings and surveys in this part of Shushtar water network were focused on better identification of this site under the supervision of Mr. Abdolhamid Rezaiee which led to the discovery of the buried parts of the Dam. Additionally, its hindrance function against Dâriun Canal overflowing as well as its architectural structures was investigated.



Discovering some parts of weir, during the excavation



Discovering one of the closed weir intake, during the excavation

SOUNDINGS IN SALASEL CASTLE

Salâsel castle as the ancient fort of Shushtar has a special place among historical water structures so that it is considered as the water administration center of the region covering all water structures of the town. The onset of Dâriun Canal from beneath this castle and its dominant position over other water structures has made it distinguished.

Soundings and surveys were conducted at this site in 1384 AH. Passage of time has destructed many parts of the castle and during recent soundings under the supervision of Mr.Darakhshi which were done to determine the limits of the castle; many sections like trenches became known.



One of the Salasel Castle soundings due to core zone identification

Location	Excavation Date	Excavator
Shushan	1969 -1961	R. Mack- Adams
Miyânâb	1969	A-A. Sarfaraz
Miyânâb(Gelalak)	1989	M.Rahbar
Miyânâb	2001	A.Moghaddam
Dâriun intake	2001	A.Moghaddam
Mizân Dam	2003	Mir-Eskandari
Khâk Dam	2004	A. Rezaii
Salâsel Castle	2005	H.Derakhshi
Miyânâb(Dastova)	2005 -2006	M.Rahbar

Archaeological excavations and investigations in Shushtar hydraulic region

APPENDIX II

**SANCTITY OF WATER IN
SHUSHTAR
AND RELEVANT CUSTOMS**

SANCTITY OF WATER IN SHUSHTAR AND RELEVANT CUSTOMS

As one of the main principals of human life, water has always been revered and praised by man, even at times has been worshipped by him. In ancient Persia, Anahita was the goddess of water and several temples were built for her and the remains of some can still be seen.

Additionally, ceremonies and feasts were performed in relation to water like: the eve of water and streams celebrated in the 29th of Esfand each year during which people poured perfume and rose water into streams. Also the Abrizgan feast in which, people used to spill water and recite magical incantations for rain to come.

Without doubt in Shushtar which is a town having intimate relationships with water, similar events were held. But many customs belong exclusively to this town and were observed until recent times.

As the river flows through the town and its alleys, residential quarters and market-place, a close relationship has been generated between the public and water. It can be said that the water sound is the daily music of their lives.

The passage of the river through different neighborhoods has caused each one having an exclusive brook used for their congregation and for recreational purposes like: swimming or kids playing.

Among special customs related to water are:

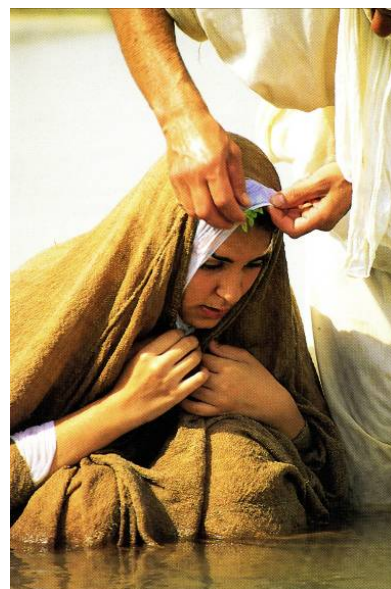
Marriage: in which the groom used to bath in the riverside

Death: in which the important persons of each district were ceremonially washed in the flowing water after their death, because it was thought that water has a cleansing property.

Daily swimming and water games were among indigenous customs. Furthermore, there was a sect called Sâbe‘in whose religion had close ties with water and formerly lived in Shushtar. Remains of their sanctuaries are still seen beside Borj-e ‘Ayâr bridge-dam at Gargar shore. They used to perform all of their customs including: birth, death and marriage ceremonies inside flowing water.



Drinking sacred water with KAPTHA



Bride and groom being baptized Baptême
Before the wedding ceremony



Baptism

The clergyman and the subject to be baptized facing celestial North, location of the angel AVATHAR. The clergy sheds water on the subject three times which means shedding particles of light on man's body that must exit darkness.

APPENDIX III

SUSHTAR GEOLOGY

SHUSHTAR GEOLOGY

INTRODUCTION

During the reproduction of previous cultural behaviors, it is necessary to examine and interpret all cultural elements implicit in the environment. As an example, ancient sites located on river terraces can easily serve as a good interpreter for determining the time of deposition.

Water, as the vital source of life and survival plays a pivotal role in Holocene settlements of arid and semi-arid lands. In Shushtar plain, water has always been a life-giving force despite its occasional destructive influence on habitats at some periods of time.

The interaction of biological quantum factors and sources, like: erosion, vegetation reduction, climatic changes, sand storms, decrease of animal species, variation of Karun river range and its eastern floodways, morphology, deposition, deposits removal as well as subsidence of underground water table in Shushtar plain during Holocene period, have transformed this region into a unique place. Thus expounding its archeological characteristics does not result in proper answers without considering geological and bio-ecological complications.

GEOGRAPHICAL BACKGROUND

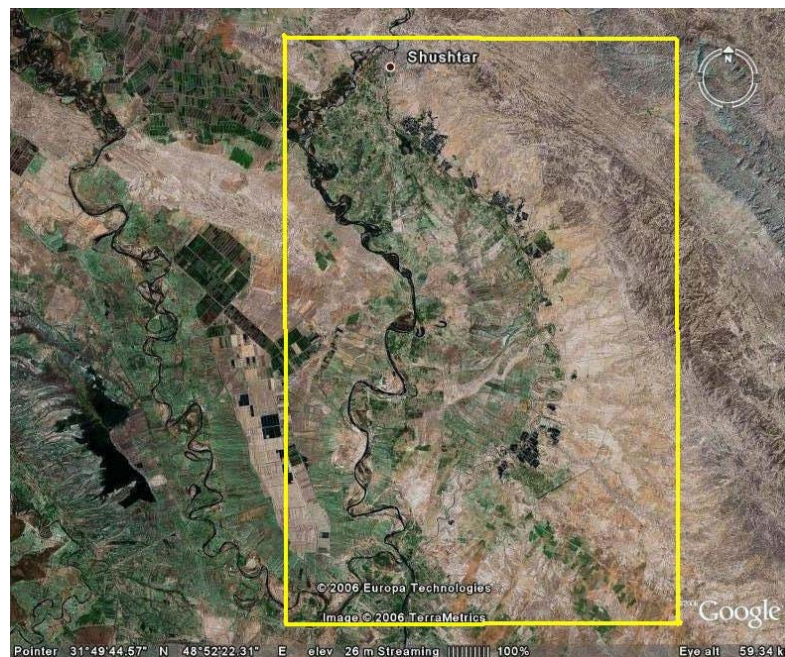
Khuzestan plain is the continuance of Miyan- rudan (Mesopotamia) plain situated between the Arabian platform and the Iranian one. Technotic movements have elevated Zagros heights leading to separation of Miyan rudan and Khuzestan plains. These plains were the result of the gradual erosion of Zagros in which due to an uplifting process, deposits have increased little by little.

Zagros has a unique ecological status and is the natural border between Mesopotamia and Iran plateau. Actually low lands of Mesopotamia and the central plateau of Iran indicate their long time affinity from prehistoric times until now.

Shushtar plain with an area of 1200 square kilometers is located northeast of Khuzestan plain. This natural route is the communication corridor of cultures in Mesopotamia, Fars, central plateau and southeast of Iran. Shushtar town is situated north of Mollasani and Haftgel, east of Dezful, west of Masjed Soleyman and south of Gotvand.

Shushtar plain from north and east is enclosed by heights with a maximum height of 700m above sea level which at the north and east directions as far as Bakhtiari ridges, their height reaches up to 4000m. These reliefs include formations of Bakhtiari, Aghajari, Gachsaran,

Mishan and Asmari which mainly belong to Fars group formations.



Archaeo-geological research region

STRATIGRAPHY OF THE REGION

The most important stratigraphical units outcropped in Shushtar region includes: Aghajari formation, Lahbari member and Bakhtiary conglomerate which date back to upper Miocene until late Miocene and finally young alluvial deposits which date back to Quaternary. Lithologically, the Aghajari formation consists of brown-grey limed siltstones, gatch veins, red marl and siltstone which have a significant thickness in Khuzestan region and build a huge anticline north and northeast of Shushtar.

This anticline which is known as Shushtar anticline has been cut almost perpendicularly by Karun River that flows in a north to south direction. It is noteworthy that Karun riverside heights from Shushtar upstream as far as 6 km have been made of Aghajari formation. In Shushtar waterfalls area, this formation is lithologically made of grey siltstones and lime cement with a thickness of 2-4m amid clay stone layers and red marl 2-5cm thick as well as Bakhtiary micro conglomerates 10-30cm thick. Bakhtiary conglomerates have a clay cementation.

1-6-1: GEOMORPHOLOGY

The geomorphologic faces of eastern half of Shushtar plain is the result of Mesas and Buttes erosion into rolling hills. Controlling the process of landform changes in the zone under investigation is a function of seasonal flooding in arid and semi-arid regions. Hard surfaces remaining on the plain have been encircled by gullies; wadies with a depth of more than 15m. Gullies were generally several kilometers long and 10-50m wide which extended from east Shushtar heights as far as old Karun in an east to west direction. Gachsaran formation due to its soluble salts (halite) caused salinity of fields especially in the southern section of the plain which acts as a negative feedback for absorbing cultural settlements.

Bluff geological indicators are for example the cliff upon which Shushtar town has been built or the rocky relief located east of Abu-chizan area. Gradual uplifting of these projections led to the lowering of Gargar stream, outcropping of Shushtar town cliff, the downfall and diversion of Hasan-shahi River as well as the upcoming of Abu-chizan area. Bulging of fields due to halite dissolution and renewed deposition of salt in clay soils have caused the uplifting and folding of some parts of the southern section of the plain.

Generally, based on erosion rate, Shushtar plain can be divided into two unequal parts: the western one and the eastern badlands Water Caves both located beside Gargar river. The eastern part is separated into three sections: active, semi-active and nonnative. Shushtar plain is 25-100m above sea level with vegetation consisting of: marshland, Salina, steppe and pasture plants, as well as scattered shrubs and trees including: lotus, Gorgtigh, kahurak and tamarisk (manna).

RIVERS

Sedimentation regimes of rivers in Khuzestan plain are widespread but separate and inconsistent as well as dependent on alternating river routes.

Ecosystem data in each geological period and weather cycle have left different river and flood alluvial deposits in the area under our investigation. These deposits which mostly contain archeological evidence have special value from a geo-archeological point of view.

Karun river with a 66930 square kilometers of watershed area meanderingly passes west of the plain. North of Shushtar town, Gargar branch is separated from Karun and after traveling a distance of 45 km rejoins it at Ghir weir.

Additionally, seasonal rivers having relatively small watershed areas flow from the eastern heights of the plain as far as Gargar canal in an eastern-western direction. Although formerly

before the construction of Gargar, the floodways extended as far as old Karun. These floodways have a width of up to 50m and a maximum depth of 18m.

Seasonal rivers in Shushtar plain were of anastomosing type and made small islands throughout their route which resulted in the branching of the main current.

Karun is a meandering stream which in its course has collided into hard side layers of the plain causing the alteration of its range. During Holocene period, these developments resulted in Karun course diversion from midlands westwards. During Pliocene period, no river existed, therefore no evidence of terraces in the plains remains but in Holocene period, it has left three terrace levels. On the first terrace, pre-historic areas and on the middle terrace historical settlements have been developed. The lower terrace of Karun is encircled by corridor-shaped grove lands.

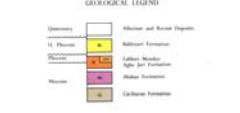
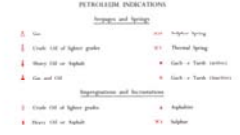
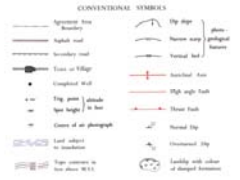
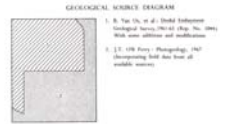
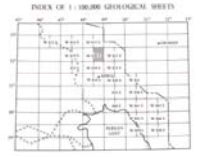
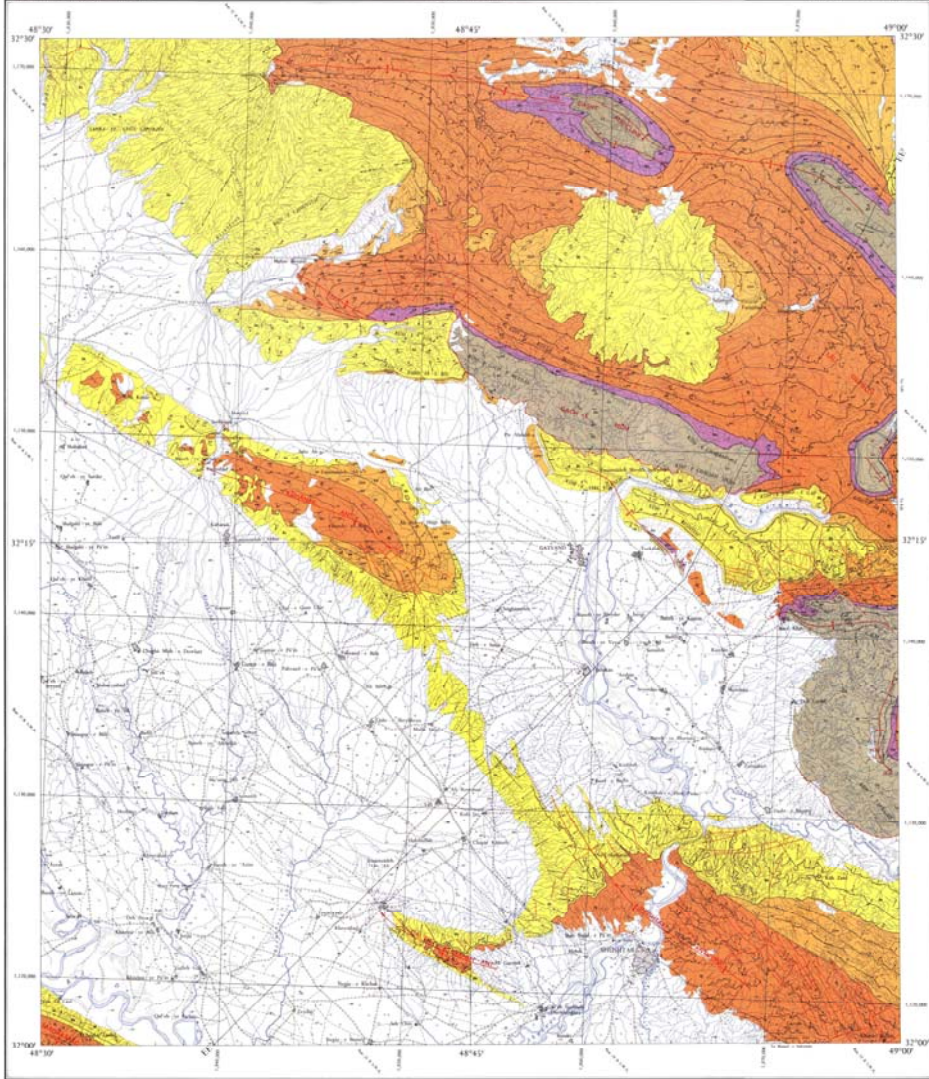


Altered landscape of eastern section of region affected by erosion

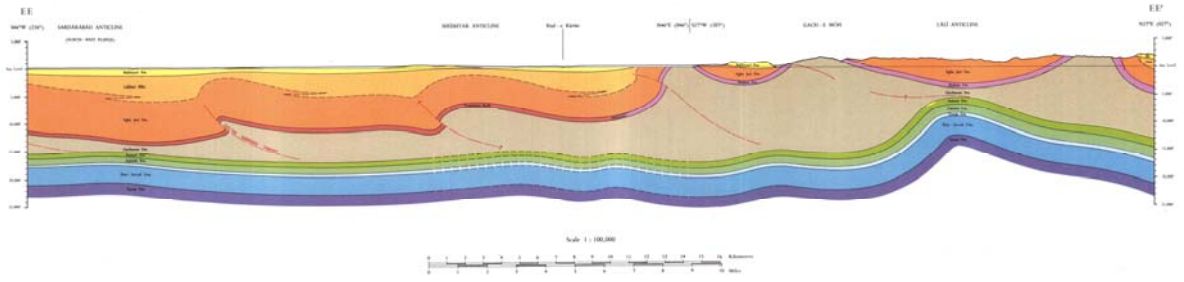


Meandering layers in depth of 5m

IRAN 1:100,000 SERIES SHUSHTAR SHEET No. 20820 E



IRANIAN OIL OPERATING COMPANIES	
GEOLOGICAL AND EXPLOREATION DIVISION TEHRAN	
SHUSHTAR	
GEOLOGICAL COMPILED MAP	
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Author: E.F. Othman	Date: June 1982
Editor: A. Soudki	Printing No. 20820 E
Geol. Sheet No. 20820 E	Sheet 6 of 6, Iran Oil, Tehran, Iran



APPENDIX IV

SUSHTAR HISTORICAL HYDRAULIC SYSTEM ACCORDING TO REPORTS AND NARRATIVES OF HISTORIANS AND TRAVELLERS

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM ACCORDING TO REPORTS AND NARRATIVES OF HISTORIANS AND TRAVELERS

In this section abridged explanations of historians, geographers and travelers about Shushtar water structures are provided according to their time sequence.

2ND CENTURY AD

1-Plinius, Roman historian

Book name: Strategemata (Polen, XII, 75-78)

In which the following cases have been mentioned: Expressing the name of Shushtar as Sostra as well as some notes about Karun River passing by it.

7TH CENTURY AD

2-Theophilactus Simokatta, Roman historian

Book name: Theophilactus Simokatta, IV, 3

In which the following cases have been mentioned: Mentioning Shâdorvan bridge as Shapoor dam

9TH CENTURY AD

3-Ebn-e Khordazbeh, Iranian geographer

Book name: Almasalek Valmamalek

Leiden, 1889, Pp.

In which the following cases have been mentioned: notes about Karun river as well as its canals and waterways

4-Ahmad Balazori, Arab geographer

Book name: Fotooholboldan

Cairo, 1957, Pp.228-229

In which the following cases have been mentioned: referring to the Sassanid town of Rostag Kwaz(=Rostam Kwaz)located at the end of hand-made Canal of Gargar in Ghir dam. Mentioning Salâsel castle and its nearby water Canal (Dâriun)

5-Ahmad Dinwari, Iranian historian

Book name: Akhbaroltewal

Cairo, 1960, Pp.130-133

In which the following cases have been mentioned: Salâsel castle and its nearby water canal (Dâriun)-Conquerance of Iran by Arab Moslems

10TH CENTURY AD

6-Abudolaf, Arab geographer and traveler

Book name: Alresâlâtolsaniah (travel account)

Tehran, 1963, Pp.88-90

In which the following cases have been mentioned: Karun river water in Shushtar-the hand-made Canal branching off the river and entering the town-Shâdorvan bridge dam-the mills and their water buckets.

7-Tabari, Iranian historian

Book name: Tarikh Alomam va Moluk

Cairo, 1939-57, I, Pp.819-831

In which the following cases have been mentioned: Shâdorvan bridge dam and its construction with the help of Roman army of Valerianous- Salâsel castle

8-Ebn-e-Asam-e-koofi, poet and historian

Book Name: Alfotooh

Bombay, 1882, Pp.223-224

In which the following cases have been mentioned: Conquerance of Shushtar by Arab Moslems-Salâsel castle

9-Estakhri, Iranian geographer and traveler

Book Name: Almasalek Valmamalek

Tehran, 1968, Pp.89-92

In which the following cases have been mentioned: Shâdorvan bridge dam and its construction-He traveled a large part of the hand-made Canal of Gargar by ship in the year 951.

10-Ibn-e-Houghal, Arab geographer and traveler

Book Name: Souratolarz

Leiden, 1938-39, Pp.249-251

In which the following cases have been mentioned: contains the oldest recognized map of the hand-made Canal of Gargar, introduced as Masreghan (the Arabized version of Mashregh in Farsi) This map was drawn around the year 969. Additionally, refers to the fact that Karun river water (Shoteit) occasionally went up as high as the gate of Shâdorvan bridge dam.

11-Moghaddasi, Arab geographer and traveler (who visited Shushtar about the year 983)

Book Name: Ahsanoltahasim Felmaarefatol Aghalim

Leiden, 1906, Pp.405-411

In which the following cases have been mentioned: Referring to Canals and water canals whirling around the town-Expressing his surprise for seeing a Qantas flowing in Shushtar underground with a cool water even during hot summers.

12-Ferdowsi, Iranian poet

Book Name: Shahnameh

Moscow, 1968, VII, Pp.197-199

In which the following cases have been mentioned: Referring to the construction of Shâdorvan bridge dam by Shapoor Sassanid with Roman help.-Mentioning a man named Branoosh managing its construction

13- Ibn-e-Balkhi, Iranian geographer

Book Name: Farsnameh

London, 1921, P.61

In which the following cases have been mentioned: Referring to the hand-made Canal of Gargar as Mashreghan constructed by the Sassanid king.

14-Hamzeh Esfahani, Iranian historian

Book Name: Chronology of the earth countries and prophets (in Arabic: Tarihk-e Senniyeh Molukolarz va Alanbia)

Berlin, 1921, P.34-36

In which the following cases have been mentioned: Referring to the hand-made Canal of Gargar as Mashreghan constructed by the Sassanid king, Ardashir.

The name of Mashreghan Canal has been considered Masreghan in Arabic derived from the Persian word of Ardashirkan. Shâdorvan bridge dam and dam construction by the Sassanid king, Shapoor.

13TH CENTURY AD

15-Ibn-e-Asir, Arab historian

Book Name: Tarikh-al-kamel

Beirut, 1994, VII, Pp.107-195, XXIV, P.116, etc

In which the following cases have been mentioned: Referring to status of the town, its reconstruction and damages inflicted

16-Yaghut Hamawi, Arab geographer and traveler

Book Name: Moajam-al-Baladan

Beirut, 1988, I, Pp.410-411

In which the following cases have been mentioned: Referring to the the Sassanid past of Shushtar and its structures-Referring to the hand-made Canal of Gargar as Masrugan

17-Ghazvini, Iranian writer

Book Name: Ajayeb-al-Makhlooghat

Tehran, 1966, Pp.183-185

In which the following cases have been mentioned: Referring to the hand-made Canal of Gargar as Masrugan-noting Shâdorvan bridge dam construction by the Sassanid king, Shapur.

18-Anonymous author, Iranian writer

Tehran, 1966, P.420

Book Name: Almokhtarat Menalrasael

In this book these subjects have also been pointed out: Traveling of large ships carrying goods and passengers from Shushtar to Askar Mokram and Ahwaz via the hand-made Canal of Gargar.

19-Rasheedin Fazlollah Hamedani, minister, writer and historian in Mongol court

Book Name: Monshaat-e-Rasheedi

Lahore, 1947, Pp.118-122

In this book these subjects have also been pointed out: In a letter to his son Amir Shahaboldeen who was Shushtar governor, examples of restoration of damages in water structures, bridges and Canals dredging have been reported.

14TH CENTURY AD

20-Mostowfi Hamdollah, Iranian historian, geographer and traveler

Book Name: Nozhatolgholob

Bombay, 1893, Pp.168-170

In which the following cases have been mentioned: construction of Shâdorvan bridge dam with Roman help-Gar gar dam-Salâsel castle-mentioning the Shoteit branch of Karun river as Chahardangeh (referring to the water volume passing in this course)

21-Ibn-e-Batuteh, Moroccan geographer and traveler (has traveled to Shushtar around the year 1330 and has stayed there for a while)

Book Name: Safarnameh (travelogue)

Tehran, 1982, Pp.201-204

In his work, these subjects have also been pointed out: Referring to a famous Canal which has encircled Shushtar town as well as its cool water in summer-Dezful gate near Shâdorvan dam where a line of boats has been tied-numerous gardens and water wheels on either side of the river

15TH CENTURY AD

22-Sharafoddeen Ali Yazdi, Iranian historian

Book Name: Zafarnameh

In which the following cases have been mentioned: mentioning the Shoteit branch of Karun River as Chahardangeh (referring to the water volume passing in this course)

16TH CENTURY AD

23-Ghazi Noorollah Shushtari, Shushtari historian, jurisprudent, man of letters

Book Name: Majalesolmomenin

Tehran, 1986, Pp.

In which the following cases have been mentioned:?

17TH CENTURY AD

24-Alaolmolq-e-Shushtari, Shushtari researcher

Book Name: Ferdows in Shushtar history

Tehran, 1973(most pages)

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

18TH CENTURY AD

25-Abdollah Shushtari, Shushtari historian, jurispudent, man of letters

Book Name: Tazkareh-ye Shushtar

Calcutta, 1924(most pages)

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

19TH CENTURY AD

26-Mir Abdollatif-e-Shushtari, Shushtari writer and historian

Book Name: Tohfatalalam

Tehran, 1984(most pages)

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

27-Mohammad Hasan Etemadolsaltaneh, prime minister of Naseroldeen Shah Qajar, geographer, writer and historian (Has also been the governor of Shushtar and Khuzestan in the company of his father)

Book Name: Maraatalbaladan (Tester entry)

Tehran, 1985, I, Pp.498-543

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

28-Henry Layard, English archeologist and politician

Book Name: A description of the province of Khuzestan

London, 1846, XVI, JRGS, Pp.79-86

In his work, these subjects have also been pointed out: Gargar Canal (Masrughan)being handmade-water canals of the town including Dâriun Canal-Salâsel castle-

Has considered Gargar dam and its water delivery tunnels as a magnificent achievement and a masterpiece-Gar gar bridge dam(Mizân dam)-other dams of Shushtar-Shâdorvan bridge dam

29-Clement Dobed, Russian embassy attaches

Book Name: A travelogue of Lorestan and Khuzestan

London, 1845, I, Pp.

In his work, these subjects have also been pointed out: Salâsel castle-Shâdorvan bridge dam and its construction by Shapoor-reconstruction and restoration of the bridge and other structures by Mohammad Ali Mirza (son of Fathali Shah) governor of Shushtar as well as Manoochehr Khan its next governor

30-George Kurzon,English Ambassador

Book Name: Iran and the Iranian subject

London, 1859, II, chap.XXV

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

31-Hosein Qoli Nezamolsaltaneh Mafi,prime minister of Naseroldeen Shah of Qajar,governor of Shushtar and Khuzestan

Book Name:Memoirs and Documents(Khaterat va Asnad)

Tehran, 1982, I, Pp.140, 151-157, II, Pp.383, 446

In which the following cases have been mentioned: Rather important explanations about Shushtar hydraulic system (Some Shushtar water structures were reconstructed by him.)

32-Jean Diulafoa, French archeologist

Book Name: travelogue (Iran, Susa, Chaldea)

Tehran, 1999, Pp.780-790

In his work, these subjects have also been pointed out: Shushtar water structures and their construction on Shoteit with the help of Romans by the Sassanid king,Shapoor-mentioning bridge dam and other Shushtar dams-Considers the waterfalls area and mills operated by water current as the greatest system of its kind before the Industrial Revolution-Salâsel castle

33-Henry Rawlinson, English researcher and Assyria expert

Book Name: March from Zohab to Khuzistan
London, 1836, JRGS (most pages)

In which the following cases have been mentioned: Rather important explanations about Shushtar water structures

34-Najmolmalek, Iranian writer (He travelled to Khuzestan and Shushtar as a representative of Naseroldeen Shah to examine the state of local waterways and bridges)

Book Name: travelogue of Khuzistan (Safarnameheye Khuzestan)
Tehran, 1962(most pages)

In which the following cases have been mentioned: Very important explanations about Shushtar water structures

35-Gret von Rogen, Dutch researcher

Article name: Notice sur anciens travaux hydrauliques en Susiane
MDP, Paris, 1905, Pp.166-207, fig.478

In which the following cases have been mentioned: Very important explanations about Shushtar water structures-Rogen can be considered as the first man who examined accurately Shushtar water structures and the possible stages of their individual construction.

36-Prescuryakov brothers, Russian military surveyors

Book Name: Iranian cities (1850)
Tehran, 2000, Pp.220-224, map.XIX

In which the following cases have been mentioned: It contains the oldest map of Shushtar in which many of its water structures were drawn

37-Anonymous author, Shushtari jurisprudent

Book Name: Faegholbayan (a manuscript copy about Koran commentary and religious subjects)

One copy of which is kept in Shushtar (by Mr.Sharafoddeen) and another copy in Tehran (by Ayatollah Hakim)

Among the subjects of this work are: restoration of some of Shushtar water structures with their relevant dates

20TH CENTURY AD

38-G.Le Strange, English geographer

Book Name: Historical geography the lands of Eastern Caliphate

Cambridge, 1905, Pp.232-235

In which the following cases have been mentioned: Very important explanations about Shushtar water structures

39-Ahmad Kasrawi, Iranian historian (He was the

Chairman of Ministry of Justice in Khuzestan and Shushtar for some time)

Book Name: the five hundred years old history of Khuzestan

Tehran, 1983(most pages)

In which the following cases have been mentioned: Very important explanations about Shushtar water structures

40-J.H.Kramers, German researcher

Article name: Tester entry in Encyclopedie de L'Islam(first edition)

Paris, 1913-1938

In which the following cases have been mentioned: Very important explanations about Shushtar water structures

41-Schwarz, German researcher

Book Name: Iran Mittelalter nach Arabischen geographen

Leipzig, 1924, IV, Pp.312-353

In which the following cases have been mentioned: Very important explanations about Shushtar water structures

42-Reza Pahlavi, Shah of Iran (the First Pahlavid)

Book Name: Khuzestan travelogue

Tehran, 1923, Pp.255-256, figs.36-39, 42

which contains: one of the old pictures of Salâsel castle-one of the old pictures of Shâdorvan bridge dam when it was still used for transportation

43-Mehdi Gharawi, Iranian writer

Book Name: From Shushtar to Abadan

Tehran, 1949, Pp.1-39

Which contains: Description of water structures and their areas at that particular year

44-Mahdi Sharafoddeen, Shushtari researcher

Book Name: History and Geography of Shushtar (This work is hand written and has yet to be printed). Which contains: explanations of considerable importance about Shushtar water structures

45-Mohammad Ali Emam Shushtari, Shushtari researcher

Book Name: History and Geography of Khuzestan

Tehran, 1952(the majority of pages)

Which contains: explanations of considerable importance about Shushtar water structures

46-Ahmad Eghtedari, Iranian writer

Book Name: Diar-e-Shahriaran (The Land of Monarches)

Tehran, 1974 (the majority of pages)

Which contains: explanations of considerable importance about Shushtar water structures

APPENDIX V

GLOSSARY OF LOCAL TERMS

TERMINOLOGY LOCAL NAMES OF SHUSHTAR MONUMENTS

Ab-bâre: a place for water passage

Askar- Mokram: an ancient town near Shushtar

Baghami: meaning black; name of part of the waterfalls

Boleyti: Name of a neighborhood beneath which Boleyti tunnel passes.

Bolheshir: the main axis in a mill used to rotate its propeller

Bozan: metal shaft, rotating pivot in a mill which transfers power to the millstone

Dahân-e Shahr: The entrance of Dahân-e Shahr tunnel opposite the town gate which is the cause of its denomination.

Chaltoki: rice paddy; name of a mill in waterfalls

Chapila: means alley; part of the waterfalls

Charkhâb: a wheel used for lifting up water and delivering it to surrounding lands

Dare zanu: women's valley; local name of one of Mizân dam intakes in which women used to swim

Dâriun: Derived from Darius or Dara, an Achaemenid king; name of a canal in Shushtar

Dastova: or Dashtabad, name of an ancient Arasid town in Shushtar

Daraje: water measuring degree; name of part of Mizân dam

Dare akhari: the last intake of Mizan dam

Dare molla: clergyman valley; local name of one of Mizan dam intakes

Dare liva: crazy valley; local name for one of Mizan dam intakes

Doberârun: two brothers; name of a mill in waterfalls

Dopolun: Meaning two bridges; a bridge with two intakes

Dopush: An intake in Mizan dam having two covers

Gargar: The name of another Karun river branch taken from wheels operating over this stream in order to bring its water up.

Ghabr: name of part of Mizan dam looking like a gravestone

Ghalâchitak: sand castle; name of part of the waterfalls where alluvial sands gather

Ghassâl: a place where the dead were ceremonially washed; name of part of Mizan dam

Ghur-Khâne: arsenal, a place in Salâsel castle

Hash o gir: connecting together; the connection spot

Hozi: water basin

Jendu: means the jinni; name of a mill in waterfalls

Kârun: a river flowing in Khuzestan

Kat: a hand-made underground irrigation canal; Kat means digging

Laghlaghun: means storks; a local name for part of the waterfalls

Lufa: or Loof meaning water wave; name of part of waterfalls

Luine: miller

Mâfarian: or Mah parian, Mah paragon (beautiful); a river north of Shushtar, another name for Shoteit

Maghzi: wooden shaft, is the main axis for power transfer in a mill to which the metal shaft and blades are connected

Masroghan: or Mashreghan; a stream flowing in the east, another name for Gargar Canal

Mâhi Bâzân: A place used for fishing

Mizan: The name of a Shushtar dam meaning balance or scale i.e., balancing water level Between two river branches.

Mino: meaning between water (o=water) or Minoo; name of a district in Shushtar

Miyânâb: meaning between water; certain fields south of Shushtar

Neir: or Nahr; tunnel with small cross-section having a width equal to a human body width and a height equal to an average man's one

Navâgheli: a room at the entrance of bridges used for collecting taxes and revenues

Obârûn: means rain water; name of a mill in waterfalls

Odelâzin: or Abdollâh zin, name of a neighborhood in Shushtar taken from the name of Emamzadeh Abdollah nearby

Paar: means the blade or propeller of a mill

Pakhshâb: a place in which water is distributed

Puzme: meaning snout; name of part of Mizân dam shaped like a curve

Raghat: name of a canal branched off Dâriun stream south of Shushtar, meaning dry land.

Ridasti: meaning on the hand; part of the waterfalls similar to a hand

Rou: the metal ball in a mill

Sâbât: Covered passage

Sâbe'in: Sâbe'in mandae, followers of John the prophet whose religion is related to water. Sâbe'in build their sanctuaries beside rivers. At present they have left Shushtar and live in Ahwaz.

Salâsel: Name of a castle in Shushtar derived from a person's name

Senere: a wooden rod having a groove in which Senrou is placed to adjust the mill

Senerou: a wooden rod for adjusting two millstones

Sâruj: a kind of mortar made by mixing gatch, lime and ash (water-proofed mortar)

Sekure: A tunnel having three intakes in its entrance which is the cause of denomination.

Sika: Meaning three of one; name of part of waterfalls

Sike gap: means great Sika; part of the waterfalls

Sisarâ: skylight, a vent for lighting Shavadun

Shabestân: A residential space in Shushtar homes built at a 4m depth underground.

Sharâbdâr: vineyard; name of a dam south of Shushtar

Shavadun: A residential space in Shushtar homes built lower than Shabestân at a 6m or

Shiv: meaning slope; sloped water mill

Shotor-khouss: a place for camels sleeping; an ancient hill in Shushtar

More depth underground having a constant temperature between 20-25 degrees.

Shoteit: Plural of shatt meaning river in Arabic; An important branch of Karun in Shushtar

Tanure: A hole having a rounded and perpendicular cylindrical shape inside the water mill structure in which water gathers.

Tir-kesh: a place for drawing or throwing an arrow

Tufdidi: (Tuf =water wave, did=smoke); name of a tunnel in the waterfalls; due to the hard impact of water of this tunnel on river surface, a smoke-like state is made.

Zâbetun: Plural of Zâbet meaning a government official and the ruler's agent for collecting taxes and revenues, also the name of a passage in waterfalls entrance

Zirkum: meaning under the precipice; part of the waterfalls

APPENDIX VI

**AGREEMENTS WITH LOCAL AUTHORITIES FOR
PROTECTION, CONSERVATION AND
MANAGEMENT OF SHHS**

There have been many letters and communication documents among the Base of Shushtar Historical Hydraulic System Office and many other offices for collaboration conservation of SHHS such as the following:

- Municipality of Shushtar
- Shushtar Water & Sewage Company
- Kârun Agro-industry Company
- Shushtar Road & Transportation office
- Shushtar Residence Foundation
- Shushtar governorship
- Shushtar Electricity Office
- Shushtar office for protection of environment
- NGOs

The Persian minutes of these agreement are as fallows:

<p>جمهوری اسلامی ایران وزارت کشور شهرداری شوشتر</p>	<p>شماره ۱۷۱۹۲/۵ تاریخ ۱۳۸۶/۶/۲۴ پوست</p>
<p>اداره محترم میراث فرهنگی صنایع دستی و گردشگری شوشتر</p>	
<p>باسلام بازگشت : به نامه شماره ۸۶/۱۲۲۲ مورخ ۸۶/۶/۱۲ در خصوص ضوابط و قوانین آثار و بناهای تاریخی شهر شوشتر به اطلاع میرساند ضوابط و قوانین این شهرداری در چهارچوب طرح جامع و طرح احیاء بافت کهن شوشتر می باشد. /ش</p>	
	<p>ورود دفتر میراث فرهنگی شوشتر شماره ۸۶ تاریخ ۱۳۸۶/۶/۲۴</p>

بسمه تعالی

تاریخ
شماره
پوست

اداره محترم آبفا شوشتر

باسلام

با توجه به مصوبات جلسه مورخ ۸۶/۵/۳ پیرامون مشکلات پیش رو جهت ثبت جهانی سازه های آبی تاریخی شهرستان شوشتر ، شایسته است ؛ اقدامات بایسته با قید فوریت بمنظور رفع مشکلات زیر صورت پذیرد و از نتیجه این فرمانداری را مطلع نمایند :

- ۱- رفع مشکل فاضلاب در حریم پل شادروان ضلع شمالی .
 - ۲- اختطاب به منازل واقع در ضلع شمالی بالای پل بند شادروان بمنظور جمع آوری لوله های تخلیه فاضلاب در حریم پل.
 - ۳- رفع مشکل عبور لوله های فاضلاب بر روی دیواره پل بند گرگر .
 - ۴- اختطاب به منازل مسکونی ضلع جنوبی آبشارها بمنظور جابجایی و تغییر مسیر تخلیه فاضلاب .
 - ۵- رفع مشکل لوله فاضلاب از زیر زمین و از وسط برج عیار .
 - ۶- رفع مشکل عبور فاضلاب شهری از زیر پل لشکر (تغییر مسیر) .
- نماینده اداره میراث فرهنگی ، صنایع دستی و گردشگری در خصوص شناسائی محل ها همکاری خواهند داشت ، /.

/الف/

زادگان
بهجا حضور استحضار

شماره ۱۳
۱۳۸۶

تلغری

سرپرست فرمانداری شهرستان شوشتر

۵۵۷۶

۱۳۸۶ / ۵ / ۱۱

رونوشت :

- اداره محترم میراث فرهنگی ، صنایع دستی و گردشگری شوشتر جهت اعزام نماینده .
- سازمان میراث فرهنگی ، صنایع دستی و گردشگری استان خوزستان جهت استحضار .
- آقای حسین نبی زاده نماینده ویژه فرماندار .

ورود دفتر میراث فرهنگی شوش

تاریخ ۱۳۸۶/۵/۱۱

شماره ۱۳۸۶/۱۱/۵۵

از سرپرست فرمانداری شهرستان شوشتر
موضوع: رفع مشکلات فاضلاب
تاریخ: ۱۳۸۶/۵/۱۱

کتاب محرم

بهرتالی



وزارت کشور
استاداری استان خوزستان
فرمانداری شهرستان شوشتر

شماره
تاریخ

تاریخ
شماره
پست

مدیریت محترم شرکت کشت و صنعت کارون شوشتر
باسلام

احتراماً ، ضمن آرزوی قبولی طاعات و عبادات جنابعالی ، جهت
پاکسازی برج عیار بمنظور رفع مشکل از موانع ثبت جهانی سازه های
آبی تاریخی شوشتر نیاز به دو دستگاه کمپرسی بصدت یک هفته
می باشد .

خواهشمند است دستور فرمائید در اختیار اداره میراث فرهنگی ،
صنایع دستی و گردشگری شوشتر قرار گیرد .

ک /



۷۱۴۱

۳۸۶ / ۷۱ - ۹

رونوشت :

اداره محترم میراث فرهنگی ، صنایع دستی و گردشگری شوشتر جهت

ورود بدو روزانه فرهنگی شوشتر

اطلاع و پیگیری -

تاریخ _____
 شماره _____
 بابت _____

بسمه تعالی

جمهوری اسلامی ایران
 وزارت کشور
 استانداری آذربایجان شرقی
 راهی شهرستان شوشتر

دورنگار فوری

اداره محترم راه و ترابری شهرستان شوشتر

باسلام

احتراماً، با توجه به مصوبه شورای اداری شهرستان شوشتر جهت
 رفع موانع ثبت جهانی سازه های آبی تاریخی شوشتر تعداد
 یکدستگاه لودر بمدت یک هفته در اختیار شهرداری شوشتر قرار

گیرد .

الف/

تذکره
 ۲۴-۷۳
 ۱۶/۱۹

تلفنی

سرپرست فرمانداری شهرستان شوشتر

۶۸۱۸

۱۳۸۶/۱۶/۲۶

رونوشت:

- شهرداری محترم شوشتر جهت اطلاع و پیگیری .
- اداره محترم میراث فرهنگی و گردشگری شوشتر جهت اطلاع و پیگیری و هماهنگی با شهرداری محترم .

وزارت کشور
 شماره _____
 تاریخ ۱۶/۱۹
 ۱۳۸۶/۱۶/۲۶

شهر شوشتر
 شماره _____
 تاریخ _____

جمهوری اسلامی ایران
وزارت کشور
استاندارداری استان خوزستان
فرمانداری شهرستان شوشتر

بسم تعالی

تاریخ: _____
شماره: _____
بسته: _____

دورنگار فوری

بنیاد مسکن محترم انقلاب اسلامی شهرستان شوشتر

باسلام

احتراماً ، با توجه به مصوبه شورای اداری شهرستان شوشتر جهت
رفع موانع ثبت جهانی سازه های آبی تاریخی شوشتر تعداد
دو دستگاه کمپرسی بمدت یک هفته در اختیار شهرداری شوشتر
قرار گیرد ./

الف/

۱۳۷۵
۲۹
۱۶۱
۲۶

تلفن

سرپرست فرمانداری شهرستان شوشتر

۲۸۱۹

۳۸۶ ۱۶۱ ۲۶

رونوشت:

- شهرداری محترم شوشتر جهت اطلاع و پیگیری .
- اداره محترم میراث فرهنگی و گردشگری شوشتر جهت اطلاع و پیگیری و هماهنگی با شهرداری محترم .

دورنگار فوری
۱۳۷۵
۲۹
۱۶۱
۲۶

جمهوری اسلامی ایران

وزارت کشور

شهردار شوشتر

شماره

تاریخ

پیوست

فرمانداری محترم شوشتر

باسلام و صلوات بر محمد و آل محمد

احتراماً: بازگشت بنامه شماره ۵۵۷۸-۸۶/۵/۱۱ به استحضار میرساند: که تعدادی از موارد ذکر شده در نامه مذکور در حد مقررات این شهرداری در حال پیگیری و اقدام بوده و مابقی آنها جهت انجام با عنایت به کمبود ماشین آلات این شهرداری نیاز به مساعدت لازم از طرف شرکتها و ادارات مربوطه به لحاظ تأمین یکدستگاه لودر - یکدستگاه بیل مکانیکی و چهار دستگاه کمپرسی به مدت (۱ماه) و بصورت شبانه روزی نیاز میباشد.

خواهشمند است در خصوص تأمین موارد خواسته شده اقدام لازم را معمول فرمائید، ضمن اینکه آقای محمد رضا بیطار بعنوان نماینده این شهرداری جهت پیگیری و اجرای موارد خواسته شده در نامه فوق الاشاره خدمتتان

معرفی میگردد.ج

۱۴۰۹۳/۵

۱۳۸۶/۵/۲۲

موسی مجتبائی
شهردار شوشتر
جیب استریشی

رونوشت: (۱) اطلاع به آقای بیطار
(۲) اطلاع به آقای بیطار
(۳) اطلاع به آقای بیطار
(۴) اطلاع به آقای بیطار
(۵) اطلاع به آقای بیطار
(۶) اطلاع به آقای بیطار
(۷) اطلاع به آقای بیطار
(۸) اطلاع به آقای بیطار
(۹) اطلاع به آقای بیطار
(۱۰) اطلاع به آقای بیطار

- ۱- اداره محترم میراث فرهنگی و گردشگری شوشتر جهت استحضار و همکاری لازم با آقای محمد رضا بیطار %
- ۲- اجرائیات جهت اطلاع و هماهنگی لازم با آقای بیطار %
- ۳- دبیر کمیسیون ماده (۱۰۰) شهرداریها جهت اطلاع و هماهنگی لازم با آقای بیطار %
- ۴- روابط عمومی شهرداری جهت اطلاع هماهنگی لازم با آقای بیطار %
- ۵- واحد خدمات شهری هماهنگی لازم با آقای بیطار %
- ۶- دفتر فنی شهرداری هماهنگی لازم با آقای بیطار %
- ۷- واحد دستگاه سنگین شهرداری جهت اطلاع و هماهنگی لازم با آقای بیطار %
- ۸- آقای محمد رضا بیطار جهت اطلاع و پیگیری در اجرای موارد خواسته شده در نامه فوق الذکر ضمیمه نامه فرمانداری %

روز سه شنبه
تاریخ ۱۳۸۶/۵/۲۲
شماره ۸۶/۵/۱۱

محمد خیرعلی

بسمه تعالی

جمهوری اسلامی ایران
وزارت کشور
سازمان میراث فرهنگی، صنایع دستی و گردشگری
اداره میراث فرهنگی شهرستان شوشتر

تاریخ: _____
شماره: _____
پیوست: _____

اداره محترم برق شهرستان شوشتر

باسلام

با توجه به مصوبات جلسه مورخ ۸۶/۵/۳ پیرامون مشکلات پیش رو جهت ثبت جهانی سازه های آبی تاریخی شهرستان شوشتر ، شایسته است ؛ اقدامات بایسته با قید فوریت بمنظور رفع مشکلات زیر صورت پذیرد و از نتیجه این فرمانداری را مطلع نمایند :

- ۱- برجیدن پایه های برق در حریم پل شادروان .
- ۲- جابجائی پایه های برق در جلوی ورودی آبشارها و مجموعه آبشارها .
- ۳- جمع آوری پایه های بتنی برق بر روی بند میزان .

د نماینده اداره میراث فرهنگی ، صنایع دستی و گردشگری در خصوص شناسائی محل ها همکاری خواهند داشت ، /.

/الف/

تلغری

سرپرست فرمانداری شهرستان شوشتر

۵۵۷۷
۱۳۸۶ / ۵ / ۱۱


رونوشت :

- ✓ - اداره محترم میراث فرهنگی ، صنایع دستی و گردشگری شوشتر جهت اطلاع و پیگیری و اعزام نماینده به اداره برق بمنظور راهنمایی محل ها .
- سازمان میراث فرهنگی ، صنایع دستی و گردشگری استان خوزستان جهت استحضار .
- آقای حسین نبی زاده نماینده ویژه فرماندار .


وزود بدفتر میراث فرهنگی شوشتر

شماره: _____ تاریخ: ۱۳۸۶/۵/۱۱
۱۳۸۶/۵/۱۱

د. محمد شوشتری

شماره ۱۲-۱۱۴۵ تاریخ ۱۴/۴/۸۶ پیوست	ریاست جمهوری سازمان حفاظت محیط زیست	
اداره کل حفاظت محیط زیست استان خوزستان اداره حفاظت محیط زیست شهرستان شوشتر		
<p>ریاست محترم میراث فرهنگی ، صنایع دستی و گردشگری شهرستان شوشتر با سلام احتراماً بازگشت بنامه شماره ۸۶/۱۱۹۰ مورخ ۸۶/۶/۱۲ در خصوص ثبت آثار و بناهای تاریخی شوشتر در محدوده پل شادروان تا بند میزان و ماهی بازان باستحضار میرساند این اداره در حال حاضر در مورد ثبت آثار فوق ضابطه خاص ندارد.</p>		
<p>ضمناً هرگونه احداث تأسیسات یا بناهای جدید مستلزم استعلام از این اداره و بررسی مسائل زیست محیطی آن میباشد//م</p>		
<p>علی بنی عجب رئیس اداره حفاظت محیط زیست شهرستان شوشتر</p>		
<p>وزیران و مسئولان میراث فرهنگی شوشتر شماره ۱۲/۱۱۴۵ تاریخ ۱۴/۴/۸۶ شوشتر - فرهنگ شهر ، بلوار کوی نیرو ، بالا تر از ثبت احوال ، صندوق پستی ۳۱۵ تلفن : ۶۲۳۴۳۴۰ نمایر : ۰۶۲۳۵۰۰۰ - ۰۶۱۲ علی محمدی</p>		

بسمه تعالی


 جمهوری اسلامی ایران
 وزارت کشور
 استانداری استان خوزستان
 فرمانداری شهرستان شوشتر

تاریخ: _____
 شماره: _____
 پروت: _____

جمعیت هلال احمر شهرستان شوشتر

باسلام

بمنظور ثبت جهانی سازه های آبی تاریخی شهرستان شوشتر با توجه به اعلام سازمان محترم میراث فرهنگی ، صنایع دستی و گردشگری استان خوزستان ، کانتی نر متعلق به آن جمعیت محترم در جلو کلاه فرنگی باید از آن محل جابجا و تغییر مکان داده شود ، شایسته است با توجه به اهمیت موضوع با قید فوریت اقدام بایسته بعمل آید و از نتیجه این فرمانداری را مطلع نمایند . (نماینده اداره محترم میراث فرهنگی ، صنایع دستی و گردشگری شوشتر در خصوص محل درست کانتی نر همکاری خواهند داشت) . /

/الف/

تلغری

سرپرست فرمانداری شهرستان شوشتر

۵۵۷۴
۱۳۸۶ / ۱۵ / ۱۱

رونوشت :

- اداره میراث فرهنگی ، صنایع دستی و گردشگری شوشتر جهت اقدام لازم . ✓
- سازمان میراث فرهنگی ، صنایع دستی و گردشگری استان خوزستان جهت استحضار .
- آقای حسین نبی زاده نماینده ویژه فرماندار .

زاده حسین نبی زاده
 نماینده ویژه فرماندار
 تاریخ: ۱۳/۵/۱۳۸۶
 ورود به دفتر میراث فرهنگی شوشتر
 شماره: ۱۶/۱۱/۵۱
 تاریخ: ۱۳/۵/۱۳۸۶
 زاده حسین نبی زاده
 نماینده ویژه فرماندار
 تاریخ: ۱۳/۵/۱۳۸۶
 ورود به دفتر میراث فرهنگی شوشتر
 شماره: ۱۶/۱۱/۵۱
 تاریخ: ۱۳/۵/۱۳۸۶

بسمه تعالی

شماره: ۸۶۱-۱-۸۱۱

پایگاه میراث فرهنگی

ریاست جمهوری

تاریخ: ۸۶/۹/۲۷

سازه های آبی تاریخی شوشتر

سازمان میراث فرهنگی و گردشگری

پیرساز:

بسمه تعالی

جناب آقای مهندس قلی نژاد
مدیر کل محترم حفظ و احیاء بافت‌های تاریخی کشور
با سلام و احترام

استحضار دارید که بازنگری طرح جامع و توسعه شوشتر توسط شرکت مهندسی مشاور طرح و تدوین و از سوی سازمان مسکن و شهرسازی استان در حال انجام است در این راستا بمنظور بررسی طرح تهیه شده جلسه ای در تاریخ ۸۶/۹/۲۵ برگزار شد که تصویری از پیش نویس صورتحجلسه مربوط بحضور ارسال می شود. لذا خواهشمند است موضوع در آن اداره کل نیز بررسی شده و در این خصوص اعلام نظر فرمائید.

محمدعلی ارسطو زاده
مدیر پایگاه میراث فرهنگی و گردشگری
بناهای آبی تاریخی شوشتر

نشانی: خورسرد - شوشتر - میدان آبنماها (گورگور) - پایگاه میراث فرهنگی سازه های آبی تاریخی

شوشتر آبنماها تلفن: ۰۶۱۲۶۲ - ۲۸۹۳۰ تلفنکس: ۰۶۱۲۶۲ - ۲۸۹۳۰

www.shushar.miras.gov.ir
E-mail: shushar_miras@iranpost.com

تصویب شد
تاریخ: ۸۶/۱۰/۱۰
مهر: [مهر سازمان میراث فرهنگی و گردشگری]
مهر: [مهر سازمان مسکن و شهرسازی]
مهر: [مهر سازمان اسناد و کتابخانه ملی]
مهر: [مهر سازمان ثبت اسناد و املاک]

APPENDIX

VII

**DOCUMENTATION OF NATIONAL
REGISTRATION OF PROPERTY**



جمهوری اسلامی ایران



بایگ ملی

نظریه بند "ج" از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب بهمن ۱۳۶۴ شمسی
نظریه بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب تیر ۱۳۶۷ شمسی
نظریه فصل اول قانون رابع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه احب الی آن
و بنا بر پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی بند سینان که مشخصات آن به قرار زیر است:

موقعیت جغرافیایی شهرستان شوشتر میدان ۱۷ شهریور انتهای خیابان بلوار

قدمت بنا

میزان

به شماره ۲۳۳۱ دفترست آثار ملی ثبت می گردد.

رئیس سازمان میراث فرهنگی کشور

سید محمد شریعتی

معاون پژوهشی
حبیب الله کشوری



جمهوری اسلامی ایران



بسمه تعالی

نظریه بند "ج" از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱۳۶۴ شمسی
 نظریه بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی
 نظریه فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه احب الی آن
 و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی برج کلاه سنگی که مشخصات آن به قرار زیر است:
 موقعیت جغرافیایی شهرت مشوشتر میدان ۱۷ شهیر انتهای خیابان بلوا
 قدمت تاریخ

میزات

به شماره ۲۶۱۱ در فهرست آثار ملی ثبت می گردد.

رئیس سازمان میراث فرهنگی کشور
 سید محمد بهشتی

معاون پژوهشی
 جمیل حسن



ریاست جمهوری
سازمان میراث فرهنگی و گردشگری

((بسمه تعالی))

در اجرای ماده ۱ از قانون تشکیل سازمان میراث فرهنگی و گردشگری و نظریه بند (ج) از ماده واحد قانون تشکیل سازمان میراث فرهنگی کشور، مصوب ۱۰ بهمن ۱۳۶۲ شمسی و بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور، مصوب ۲۸ تیر ۱۳۶۷ شمسی و فصل اول راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن و بنا به پیشنهاد مدیرکل دفتر ثبت میراث فرهنگی و طبیعی؛

اثر فرهنگی، تاریخی « نهر گرگر » که مشخصات آن به قرار زیر است :

موقعیت جغرافیایی : استان خوزستان - شهر شوشتر - استای بوار شرافت

قدمت : هخامنشی

به شماره ۱۷۵۹۹ در تاریخ ۱۳۸۵/۱۲/۰۶ «دفترت آثار ملی ثبت گردید». رک

فریبرز دولت آبادی

معاون حفظ و احیاء آثار تاریخی

حسینعلی ویگل

مدیرکل دفتر ثبت آثار تاریخی، فرهنگی و طبیعی



جمهوری اسلامی ایران



بسمه تعالی

نظریه بند "ج" از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب بهمن ۱۳۶۴ شمسی
نظریه بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۱۸ تیر ۱۳۶۷ شمسی
نظریه فصل اول قانون راجع به خط آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن
و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی، پل بند گرگر که مشخصات آن بقرار زیر است:

موقعیت جغرافیایی شوستر خیابان شیرینی مجموعه آبشارها

قدت ساسانی

میزات

به شماره ۲۹۱۴ در فهرست آثار ملی ثبت می گردد.

رئیس سازمان میراث فرهنگی کشور
سید محمد بهشتی

معاون پژوهشی
جلیل گلشن



جمهوری اسلامی ایران



باب سه تنگ

نظر به بند ج "از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب بهمن ۱۳۶۴ شمسی
نظر به بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی
نظر به فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن
و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور .

اثر فرهنگی، تاریخی و محبت‌آمیزی آثار تاریخی شهر که شخصیات آن بقرار زیر است:
موقعیت جغرافیایی شهرستان شوشتر

قدیمت دورپایه

مميزات

به شماره ۲۱۸۰ دفترست آثار ملی ثبت می کردد .

رئیس سازمان میراث فرهنگی کشور

سید محمد بهشتی

معاون پژوهشی

حبیب‌الله گشن



جمهوری اسلامی ایران



بایگستان

نظر بند ساج ۴۰ از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱۳۶۴ شمسی
 نظر بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۱۳۶۷ شمسی
 نظر فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن
 و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی اثر تاریخی بند بروج عیار که مشخصات آن به قرار زیر است:
 موقعیت جغرافیایی شهرتان شوشتر روبروی کتارگاه رود گرج جنوب شوشتر
 قدمت تاریخی

میزات

به شماره ۲۹۴۰ دفترست آثار ملی ثبت می گردد.

رئیس سازمان میراث فرهنگی کشور

سید محمد بهشتی

معاون پژوهشی

حسین گلشن



باسمه تعالی

نظر به بند «ج» از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱۰ بهمن ۱۳۶۴ شمسی و بند ششم از ماده نهم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی و فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی، پل خدا آفسرین که مشخصات آن به قرار زیر است:

موقعیت جغرافیایی: شهرستان شوشتر جنوب غرب شهر قدیمی دستوا - کناره غربی رود گرگر

قدمت: اسلامی

مميزات

به شماره ۴۲۰۷ در تاریخ ۱۳۸۰/۹/۵ در فهرست آثار ملی ثبت گردید.

رئیس سازمان میراث فرهنگی کشور

سید محمدحسینی

معاون پژوهشی

جلیل کاشن



دولت شاهنامه ایران

وزارت فرهنگ و هنر

اداره کل حفاظت آثار باستانی و بناهای تاریخی

نظر فصل اول قانون عتیقات مصوبه ۱۲ آبان ۱۳۰۹ خورشیدی
نظر فصل اول آئین نامه اجرای قانون عتیقات مصوبه ۲۸ آبان ۱۳۱۱ خورشیدی
نظر پیشنهاد مدیرکل حفاظت آثار باستانی و بناهای تاریخی

وزیر فرهنگ و هنر مقرر میدارد:

محل باستانی - قوس ساسانی

کوشکات آن بفرار زیارت

بوقیمت جزایانی در آخرین قطعه کنونی در جنوب شرقی

تاریخ قدمت در دلیل سبب گنجی برزی شده

میزرت -

ملاحظات ساخت آنرا به بنا پرورد اول نسبت داده

جزوات تاریخی به ثبت برسد

به شماره ۳۱۱۳

تاریخ ثبت ۵۶۸۰

مدیرکل حفاظت آثار باستانی و بناهای تاریخی

وزیر فرهنگ و هنر



جمهوری اسلامی ایران



بایسته‌خانه

نظریه بند «ج» از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب بهمن ۱۳۶۴ شمسی
 نظریه بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب تیر ۱۳۶۷ شمسی
 نظریه فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن
 و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی، محسوس و نامرئی که مشخصات آن بقرار زیر است:

موقعیت جغرافیایی شهرستان شوشتر غرب شهر ضلع شمالی قلعه سلال

قدمت تاریخی

میزان

به شماره ۳۰۸۳ در فهرست آثار ملی ثبت می‌گردد.

رئیس سازمان میراث فرهنگی کشور

سید محمد بهشتی

معاون پژوهشی

جیل گلشن

۲۰۰-ل



نمبر ۱۷۹۳ / ۵۲۴۵۶

دولت شاهنشاهی ایران

وزارت معارف و اوقاف و صنایع مستظرفه

نظر به فصل اول قانون عتیقات مصوبه ۱۲ آبان ۱۳۰۹ شمسی

نظر به فصل اول نظامنامه اجرای قانون عتیقات مصوبه ۲۸ آبان ۱۳۱۱ شمسی

نظر به پیشنهاد مدیر کل عتیقات

وزیر معارف مقرر میدارد:

که مشخصات آن بقرار ذیل است:

که محل معلوم و بنام **مدرسه** بنام **مدرسه**

تاریخ بنا در عهد ساسانیان و در زمان شاهپور دوم ساخته شده است

معیارات بنا

ملاحظات

جزو آثار ملی به ثبت برسد

تحت شماره ۷۸

تاریخ ثبت پانزدهم دی ماه ۱۳۱۰

تاریخ ۳۰ دی ماه ۱۳۱۳

وزیر معارف



مدیر کل عتیقات

[Handwritten signature]



جمهوری اسلامی ایران



وزارت منابع
آب و برق

باسمه تعالی

نظر به بند «ج» از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱۰ بهمن ۱۳۶۴ شمسی و بند ششم
از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی فصل اول قانون
رابع به خط آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرایی آن و بنا به پیشنهاد معاون پژوهشی
سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی «محوطه بند خاک شوشتر» که مشخصات آن بقرار زیر است:
موقعیت جغرافیایی: استان خوزستان، بوشر، مجاور خیابان مکرندی ضلع شمال غربی امامزاده عبدالله

قدمت: ساسانی

میزات

به شماره ۱۰۸۷۴ در تاریخ ۲/۱۱/۱۳۸۲ در فهرست آثار ملی ثبت گردید.

سید محمدتقی
رئیس سازمان میراث فرهنگی کشور

حلیل گلشن
معاون پژوهشی



جمهوری اسلامی ایران



با هم ستان

نظریه بند "ج" از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب بهمن ۱۳۶۴ شمسی
نظریه بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب تیر ۱۳۶۷ شمسی
نظریه فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه حسب لایحه آن
و بنا بر پیشنهاد و معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی پل بند لنگر که شخصات آن بقرار زیر است:
موقعیت جغرافیایی جنوب شهرستان شوشتر و اما فراده عبدالشاه بر روی شعبه شرقی نهر داریون
قدمت ساسانی (اسلامی)

میزات

به شماره ۲۳۵۹ دفترست آثار ملی ثبت می گردد.

رئیس سازمان میراث فرهنگی کشور

سید محمد بهشتی

معاون پژوهشی

جیل گلشن



باسمه تعالی

نظر به بند «ج» از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱۰ بهمن ۱۳۶۴ شمسی و بند ششم از ماده سوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۲ آبان ۱۳۰۹ شمسی و نظام نامه اجرایی آن و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی، تاریخی «پل شاه علی» که مشخصات آن به قرار زیر است:

موقعیت جغرافیایی: استان خوزستان، شهرستان شوشتر، جاده شوشتر به ابواب جنب پل ملت

قدمت: صغوی

میزات

به شماره ۷۹۳۸ در تاریخ ۱۳۸۱/۱۲/۱۷ در فهرست آثار ملی ثبت گردید.

سید مجتبیٰ
رئیس سازمان میراث فرهنگی کشور

حلیل گلشن
معاون پژوهشی



باسمه تعالی

نظر به بند «ج» از ماده واحده قانون تشکیل سازمان میراث فرهنگی کشور مصوب ۱ بهمن ۱۳۶۴ شمسی و بند ششم از ماده دوم قانون اساسنامه سازمان میراث فرهنگی کشور مصوب ۲۸ تیر ۱۳۶۷ شمسی و فصل اول قانون راجع به حفظ آثار ملی مصوب ۱۳ آبان ۱۳۰۹ شمسی و نظام نامه اجرائی آن و بنا به پیشنهاد معاون پژوهشی سازمان میراث فرهنگی کشور.

اثر فرهنگی تاریخی بند شرا ابدار که مشخصات آن به قرار زیر است:

موقعیت جغرافیایی: شهرستان شوشبرخیز مرکزی - دبستان میان آب - روی نهر داریون و شمال بیخ غرم

قدمت: اسلامی

مميزات

به شماره ۴۲۱۸ در تاریخ ۵/۹/۱۳۸۰ در فهرست آثار ملی ثبت گردید.

رئیس سازمان میراث فرهنگی کشور

سید محمد بهشتی

معاون پژوهشی

حلیل کاشن

APPENDIX

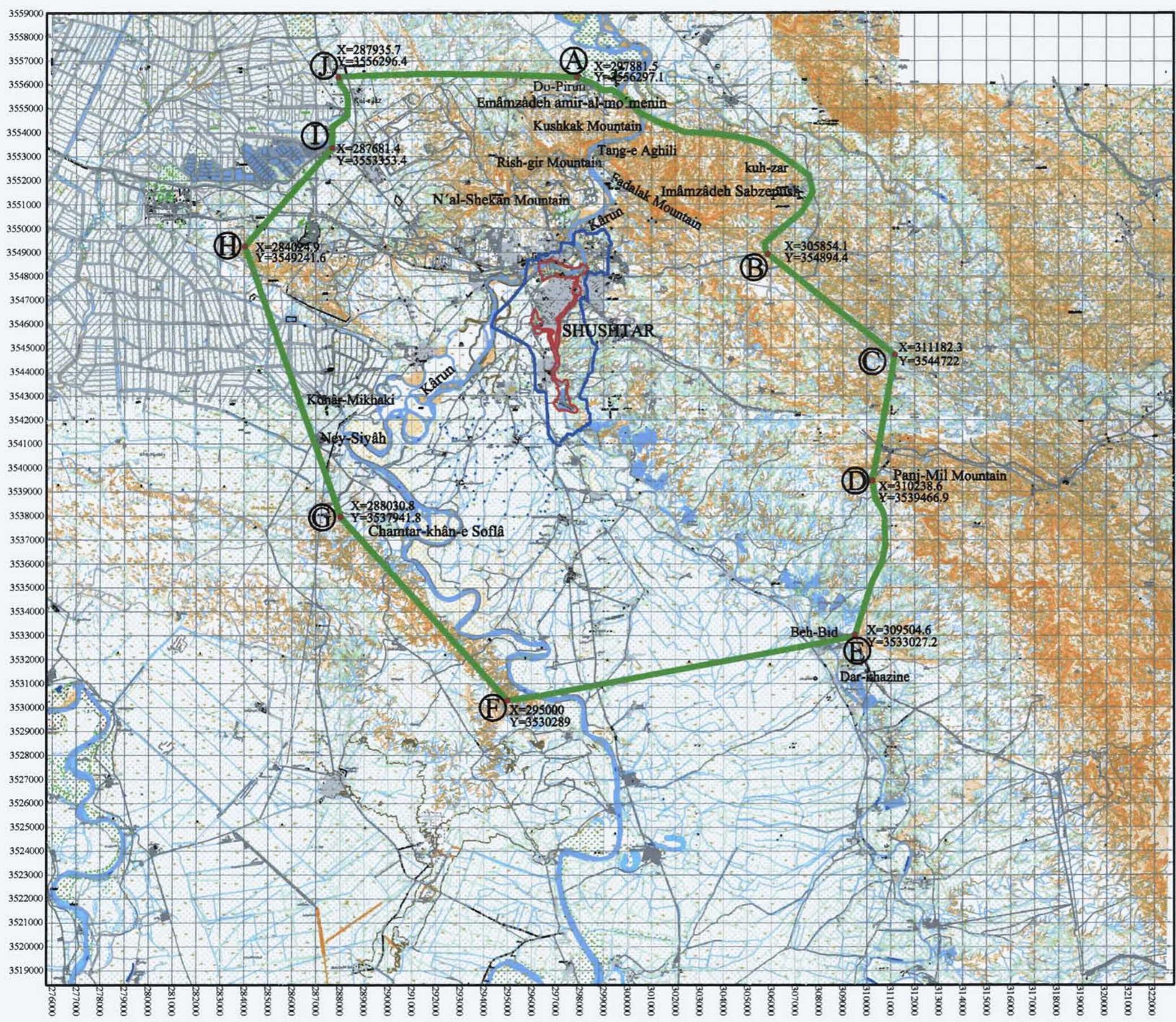
VIII

**A3 SIZE MAP OF THE NOMINATED
PROPERTY,
SHOWING BOUNDARIES AND BUFFER ZONE**

SHUSHTAR HISTORICAL HYDRAULIC SYSTEM

SHUSHTAR (Map-I)

Landscape, Core & Buffer zones



- LANDSCAPE ZONE REGULATIONS:
 1-According to the regulations of the Landscape zone, any program, project or intervention which can somehow change the natural, environmental, historical or cultural status of the Landscape (especially macro scale development projects ,e.g., construction of bridges, roads and highways, new town or high-rises as well as infrastructural facilities, power transfer plans, etc) must be approved by ICHHTO at all stages of planning and implementation.
 2-Construction of any macro scale industry establishments which may pollute the environment including: soil, water, air , vegetation, etc. as well as projects witch significantly change the landscape, are forbidden.

Geographical coordinates	UTM	
	X	Y
A	297881.5	3556297.1
B	305854.1	354894.4
C	311182.3	3544722
D	310238.6	3539466.9
E	309504.6	3533027.2
F	295000	3530289
G	288030.8	3537941.8
H	284024.9	3549241.6
I	287681.4	3553353.4
J	287935.7	3556296.4

LEGEND

- Core Zone —
- Buffer Zone —
- Landscape Zone —

Shushtar Historical Hydraulic System Base (SHHS; ICHHTO)



SHUSHTAR (Map-II)

-GENERAL REGULATIONS:

All individuals or legal bodies, whether governmental, or non-governmental, are obliged to inform ICHHTO and acquire its prior agreement regarding any program, project or intervention which can somehow change the natural, environmental, historical and cultural status of the entire area within the protected zones of SHHS, especially in the following cases: macro-scale developmental projects (construction of bridges, roads and highways, building new townships or high-rises as well as infrastructural facilities, power transfer plans, etc) including construction of dams and irrigation networks in the entire Kârun River which can significantly change the natural river bed, its output and water balance.

-CORE ZONE REGULATIONS

- 1-Any new construction work in the core zone is prohibited.
- 2-Any action in the core zone to identify, conserve or present any historical properties, develop green space and tourist facilities, provide urban services or buildings develop as well as to equip, restore, rehabilitate or reuse historical properties or to install advertisements is subject to the approval of ICHHTO.
- 3-Vegetation and natural landscape of the core zone must be protected and conserved in its present form.
- 4-Actions potentially or actually endangering the function, structure or visual integrity of any historical property are strictly forbidden in the core zone both in short and long terms.
- 5-All unharmonious structures present in the core zone must be removed. All the elements not compatible with the natural-historical identity of Shushtar Historical Hydraulic System must be managed based on the approval of the ICHHTO.

-BUFFER ZONE:

The buffer zone of Shushtar Historical Hydraulic System (SHHS) comprises of two types: the built up areas and agricultural areas. Different sets of regulations apply in these two different areas as follows:

I: BUILT-UP AREAS

- 1-Actions potentially or actually endangering the function, structure or visual integrity of Shushtar Historical Hydraulic System are prohibited.
- 2-Any action adversely affecting environment of health is forbidden, Such actions include: the dumping garbage, disposal of surface water carrying chemical agents or other hazardous materials into the historical sites or river.
- 3-All the elements not compatible with the natural-historical identity of Shushtar Historical Hydraulic System must be managed based on the approved plan of the ICHHTO.
- 4-Any developmental or constractural activity or management plan, tourist services develop, making or developing urban or regional facilities, restoration, rehabilitation, urban development, renovation or reconstruction of buildings, development and generation of green spaces, repairing or changing the function of part or whole of buildings are only permitted with the approval of ICHHTO.
- 5-Any excavation is only permitted with the approval of the organization.
- 6-All historical monuments should be restored and conserved under ICHHTO supervision.
- 7-Any kind of intervention activities in historical monuments and all places that have a view of the SHHS, must be carried out base on the approval of ICHHTO.
- 8-Maximum allowable height of building in all places that have a view of SHHS, is two floors or 7.5m above the level of adjacent passageway and other buildings are included in ICHHTO approved regulations related to Shushtar Historical Town.

II: AGRICULTURAL AREAS

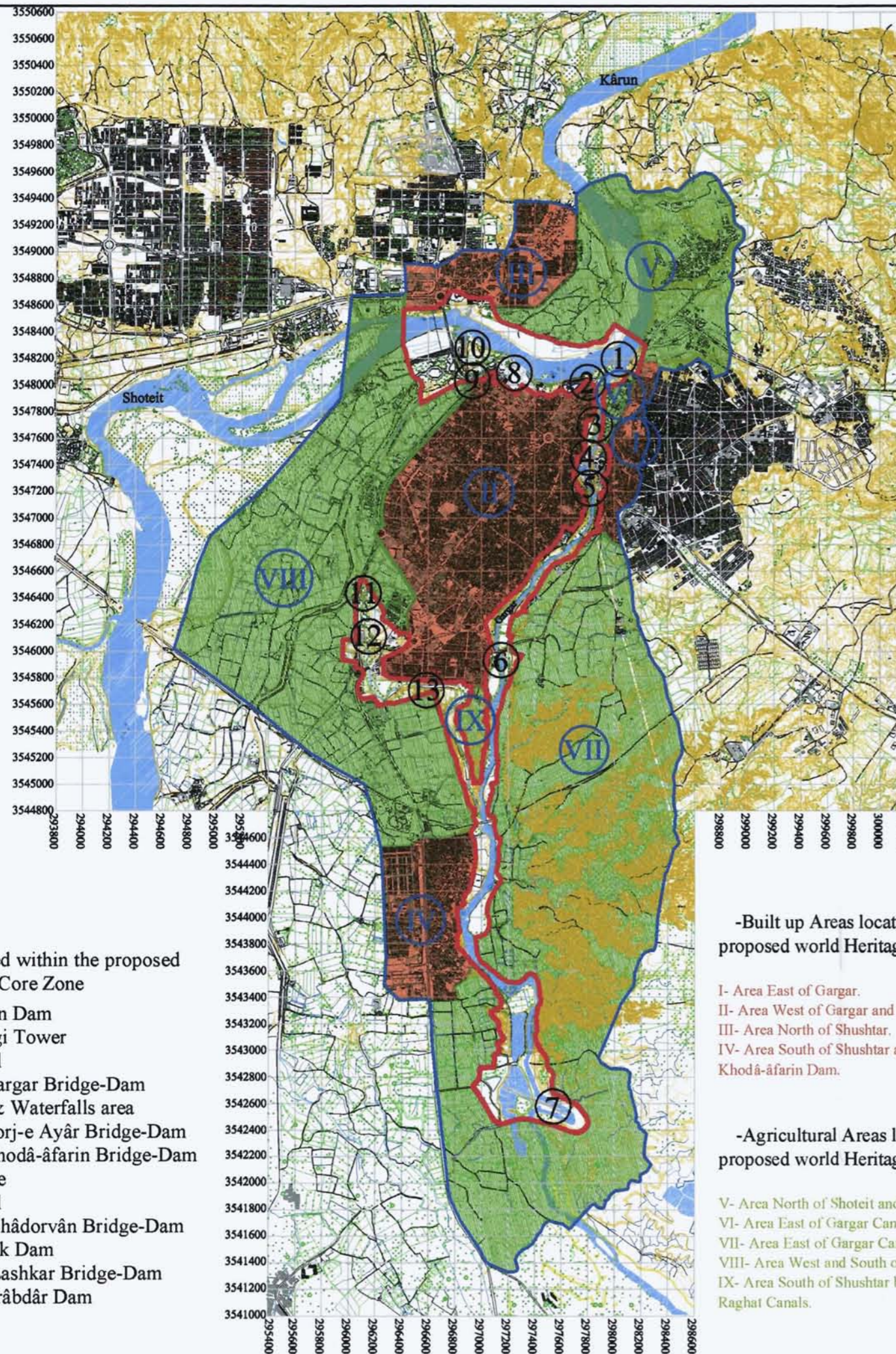
- 1-Actions potentially or actually endangering the function, structure or visual integrity of Shushtar Historical Hydraulic System are prohibited.
- 2-Any action adversely affecting environmental health is forbidden, such actions include: dumping garbage, disposal of surface water carrying chemical agents, or other hazardous materials into the historical sites or river
- 3-Any excavation is only permitted after confirmation of ICHHTO.
- 4-The only allowable utilizations in this area are agriculture and animal husbandry.
- 5-Any construction work in the area must only aim to procure the needs of farming or animal husbandry with the approval of the organization provided that building area does not surpass 10% of the property area (or 70 square meters) and its height is not more than 4.5m or one floor.

Core Zone
Buffer Zone

Area 1: Built-up areas
Area 2: Agricultural areas

0 200 500 1000 1500 2000m

NO: Map-II



-Built up Areas located within the proposed world Heritage Buffer zone:

- I- Area East of Gargar.
- II- Area West of Gargar and South of Shoteit.
- III- Area North of Shushtar.
- IV- Area South of Shushtar and Northwest of Khodâ-âfarin Dam.

-Agricultural Areas located within the proposed world Heritage Buffer zone:

- V- Area North of Shoteit and Shushtar town.
- VI- Area East of Gargar Canal.
- VII- Area East of Gargar Canal and South of Shushtar.
- VIII- Area West and South of Shushtar.
- IX- Area South of Shushtar between Gargar and Raghat Canals.

Properties located within the proposed World Heritage Core Zone

- ① .Band-e Mizân Dam
- ② .Kolâh-farangi Tower
- ③ .Gargar Canal
- ④ .Polband-e Gargar Bridge-Dam
- ⑤ .Watermills & Waterfalls area
- ⑥ .Polband-e Borj-e Ayâr Bridge-Dam
- ⑦ .Polband-e Khodâ-âfarin Bridge-Dam
- ⑧ .Salâsel Castle
- ⑨ .Dâriun Canal
- ⑩ .Polband-e Shâdorvân Bridge-Dam
- ⑪ .Band-e Khâk Dam
- ⑫ .Polband-e Lashkar Bridge-Dam
- ⑬ .Band-e Sharâbdâr Dam

APPENDIX

IX

**IMAGE INVENTORY AND PHOTOGRAPH
AND
AUDIOVISUAL AUTHORIZATION FORM**

Id. No	Format	Caption	Date of Photo	Photographer /Director of the video	Copyright owner	Contact details of copyright owner	Non exclusive cession of rights
1	photo	The location of the city of Shushtar in Iran	-	-	Google Website	-	-
2	photo	Shushtar Historical hydraulic System, General landscape	-	-	Google Website	-	-
3	photo	The location of Shushtar and of the Kârun river with its branches	-	-	Google Website	-	-
4		The ancient Dams locations in southern plain of Kor River			Google Website		
5	photo	Air view of Shushtar			ICHHTO	-	-
6	photo	Air view of Band-e Mizân	-	-	ICHHTO	-	-
7	photo	View of the northern section of Band-e Mizân	-	-	ICHHTO	-	-
8	photo	View of the southern outlets of Band-e Mizân	-	-	ICHHTO	ICHHTO	-
9	photo	View of the western outlets	-	-	ICHHTO	ICHHTO	-
10	photo	An ancient harbor point on the western side	-	-	ICHHTO	ICHHTO	-
11	photo	View of Band-e Mizân dam	-	-	ICHHTO	ICHHTO	-
12	photo	Kolâh-Farangi Tower	-	-	ICHHTO	ICHHTO	-
13	photo	Air view of the Gargar in Shushtar	-	-	ICHHTO	ICHHTO	-
14	photo	Gardens on the bank of the Gargar canal	-	-	ICHHTO	ICHHTO	-
15	photo	The Dam on the Gargar in 1935	-	-	ICHHTO	ICHHTO	-
16	photo	The Dam on the Gargar as it is today	-	-	ICHHTO	ICHHTO	-
17	photo	Ground view of the Dam on the Gargar	-	-	ICHHTO	ICHHTO	-
18	photo	Waterfalls in the 1880s (Dieulafova)	-	-	ICHHTO	ICHHTO	-
19	photo	The Waterfalls in 1980	-	-	ICHHTO	ICHHTO	-
20	photo	The Waterfalls area today	-	-	ICHHTO	ICHHTO	-
21	photo	Aerial photo of the tunnels built inside Gargar Bridge-dam	-	-	ICHHTO	ICHHTO	-
23	photo	Northern part of the waterfalls area	-	-	ICHHTO	ICHHTO	-
24	photo	Hydro power station	-	-	ICHHTO	ICHHTO	-
25	photo	The entrance Sâbât	-	-	ICHHTO	ICHHTO	-
26	photo	View from the inside the sâbât	-	-	ICHHTO	ICHHTO	-
27	photo	View from the eastern side of the Waterfalls	-	-	ICHHTO	ICHHTO	-
28	photo	View of the Waterfalls	-	-	ICHHTO	ICHHTO	-
29	photo	View of the western ramp of area	-	-	ICHHTO	ICHHTO	-
30	photo	The châhâr-tâqi	-	-	ICHHTO	ICHHTO	-
31	photo	Dopolun	-	-	ICHHTO	ICHHTO	-
32	photo	One of the openings of the Boleyti tunnel	-	-	ICHHTO	ICHHTO	-
33	photo	The entrance of the Boleyti tunnel from Band-e Gargar	-	-	ICHHTO	ICHHTO	-
34	photo	Inside the Boleyti tunnel	-	-	ICHHTO	ICHHTO	-

35	photo	Dahân-e-Shahr tunnel behind Band-e Gargar	-	-	ICHHTO	ICHHTO	-
36	photo	Openings of Dahân-e-Shahr tunnel in the waterfalls area	-	-	ICHHTO	ICHHTO	-
37	photo	The entrance of the Se-Kureh Tunnel	-	-	ICHHTO	ICHHTO	-
38	photo	Opening of the Se-Kureh tunnel in the Waterfalls area	-	-	ICHHTO	ICHHTO	-
39	photo	The watermill stone	-	-	ICHHTO	ICHHTO	-
40	photo	View of a watermill building	-	-	ICHHTO	ICHHTO	-
41	photo	View from the interior of a watermill structure	-	-	ICHHTO	ICHHTO	-
42	photo	Views from the interior of a watermill structure	-	-	ICHHTO	ICHHTO	-
43	photo	Plan of one of the watermills	-	-	ICHHTO	ICHHTO	-
44	photo	Inside of Sika	-	-	ICHHTO	ICHHTO	-
45	photo	SIKA entrance steps	-	-	ICHHTO	ICHHTO	-
46	photo	View of water flowing out of Sika	-	-	ICHHTO	ICHHTO	-
47	photo	Air view of the Borj-e Ayâr area	-	-	ICHHTO	ICHHTO	-
48	photo	A section of the Borj-e Ayâr Dam	-	-	ICHHTO	ICHHTO	-
49	photo	Sections of the Sâbe'in sanctuary	-	-	ICHHTO	ICHHTO	-
50	photo	Sections of the Sâbe'in sanctuary	-	-	ICHHTO	ICHHTO	-
51	photo	Air view of the Mâhi-bâzân Dam in 1935	-	-	ICHHTO	ICHHTO	-
52	photo	Views of Mâhi-bâzân Bridge-Dam	-	-	ICHHTO	ICHHTO	-
53	photo	Views of Mâhi-bâzân Bridge-Dam	-	-	ICHHTO	ICHHTO	-
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