Irrigated Landscapes beyond Political Dynamics:

Long Term Water Management Strategies on the Miyānāb Plain of Khuzistan (Iran)

by

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DEDICATION

To Emad, by whose side I have lived an unending dream of love and Joy

&

To mom, whose eternal love shines my way from near and afar

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ABSTRACT

Past archaeological research in the fluvial landscapes of southern Iraq and southwestern Iran has suggested that the increasing consolidation of power under centralized territorial states set the stage for a remarkable expansion of irrigation infrastructure. The subject of Sasanian irrigation has been pivotal in this argument. Archaeologists have argued that the centralized power and bureaucratic apparatus of the Sasanian empire enabled the expansion of waterworks and intensification of irrigation agriculture on an unprecedented scale. After the Islamic conquest, the extensive Sasanian systems collapsed or declined, further confirming that the centralized power of states and empires enabled the construction and operation of the large-scale canal systems. A similar trajectory has been postulated for the irrigation history on the Miyanab: construction of a monumental canal system, the Gargar and associated headworks, under the patronage of the Sasanian state and an eventual collapse of irrigation after the conquest.

The Miyānāb is the agricultural hinterland of the historic town of Shushtar, a city famous for its ancient waterworks, which were inscribed as a World Heritage site in 2009. Nevertheless, little is known about the construction date, subsequent developments, and in some cases, even the function of these monuments. This dissertation presents a long term perspective on the history of settlement and irrigation on the plain. Insights from archaeology, texts, and remote sensing were combined in order to assess the impact of various factors contributing to changes in the irrigated landscape, particularly, political dynamics. Some of the main results are summarized below.

This study demonstrates the strong continuity in irrigation strategies and practices on the Miyanab. Canal systems seem to have been developed gradually in the course of increasingly more

complex actions of humans in channel straightening and expansion, building on the natural hydrology of an alluvial fan. Investment in canal system expansion appears to pre-date the Sasanian period. Sasanian irrigation projects were probably focused on the re-engineering of the historical canal head at Shushtar. This study demonstrates that imperial investments may not necessarily result in the structural transformation of the landscape. They may instead work to enhance the durability and increase the capacity of already existing infrastructure.

A main conclusion of this research is that the impact of the fall of Sasanian state on irrigation agriculture in the region may have been less pronounced than previously thought. Irrigation agriculture in the Miyanab does not seem to have changed notably in the Early Islamic period. In addition, the establishment of a new administrative province, ‘Askar Mukram, after the Islamic conquest points to new or increased agricultural investment in the buffer zone between the two pre-Islamic cities of Shushtar and Ahwaz. The strong continuity in irrigation and settlement patterns on the plain throughout the historical periods undermines the idea that central governments were directly involved in the management of irrigation. It is more likely that community participation around the economic and socio-political power of elites played a fundamental role in the construction and maintenance of irrigation infrastructure.

The present research makes a significant methodological contribution to the study of relict canal systems. It demonstrates that the relative dating of canal evolution is possible based on the internal analysis of the system and does not need to be tied to settlement pattern data. In addition, detailed mapping and comprehensive study of canal systems can yield new information about the “features” of a system and the “functions” they perform. For example, it is argued that the Gargar canal did not play a role in the irrigation of the Miyānāb, as has been widely-assumed. Its purpose

for the plain must be sought in other reasons, including flood control as well as industrial production and possibly waterborne transportation. In addition, this study highlights the complexity of human-water relationship in shaping fluvial landscapes. A wide range of human activities and natural processes seem to have worked in tandem in the formation of the Gargar canal that has been frequently considered the result of a short-term, planned project.

Finally, this research contributes to a demonstration of the limits of universal explanations. Until recently, the model of expansion and decline based on research in lower Mesopotamia had been considered applicable to the core areas of Near Eastern empires in Iraq and southwestern Iran. The trajectory of the Miyanab diverges from the widely-accepted rhetoric of Sasanian imperial expansion and post-conquest decline. Similar micro studies in other regions are needed in order to illuminate whether the trajectory proposed for the Miyanab is an exception or whether it represents a pattern that was more widespread.

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LIST OF ABBREVIATIONS

ICAR	Iranian Center for Archaeological Research
ICHHTO	Iran Cultural Heritage, Handicraft and Tourism Organization
KWPA	Khuzistan Water and Power Authority
MIDP	Miyanab Irrigation and Drainage Project

ABBREVIATION OF HISTORICAL SOURCES

Bal Fut	al-Balāḏurī. *Kitāb Futūḥ al-Buldān*
Baṭ	Ibn Baṭṭūṭa. *Riḥla*.
Dim	Ad-Dimašqī. *Nuḫbat Ad-Dahr*.
Dīn	ad-Dīnwarī. *Aḫbār aṭ-Ṭiwāl*.
Dlf	Abū Dulaf. *Abu Dulaf Travels in Iran (ar-Risāla)*.
Faq A	Ibn al-Faqīh. *Kitāb Al-Buldān (Abridgment)*
Faq M	Ibn al-Faqīh. *Het Boek van de Geschiedenis Der Landen*.
Far	Ibn Balḫī. *Farsnāmā*.
Fid	Abū l-Fidā'. *Géographie d'Aboulféda*.
Ḫal	Ḫalīfa b. Ḫayyāt. *Tārīḫ Ḫalīfa B. Ḫayyāt*.
Ḥaw	Ibn Ḥawqal. *Kitāb Ṣūrat al-Arḍ*.
Ḥmz	Ḥamzah al-Iṣfahānī. *Tarīḫ Sinī Mulūk al-Arḍ Wa-l-Anbiyā'*
Ḥud	*Ḥudūd Al-'Ālam*
Ḫur	Ibn Ḫurradaḏbih. *Kitāb al-Masālik Wa al-Mamālik*.
Idr Nzh	al-Idrīsī. *Nuzhat Al-Muštāq Fi-ḫtirāq Al-āfāq*.
Iṣṭ	al-Iṣṭaḫrī. *Kitāb al-Masālik Wa al-Mamālik*
Juġ	Ḥāfiẓ Abrū. *Juġrāfiyā-yi Ḥāfiẓ Abrū*.

Msk	Miskawaih. *Tajārib al-Umam*
Muq	al-Muqaddasi. *Ahsan al-Taqāsim fi Ma'rifat al-Aqālim*.
Mur	al-Mas'ūdi. *Murūj aḏ-ḏahab*.
Naj	Najm al-Mulk, 'Abd al-Ġaffar. *Safarnāmah-yi Khuzistan*.
Nuz D	Ḥamd Allāh Mustawfī. *Nuzhat-al-Qulūb*.
Nuz S	Ḥamd Allāh Mustawfī. *The Geographical Part of the Nuzhat-Al-Qulūb*.
Rus	Ibn Rusta. *Kitāb Al-A'lāk an-Nafīsa*
Sm'	as-Sam'ānī. *Kitāb al-Ansāb*
Suh	Ibn Sarābiyūn. *Das Kitāb 'Aǧā'ib al-Aḳālīm as-Sab'a*
Ṭab	aṭ-Ṭabarī. *Annales*
Taz	Abd Allāh ibn Nūr al-Dīn Shūshtarī. *Tazkirah-i Šūštar*.
Tuḥ	Mīr 'Abd al-Laṭīf Ḫān Šūštarī. *Tuḥfat al-'Ālam*.
Ya' Bld	al-Ya'qūbī. *Kitāb Al-Boldan*
Ya' Trḫ	al-Ya'qūbī. *Tārīḫ Al-Ya'qūbī*.
Yāq	Yāqūt al-Ḥamawī. *Mu'jam Al-Buldān*.
Ẓaf	Šaraf al-Dīn 'Alī Yazdī. *Ẓafarnāmah*.

NOTE ON TRANSLITERATION

Historical names, people and places, have been transliterated according to Hans Wehr system. For letter *jīm*, 'j' is used instead of 'ğ'. Proper names of modern people and places have not been transliterated. Their spelling follows the most common English spelling used in Iran, in order to make it easier for the reader to relate to the material presented here to the other sources of information, including maps, literature, web pages etc.

Kasra has been always transliterated as 'i', both for Persian and Arabic names. However, in the case of Persian words ending in silent *hā*' (h), *kasra* is transliterated as 'e' (i.e. eh) in order to make the distinction with the Arabic pronunciation+.

Chapter 1
Introduction

1.1. The Miyānāb Plain

This study investigates the long term dynamics of irrigation and settlement on the Miyānāb[1] plain, in Khuzistan province, Iran. The goal is to understand aspects of continuity and rupture in irrigation and land use, and to assess the impact of political dynamics, in particularly the rise and fall of the Sasanian Empire on the irrigated landscape. In addition, this study seeks to explore new interdisciplinary methods for the study of irrigation history, specifically in archaeological landscapes severely damaged by development.

Miyanab is a fertile alluvial plain, located at the far eastern edge of Susiana (Map 1.1). It is situated on the left bank of the Karun, immediately after the river exits the Zagros. The eastern boundary of the Miyanab is defined by a large canal, the Gargar. The historic town of Shushtar is positioned in the northernmost area of the plain, at the bifurcation of the Karun and the Gargar. The city has been continuously inhabited since at least the fourth century CE and its establishment might date to an even earlier time.[2] The Miyanab is a fertile plain and constitutes the most important area of the agricultural hinterland of Shushtar. The city is famous worldwide for its ancient waterworks, including canals, weirs, dams, bridges, subterranean tunnels, and watermills, which were inscribed as a World Heritage site in 2009 (Fig. 1.2).[3] Despite the significance of these ancient waterworks, systematic archaeological investigation on the Miyanab plain began relatively

[1] For simplicity, Miyānāb has been written without diacritics henceforth.
[2] Soroush, "Irrigation in Khuzistan after the Sasanians: Continuity, Decline, or Transformation?"
[3] http://whc.unesco.org/en/list/1315

late; none of the surveys of 1960s-1980s in Khuzistan covered this region.[4] In the early 2000s, settlements and the ancient canal system on Miyanab were systematically studied for the first time.[5] The timing of these surveys was crucial; they were undertaken just as a major modern irrigation scheme, The Miyanab Irrigation and Drainage Project,[6] had started to be implemented. Much of the archeological record on the Miyanab has been lost thereafter as a result of the modern irrigation project, and even more as a result of the subsequent land leveling scheme.

It is widely assumed that the all of the major hydraulic remains at Shushtar and on the Miyānab date to the Sasanian period. The medieval authors were the first to attribute the construction of the Gargar canal and the bridge of Shādorwān to the powerful Sasanian kings, Ardashir I (224-241 CE) and Shapur I (241-271 CE). Modern scholarship has not disputed this date, even though material evidence for this assumption is lacking.[7] Over time, more waterworks have been attributed to these kings (see Chapter 2). The publication of *The Decline of Iranshahr* integrated the Miyanab into the discourse of Sasanian irrigation expansion and post-Sasanian collapse.[8] Moghaddam (2012 a, b) utilized archaeological data to argue that an unprecedented expansion of irrigation on the Miyanab happened during the Sasanian period, followed by a

[4] Hole, *The Archaeology of Western Iran*; Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*.
[5] Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*; Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*; Moghaddam and Miri, "Archaeological Research in the Mianab Plain of Lowland Susiana, South-Western Iran"; Moghaddam and Miri, "Archaeological Surveys in the 'Eastern Corridor', South-Western Iran."
[6] Hereafter MIDP.
[7] Rawlinson, "Notes on a March from Zoháb," 73–75; Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane"; Christensen, *The Decline of Iranshahr*, 107–109.
[8] Christensen, *The Decline of Iranshahr*.

collapse after the Muslim Conquest.[9] Even though the evidence for this argument is questionable,[10] water history on the Miyanab (especially the case of the Gargar canal) has recently became firmly tied to the archaeological literature on empires and irrigation in Near Eastern history.[11] It is, therefore, crucial to carefully collect and closely examine the material evidence for the long-term developments of the irrigated infrastructure in order to test whether a significant correlation between water history and political history can be observed.

Headworks of the irrigated plain in Shushtar that are inscribed as a World Heritage site demonstrate outstanding achievements in water management history. Yet, little is known about their creation and subsequent developments. The literature on these monuments consists largely of local and historical legends, and contains little factual information. We know nearly nothing about the mechanisms of creation and subsequent modifications of these waterworks, and about the dynamics of the relationship of the inhabitants of the plain with water through history. At the same time, a holistic and systematic study of this landscape becomes increasingly more challenging as MIDP is eradicating landscape features, proceeding from north to south of the plain. While landscape features such as relict canals, field systems and hydraulic features in the countryside that are crucial in understanding irrigation history are clearly and at a high rate destroyed by development, the damage to the hydraulic monuments in Shushtar should not be underestimated. The conditions of these headworks is severely affected by air pollution, water pollution caused by industrial and domestic waste, increasing erosion capacity of river flow caused

[9] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 28–30; Moghaddam, "A Note on the Gargar Irrigation System."
[10] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 293; Soroush, "Irrigation in Khuzistan after the Sasanians: Continuity, Decline, or Transformation?"
[11] Wilkinson, *Archaeological Landscapes of the Near East*, 92–93.

by upstream dams, and vibration of motor vehicles on and around the monuments. In addition to direct damage to the visible parts of the monuments, urban development is continuously changing the physical context surrounding these monuments and potential undiscovered evidence that they contain. An archaeological investigation of the Miyanab is, therefore, not only important but also urgent. Before discussing the research goals and objectives in more detail, in the following pages, I will review the theoretical background of the examination of irrigation and political power in general, and in Near Eastern studies in particular.

1.2. Irrigation and Authority; Conceptual Framework of Research

Wittfogel's theory of hydraulic society has influenced anthropological research since the 1930s, especially after the translation of *Oriental Despotism* into English in 1957. Attempting to prove, refute or reformulate his ideas, generations of anthropologists have sought to understand the relationship between construction and operation of irrigation systems in arid and semiarid environments and the development of socio-political complexity. Despite this long research history, there is still little agreement about the nature of the relation between irrigation and authority in the past societies. Even the principals and implications of the hydraulic hypothesis are debated creating diverging opinions about the nature of the research questions that have to be asked.[12] In addition, these attempts at universal explanation are targeting very different historical periods and geographic regions, which are dramatically varied in terms of quantity and quality of data on irrigation management, hindering comparability of various research's findings. What

[12] Price blames the scholars for creating a straw man of Wittfogel's theory, and for criticizing a work which they have not understood or worse have not read. Very rarely, Wittfogel is directly cited. Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction." Also see: Mitchell, "The Hydraulic Hypothesis."

comes below is a brief review of the principal themes that are most commonly discussed in the literature on irrigation and authority.

Does irrigation necessitate central authority for the construction and operation of the system to be successful? Several studies of irrigation systems have demonstrated that irrigation per se does not necessitate centralized coordination and management. Canal systems of various size can be built and operate by communal, non-hierarchical groups without centralized authority.[13] However, as Mitchell and Price have argued, Wittfogel never claimed that all irrigation systems required a strong central authority.[14]

> *Thus, too little or too much water does not necessarily lead to governmental water control; nor does government water control necessarily imply despotic methods of statecraft. It is only above the level of an extractive subsistence economy, beyond the influence of strong centers of rainfall agriculture, and below the level of a property-based industrial civilizations that man…moves toward a specific hydraulic order of life.*[15]

This assumption seems rather to have originated in the early works of Steward, who argued that "political control becomes necessary to manage irrigation and other communal projects."[16] Wittfogel, on the other hand, categorizes irrigation societies into hydraulic and hydroagricultural, in order to account for the geographical, ecological, technological, and hydrological conditions

[13] Millon, "Irrigation at Teotihuacan"; Leach, "Hydraulic Society in Ceylon"; Netting, "The System Nobody Knows: Village Irrigation in the Swiss Alps"; Hunt, "Size and the Structure of Authority in Canal Irrigation Systems."
[14] Mitchell, "The Hydraulic Hypothesis"; Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction."
[15] Wittfogel, *Oriental Despotism; a Comparative Study of Total Power*, 14.
[16] Steward, "Cultural Causality and Law," 22. Steward later played down the significance of irrigation as one of several catalysts of states, and eventually dismissed it as a trigger altogether. Steward, "Some Implications of the Symposium," 61–64.

that favor a particular hydraulic trajectory. Hydroagricultural society defines those instances where irrigation is practiced without leading to political integration and centralization. [17]

The second, more critical question that is tied to the hydraulic hypothesis is whether all *large-scale* irrigation systems must have a centralized authority. Adams' archaeological studies of irrigation in southern Mesopotamia and southwestern Iran suggested that such a relationship exists; all extensive canal systems were built and sustained under the centralized rule of territorial states and empires. He argued that disintegration of the centralized political system, most notably in the case of the Sasanian Empire, resulted in the decline or collapse of the monumental canal systems.[18]

Robert Hunt's seminal study examined the relevance of the size of a canal system in defining the structure of the operating authority.[19] Through a comparative study of a significantly wide-range of irrigation systems, Hunt argued that size alone does not determine the charter and structure of authority and the form of control in the system. Canal systems as small as 700 ha are found which are directly administered by the state, while systems as large as 458,000 ha can be operated at a local level. Price criticizes Hunt's study as irrelevant to Wittfogel's theory on two grounds: first, disregard for the nature of Wittfogel's hypothesis and his distinction between hydraulic and hydroagricultural societies; second, disregard for the fundamental impact of technology when comparing past and present societies.[20] The validity of the latter problem needs

[17] Wittfogel, *Oriental Despotism; a Comparative Study of Total Power*, Ch. 2–3. Initially, he had categorized three types of irrigation societies, Egyptian, Japanese, and Indian to account for differences in the social organization and structure. Wittfogel, "Geopolitics, Geographical Materialism and Marxism." It is true, however, that Wittfogel misclassified several instances of hydroagricultural societies as hydraulic, most notably in the case of Ceylon, see Leach 1959; Price 1994:190), perhaps contributing to this misunderstanding. Leach, "Hydraulic Society in Ceylon"; Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction," 190.
[18] Adams, *Land behind Baghdad a History of Settlement on the Diyala Plains*.
[19] Hunt, "Size and the Structure of Authority in Canal Irrigation Systems."
[20] Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction," 193–98.

little comment: The hydraulic hypothesis questions whether the managerial needs of large hydraulic works could have been met in the ancient world with *available* technologies without specialized bureaucratic hierarchy. Modern technologies and state-funded infrastructure of communication and administration (e.g., massive dams and headworks, road systems, telecommunication, legal systems, etc.) allow efficient coordination of the extensive canal systems by local communities and corporations. Hence, these canal systems cannot be considered local in nature. Interestingly, Hunt does recognize the possibility of wide variations in the form and hierarchy of control within the systems where authority is chartered by state. He also admits that in the modern world, all irrigation systems are articulated in some way with the state.[21] But, he fails to acknowledge that these problems undermine the applicability of his results to Wittfogel's hypothesis about ancient states.

The second criticism addresses a more complicated issue. Price argues that "size" is not a determining factor in Wittfogel's hypothesis. The key instead is "hydraulic density," i.e., the degree to which agricultural societies are dependent on hydraulic agriculture because "bureaucratic density of an agromanagerial society varies with its hydraulic density."[22] It is true that Wittfogel does not argue that the scale of canal systems is solely determinant of the sociopolitical trajectory of an irrigation society. He attempts to theorize a variety of natural and human factors that make an *irrigation* society choose to become a *hydraulic* one. If the society makes this choice, the managerial needs of the "massive hydraulic devices" trigger the formation of despotic states. All hydraulic societies rely on irrigation systems of considerable scale. As a

[21] Hunt, "Size and the Structure of Authority in Canal Irrigation Systems," 341–42.
[22] Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction," 194; Wittfogel, *Oriental Despotism; a Comparative Study of Total Power*, 167.

result, the factor of *size* has become a fundamental aspect of research on the topic of irrigation and authority. Even if Hunt's study does not address the fundamental shortcoming of the hydraulic hypothesis, it makes a significant contribution to the field by stressing the need for the clarification of the concept of size and scale in irrigation literature. The terms "irrigation system size" and "irrigation system structure of authority" are widely used but are rarely defined by scholars. No author defines precisely what he means by concepts such as *large* and *extensive*. Even the basic concept of "irrigation system", comprising the headworks that *feed* the canal system from a source, the control works such as dams and weirs that *regulate* the flow in the system, and the extent (in area) that is supplied by a single canal system, is often left undefined.[23] The extent of the canal relicts that seem to have been fed from the same source of water is frequently presented as the size of "the irrigation system".

While it has become customary to reject Wittfogel's hypothesis, much of the later scholarship confirms the positive relationship between the size of irrigation systems and central authority without clarifying the nature of the *tasks* that require state control. Is authority necessary for the *construction* of the system or for the *operation*? It is fundamental that these two aspects be considered independently. The construction of an irrigation system on any substantial scale seems to benefit from central and bureaucratic management. Given the sophistication of the decision making and the complexity of coordination (tasks such as setting the headworks for the canals, assembling labor and supplies including food and tools, calculation of the process and coordination of various jobs), a central and specialized bureaucracy seems to be advantageous and in many

[23] Hunt, "Size and the Structure of Authority in Canal Irrigation Systems," 344–46.

cases to be involved in the initiation of a system.[24] Central governments and ancient rulers often claim credit for such construction efforts, whatever the reality.[25] It is far more difficult to show that the involvement of centralized administrative action is essential for the working of the system. Research has demonstrated that canal systems of substantial size can be operated at community level; and that the same physical canal system can operate under different social organizations. The specific managerial forms of irrigation societies are selected through the calculations of, and the experimentations with, the costs and benefits for the individual irrigation society and its central authority (if existing).[26]

Further complicating research on the social organization of irrigation is the diversity of the forms of control over irrigation tasks and the relationships between the irrigation community and an external authority. Two separate dimensions of organization are frequently muddled in the irrigation literature. First, the internal organization of irrigation, i.e., the degree to which irrigation roles in the systems are hierarchically configured (acephalous vs. unified). Second, the external relationship of the irrigation roles to the roles in the political system of the state, i.e. the degree to which organization of irrigation is linked to or independent of the state (decentralized vs. centralized). All canal systems larger than 50 ha seem to necessarily constitute authority in their internal organization. The charter of authority might be the local irrigation community, the state or a private investor. There is no data that proves that centralized organization is necessary, or that

[24] Given the complexity of tasks and the scale of resources needed, large scale canal construction in Mesopotamia was often a multi-generational project, exceeding the period of a single king's time of authority.
[25] Hunt, "Size and the Structure of Authority in Canal Irrigation Systems."
[26] Leach, "Hydraulic Society in Ceylon"; Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction"; Kaptijn, "Communality and Power: Irrigation in the Zerqa Triangle, Jordan"; Eva Kaptijn, *Life on the Watershed*; Ertsen and van der Spek, "Modeling an Irrigation Ditch Opens up the World. Hydrology and Hydraulics of an Ancient Irrigation System in Peru."

the state is the only entity that can confer authority. If the state charters authority, it may choose to exert varying degrees of control on the system for political or economic reasons.[27] The next section, will review background of irrigation research in Near Eastern archaeology, in terms of research methods as well as theoretical framework, both contributing to the questions and methodology of the present study.

1.3. Near Eastern Irrigation Studies and Political Dynamics

The earliest substantial research on Near Eastern hydraulic infrastructure was carried out by the Dutch engineer, Graadt Van Roggen, around the historic cities of northern Khuzistan, Susa, Dezful, Iwan-i Karkheh, Shushtar, and Ahwaz. [28] The project was focused on the examination and documentation of the architectural remains at these locations as well as the mapping of the canal segments in their immediate vicinity. The first systematic attempt at the regional reconstruction of relict watercourses in Near Eastern archaeology was initiated by Thorkild Jacobsen, during the Diyala project in the late 1930s.[29] Jacobsen was interested in the study of the network of canals which formed the backbone of Sumer, by providing the means of communication between settlements as well as irrigation water. He developed the 'Ceramic Surface Collection' method for reconstruction as well as dating of ancient water courses. The underlying assumption was that in the semi-arid alluvial Mesopotamian plain, human settlement was possible only along rivers and canals. Therefore, systematic survey of all existing settlements, dating the settlements by means of their surface pottery, and plotting them on period maps will show that they group in linear

[27] Kelly, "Concepts in the Anthropological Study of Irrigation"; Hunt, "Size and the Structure of Authority in Canal Irrigation Systems"; Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction."
[28] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane." See also chapter 2, section 2.2.
[29] Wilkinson, *Archaeological Landscapes of the Near East*, 97.

patterns representing the lines of major water courses in each period. This method began to be extensively applied in the regional surveys in the 1950s. The Ceramic surface method was then combined with the use of cuneiform texts for a more sophisticated reconstruction of ancient watercourses.[30]

Robert McC. Adams's regional studies of settlement and irrigation in southern Iraq and southwestern Iran applied this method in combination with limited use of accessible aerial photography, between the 1950s and 1970s, collecting large amounts of data about relict canal systems and their evolution over extensive survey areas.[31] He was specifically interested in exploring the impact of sociopolitical dynamics on the developments of irrigation systems. The impact of Adams' surveys on shaping the research methods and conceptual framework of Near Eastern archaeological studies of irrigation was profound. Following in his footsteps, many projects in the fluvial plains of Mesopotamia and Khuzistan began to collect data on relict canal systems at regional scale, and to explore the relationship of their evolution with sociopolitical history.

A major advancement was brought about in the 1970s-1980s, in a series of interdisciplinary projects in southern Iraq, undertaken by the Ghent University and the Oriental Institute. Through close collaboration between archaeologist, epigraphers and geomorphologists, the complexity of the factors shaping southern Mesopotamian landscapes began to be fully understood. It became clear that neither plotting of archaeological sites in period maps, nor use of textual sources alone

[30] Jacobsen, "The Waters of Ur," 173.
[31] Adams, "Agriculture and Urban Life in Early Southwestern Iran"; Adams, *Land behind Baghdad a History of Settlement on the Diyala Plains*; Adams, *Heartland of Cities*; Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain."

is sufficient to understand the complex palimpsest of fluvial landscapes.[32] Unfortunately, fieldwork in Iran and Iraq came to a halt in the 1980s and 1990s as a result of war and political conditions. At the same time, much of the archaeological landscapes across the Middle East were damaged by development projects which started in the 1960s and have continued to obliterate archaeological evidence ever since. In the late 1990s, declassification of the cold war CORONA satellite imagery that captured Middle Eastern landscapes prior to and at the onset of these development schemes brought a new momentum to the study of Near Eastern water history, by providing the opportunity for remote sensing of remains of canal systems. Meanwhile, advances in Geographic Information Systems (GIS) and the availability of a wide range of satellite and aerial imagery enabled data acquisition even in the regions where fieldwork was not impossible. A truly influential figure in this phase was the late Tony Wilkinson. His innovative research methods that combined remote sensing (the systematic study of aerial and satellite imagery) along with extensive fieldwork of off-site features significantly advanced the field and were quickly and widely applied by archaeologists.[33] Since the 1990s, Near Eastern landscape archaeologists turned their attention to northern Mesopotamia, which had remained relatively understudied compared to the south. Regional field surveys that were conducted in northern Iraq and Syria and in southern Turkey enabled ground-truthing of the data acquired by remote sensing. Fortunately for archaeology, these areas had remained fairly underdeveloped and much information about the extent and scale of canal systems and their broad patterns of evolution was brought to light, complementing the results of the earlier research in the south.

[32] Gasche and Cole, "Second-and First-Millennium BC Rivers in Northern Babylonia," VII–VIII; ibid., 2–6.
[33] See e.g. Wilkinson and Tucker, *Settlement Development in the North Jazira, Iraq*; Wilkinson, "Geoarchaeology, Landscape and the Region"; Wilkinson, *Archaeological Landscapes of the Near East*; Wilkinson, *On the Margin of the Euphrates*.

With regard to research questions, the past and present focus of the field's research has been largely shaped by the theoretical framework of Robert McC. Adams' regional surveys, in the 1950s-1970s. Adams demonstrated that the first appearance of substantial canal systems occurred at the end of the third millennium BC, over a millennium after the emergence of the first urban states. Therefore, Wittfogel's theory that the managerial needs of large scale irrigation were the catalyst of state formation was disproved.[34] Adams' studies of ancient irrigated landscapes in Mesopotamia and Khuzistan supported a different type of relationship between power and water, namely that the emergence of states, particularly the increasing consolidation of power under centralized territorial states, sets the stage for a remarkable expansion of irrigation systems. He argued that a long period of increasing investment in irrigation infrastructure by territorial states, especially since the Neo-Babylonian period, culminated in the maximum expansion and intensification of irrigated agriculture under the Sasanian Empire. After the Islamic Conquest, the extensive Sasanian systems collapsed or declined, providing further confirmation that the centralized power of states and empires enables construction and operation of large-scale irrigation infrastructure.[35] The subject of this study, i.e., the Miyanab, was not studied by Adams. A similar trajectory, however, has been postulated for the irrigation history of the plain in the later historical

[34] Price (1994), on the other hand, argues been argued that Adam's research did not disprove Wittfogel's hypothesis, and, that a mechanistic model of causality looks for the cause (irrigation) at a point in time explicitly before the effect (political control). If the model were to be verified, however, the two variables would probably emerge together, interacting with each other in a synergistic fashion. Mitchel (1973), on the other hand, argues that the problem with Steward and Wittfogel's work is that they had isolated important social consequences of the central coordination of large-scale irrigation and not of irrigation per se. "Their hydraulic hypothesis can be reformulated to state that if there is centralized direction of irrigation activities in an arid or semiarid environment, then there will be a corresponding increase in centralized political powers in other areas of social life."

[35] Adams, "Agriculture and Urban Life in Early Southwestern Iran"; Adams, *Land behind Baghdad a History of Settlement on the Diyala Plains*; Adams, "Historic Patterns of Mesopotamian Irrigation Agriculture"; Adams, *Heartland of Cities*; Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain"; Adams and Nissen, *The Uruk Countryside*.

periods: construction of a monumental canal system under the patronage of the Sasanian state and an eventual collapse of irrigation after the conquest.

Compared to the advances in the archaeological investigation of the remains of waterworks, their physical character, their landscape structure and spatial patterns of distribution, the theoretical framework of Near Eastern water studies has remained mostly limited to the examination of the impact of empires on water history. Aside from a few studies that deal with the origins of irrigation, imperial discourse has received the lion's share of scholarship on irrigation in the Near East.[36] Past research has suggested a positive correlation between the power of Near Eastern territorial states and the scale of the water works they built, and has set its goal on "laying out the archaeological evidence" for this trajectory.[37] This relation is further underlined by an emphasis on the decline and collapse of large waterworks with the demise of the state powers.

Aside from limited occasions where textual data present the claim of a central authority for involvement in the construction of a hydraulic system, size is the determining factor for postulating centralized control: If a system is big, state management was required. But, as Hunt discusses, scale is rarely defined; nor is the nature of the postulated state control. Irrigation systems are simply defined as large-scale or extensive or monumental, leaving the reader with little clue as to what these qualities mean in quantitative and comparative terms. For example, how does a Neo-Assyrian canal system differ from a Sasanian one, with both described as large-scale? When numbers are

[36] See e.g., Adams, "Historic Patterns of Mesopotamian Irrigation Agriculture"; Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain"; Wenke, "Imperial Investments and Agricultural Developements in Parthian and Sassanian Khuzestan"; Wilkinson, "Introduction"; Wilkinson, "Empire and Environment in the Northern Fertile Crescent"; Wilkinson and Rayne, "Hydraulic Landscapes and Imperial Power in the Near East"; Wilkinson et al., "Landscape and Settlement in the Neo-Assyrian Empire"; Ur, "Sennacherib's Northern Assyrian Canals"; Moghaddam, "A Note on the Gargar Irrigation System."

[37] Wilkinson, "Introduction," 86.

provided, they concern the extent of the survey area, the land irrigated, or the potential irrigable area, and not the "size of a single irrigation system". A large irrigated area can comprise several systems of varying size and complexity in terms of technical aspects of water supply and organizational aspects of water distribution. I am aware of only one archaeological study that attempts at detailed reconstruction of the features of an irrigation system in the Assyrian heartland, including the headworks, main canals, and off takes, from its source to its distribution to the fields, based on the physical remains of the irrigation landscape.[38] It appears that the inherently low resolution of archaeological data is a contributing factor in the rarity of detailed hydraulic reconstructions, even in the case of the Assyrian waterworks that, thanks to extensive philological and iconographic evidence in addition to the preserved archaeological remains, are the most extensively studied and best understood features in the Near Eastern water history.[39]

Near Eastern irrigation literature is frequently ambiguous in terms of the tasks that require state control, the nature of centralized management that is being postulated, and the evidence or justification for the proposed structure of authority. The following statement is an example of the argument that is found in various versions in the literature:

> *"Not only does the Distribution of water over long distances require a well-developed system of hydraulic technology, it is also necessary to marshal labor supply*

[38] Ur, "Sennacherib's Northern Assyrian Canals."
[39] Among numerous studies of Assyrian hydraulic infrastructure, including extensive publication of Ariel Bagg see for example: Bagg, *Assyrische Wasserbauten*; Bagg, "Irrigation in Northern Mesopotamia"; Bagg, "Assyrian Hydraulic Engineering. Tunneling in Assyria and Technological Transfer"; Jacobsen and Lloyd, *Sennacherib's Aqueduct at Jerwan*; Simonet, "Irrigation de Piémont et économie Agricole à Assur"; Reade, "Studies in Assyrian Geography, Part I: Sennacherib and the Waters of Nineveh."

and control resources over large areas, all of which takes considerable political clout."[40]

Many elements of the above statement are subject to scrutiny. For example, what constructional or operational tasks of water distribution are considered to require political clout? How is considerable political clout defined and measured, specifically with regard to the extent of the irrigation area? Is the proposed political power defined in terms of the configuration and source of authority in the irrigation roles, or, does it postulate a certain form of the articulation of irrigation authority with a specific form of overarching political system? Admittedly, answering these questions is often beyond the reach of the archaeological data. The danger lies, however, in positing a certain structure of internal and external authority on the basis of an (often subjective) assessment of the scale of the relict canal systems. Recently, Stephanie Rost has applied a task-based approach to the analysis of administrative texts from the Ur III period and has made a significant contribution to this question. She has demonstrated that in the province of Umma, the management of the irrigation tasks in the areas that were supervised by the provincial administration was highly centralized (unified, in Hunt's terms) at the provincial level, but the state was not involved beyond that. This research sheds light on variations in terms of the structure of authority in one case, but cannot be used as a model for other cases in Near Eastern history.[41]

Wittfogel postulates that the centralized coordination of irrigation activities permits the intensification of agriculture. A higher level of agricultural returns supports more population and allows territorial expansion that would be impossible without such centralized control. The extent

[40] Wilkinson, "Introduction," 85.
[41] Rost, "Watercourse Management and Political Centralization."

of political power that is derived from agromanagement depends on the importance of irrigation systems to the political economy.[42] The case of Sasanian irrigation, which has played a pivotal role in shaping the discourse of imperial water management in Near Eastern studies, has been conceived within the same theoretical framework[43]. Adams and others following him have argued that the centralized power and bureaucratic apparatus of the Sasanian Empire enabled the expansion of waterworks and intensification of irrigation agriculture on an unprecedented scale. The agricultural return (food as well as revenue) enabled the Sasanians to sustain a very large population and to fund militaristic expansionist activities. Given the importance of irrigation agriculture in the Sasanian political economy, the state undertook reforms in the late 5th and early 6th centuries and increased the power of the hydraulic bureaucracy to exert more control over production in the riverine territories of Mesopotamia and Khuzistan[44]. There is no doubt that centralized control *can be* advantageous to the *construction* of hydraulic works. Also true is that in a hydraulic society, agricultural revenues generally enhance the power of the ruling polity. As discussed above, however, the existence of central rule does not necessary entail direct involvement of the state in any task related to irrigation. Furthermore, the scale of waterworks is not *proof* for a certain level of state involvement. It appears that past archaeological research has been trapped in a reductionist model of irrigation and power, and has not sought to explore or even

[42] Wittfogel, *Oriental Despotism; a Comparative Study of Total Power*; Mitchell, "The Hydraulic Hypothesis"; Price, "Wittfogel's Neglected Hydraulic/Hydroagricultural Distinction."

[43] The same theoretical frameworks propel research on other empires, specifically the Neo-Assyrian. I limit the discussion to the Sasanian case because it is of most relevance to the research here and has formed the cornerstone of the argument.

[44] Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain"; Christensen, *The Decline of Iranshahr*; Wilkinson et al., "From Human Niche Construction to Imperial Power: Long-Term Trends in Ancient Iranian Water Systems"; Wilkinson and Rayne, "Hydraulic Landscapes and Imperial Power in the Near East"; Alizadeh and Ur, "Formation and Destruction of Pastoral and Irrigation Landscapes on the Mughan Steppe, North-Western Iran."

consider the diversity of operative mechanisms that are involved in the social organization of irrigation.

Even more problematic is the use of *scale*, especially one that is usually left undefined, as proof for *date*. Over the past decades, there has been an increasing readiness to date any irrigation system described as *large-scale* and *linear* to the Sasanian period. The dating of the canal systems in the regional surveys is generally based on association with dated archaeological sites. Despite the shortcomings that are involved in this method, a controlled and clearly defined archaeological procedure is utilized. The *conclusion* that Sasanian irrigation systems were monumental and generally linear is increasingly used as evidence for dating, even in the absence of any site association,[45] or in cases where the site association does not suggest a Sasanian date.[46] This methodological bias is clearly demonstrated in the use of double-standards when applying the site-canal association method; a Parthian or Islamic date far canals has to be confirmed by well-defined ceramic chronology while the Sasanian date can be merely supported by the monumentality of the features.

> *As Parthian and Sasanian archaeology is less well developed [compared to Mediterranean archaeology], we know less about their water systems. Nevertheless, thanks to the monumental scale of some Sasanian canals, certain features have become*

[45] E.g., in Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 29–30.
[46] E.g., in Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*; Soroush, "Irrigation in Khuzistan after the Sasanians: Continuity, Decline, or Transformation?"; Verkinderen, *The Waterways of Iraq and Iran*, 132.

well known. However, disagreements over the archaeological evidence weakens the arguments that favor Parthian contribution to hydraulic engineering."[47]

Further proof for the positive relationship between centralized political control and irrigation comes from the argument for the collapse or decline of these canal systems in the wake of the Muslim conquest of the Sasanian empire in the 7th century CE. A widely accepted explanation has been that investment in the construction and maintenance of waterworks stopped or was significantly reduced after the fall of the Sasanian state. Other reasons, mainly environmental conditions and the inherent fragility of the heavily engineered irrigation infrastructure, have also been considered. Even so, it has been frequently argued that the absence of state sponsorship (for lack of interest, centralized bureaucratic apparatus, resources or a combination of all) has been the reason why the collapse could not be averted and the canal systems could not be restored to their intended capacity. The case of Sasanian-Early Islamic agricultural economy presents one of the most striking cases of disciplinary incongruity. The Near Eastern archaeological narrative of post-Conquest decline contradicts the literature on Islamic economic history that argues for a thriving economy especially until the 11th century, largely based on the mass production of cash crops and related industries.[48]

Sustained archeological survey and fieldwork in the eastern Mediterranean along with improved methodological and theoretical approaches resulted in a serious reconsideration of the narratives of general decline after the Conquest; new light has been shed on continuity and change

[47] Wilkinson and Rayne, "Hydraulic Landscapes and Imperial Power in the Near East," 121.
[48] The cause(s) of the 11th century decline are not well understood; nevertheless, varying degrees of recess in settlement and economy is suggested across the Islamic Caliphate on the basis of archaeological, philological and numismatic evidence, from the Eastern Mediterranean to Central Asia. Watson, *Agricultural Innovation in the Early Islamic World*; Bulliet, *Cotton, Climate, and Camels in Early Islamic Iran*; Banaji, "Late Antique Legacies and Muslim Economic Expansion"; Kennedy, "Military Pay and the Economy of the Early Islamic State."

in the Late Antique-Medieval transition as well as on the varied local responses to the post-Conquest socio-political context.[49] Even though this type of continuous reappraisal has been impossible in Mesopotamia, emerging evidence begs for a reassessment of earlier views. In northern Mesopotamia, for example, recent studies have suggested considerable continuity in irrigation landscapes from the Hellenistic to the medieval periods and have especially shed light on the remarkable investments in canal building in the Early Islamic period.[50]

In Khuzistan, an unprecedented expansion of irrigation agriculture in the Sasanian period, and a decline following the fall of the empire has been similarly posited.[51] Although evidence for continuity in land use and irrigation has been accumulating, it has remained largely unnoticed in the synthesizing literature. Already in the 1970s, Wenke's surveys suggested that large scale investments in irrigation in the Susiana plain were undertaken in the Parthian period.[52] This argument was largely dismissed on account of the disagreement over ceramic chronology. It is important to note, however, that the critics of ceramic chronology suggested an earlier chronology, not a later date.[53] Two Greek inscriptions discovered at Susa suggest that substantial investments in canal construction were made in the Parthian period by the satrap of Susa. They may refer to some of the large relict canals identified by Wenke or Adams.[54] Alizadeh has similarly argued for

[49] Walmsley, *Early Islamic Syria*.
[50] Bartl, "Continuity and Change in Northern Mesopotamia from the Hellenistic to the Early Islamic Period"; Wilkinson and Rayne, "Hydraulic Landscapes and Imperial Power in the Near East"; Rayne, "Imperial Irrigated Landscapes in the Balikh Valley."
[51] Adams, "Agriculture and Urban Life in Early Southwestern Iran"; Hansman, "Urban Settlement and Water Utilization in South-Western Khuzistan and South-Eastern Iraq from Alexander the Great to the Mongol Conquest of 1256."; Christensen, *The Decline of Iranshahr*.
[52] Wenke, "Imperial Investments and Agricultural Developements in Parthian and Sassanian Khuzestan."
[53] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 43 ff. 85.
[54] Potts, "Gundešapur and the Gondeisos," 327–32.

a peak of settlement and irrigation on the alluvial fan of the Jarrahi River in the Parthian period.[55] Neely's study of irrigation history in Deh Luran argued for continued functioning of irrigation infrastructure in the Early Islamic period until the 8th century. [56] Surveys in the lower Khuzistan plain, near Ahwaz, have found no significant change in the spatial distribution of sites from the Parthian to the Early Islamic period;[57] hindering the applicability of site-canal association for the dating of the canals.[58] Even in Adams' study of the Susiana plain, the choice of map graphics exaggerates the contrast between the settlement map of the Sasanian and Islamic period. When the same symbology is applied, the contrast between the two maps is less dramatic (Fig. 1.2).

1.4. Research Goals & Questions

The Miyanab presents a very interesting case for the long-term study of the aspects of continuity and rupture in irrigation, especially with regard to the Late Antique-Medieval transition. The multi-period nature of the hydraulic infrastructure and the potentials of long-term community participation in the evolution of the hydraulic systems on the plain have, nonetheless, remained understudied. While water history in Miyanab has been solely investigated within the framework of imperial expansion, continuity in irrigation and land use on the plain is striking. Both in pre-modern and in modern times, hydraulic structures of Shushtar have supported irrigation agriculture on the plain, permitting the city to maintain its status as an economic and political center in

[55] Alizadeh, "Elymaean Occupation of Lower Khuzestan During the Seleucid and Parthian Periods: A Proposal."
[56] Neely, "Sasanian and Early Islamic Water-Control and Irrigation Systems on the Deh Luran Plain, Iran." Given that distinguishing between the ceramic of the 7th and 8th century in Khuzistan is impossible, Neely's proposed terminal date of 8th century is questionable. If his identification is based on the findings of opac white glazed sherds, then the final date of occupation was not sooner than 9th-10th century.
[57] Gasche and Paymani, "Repères Archéologiques Dans Le Bas Khuzestan."
[58] Heyvaert et al., "Susa and Elam."

Khuzistan until the present. The resulting challenge for study of water history is that the origin and development of these structures is obscured by millennia of re-use and modifications.

This research aims at a long term study of irrigation history on the Miyanab plain in order to advance our understanding of the processes associated with the creation, transformation, and abandonment of hydraulic infrastructure in fluvial landscapes, with particular focus on such processes in Khuzistan. I will investigate whether the archaeological evidence from the Miyanab is indicative of large-scale imperial investments, or the result of gradual accretions of local practices or a combination of the two.

Methodologically, this study will assess the potential of the historic air photos and widely-used CORONA imagery for the study of settlement and irrigation. The potential of high resolution air photographs for regional archaeological studies was already recognized by Adams in the 1950s, and air photos has been occasionally used in Mesopotamian studies. But the lack of public access to these archives has hindered their systematic application in landscape studies and the attention was turned to the use of the CORONA satellite imagery.[59] Iran is the only country in the Middle East that has provided public access to these archives; air photos capture the appearance of the landscape at and around Shushtar since the 1950s with exceptional resolution. The historical hydraulic landscape of Miyanab is heavily damaged by modern irrigation and agricultural schemes, to the point of total obliteration in many areas. This study examines how remote sensing, specifically of these largely unexplored datasets, can contribute to the study of the damaged irrigation landscape.

[59] Adams, *Land behind Baghdad a History of Settlement on the Diyala Plains*; Gasche and Tanret, *Changing Watercourses in Babylonia*, VII; Pournelle, "KLM to CORONA: A Bird's Eye View of Culutral Ecology and Early Mesopotamian Urbanization."

Universal explanations may blur the ability to see the varied trajectories of irrigation and settlement in the fluvial plains, and the diverse responses of societies to the environmental and socio-political changes.[60] This dissertation presents a *micro-study* of human-water interaction on the Miyanab, a fertile plain which has been part of the core areas of several successive empires, and yet has shown remarkable resilience in the course of the sociopolitical history of Khuzistan.

In order to pursue these goals, the study addresses the following questions:

a) What are the main features of the ancient irrigation system of the Miyanab plain? How did they form and develop? What is the approximate date of various canals and hydraulic structures?

b) What types of evidence can shed light on the water history of the Miyanab? What is the potential of textual and archaeological data, especially when utilized in tandem? How can remote sensing data and GIS enhance our methods of enquiry, especially in a landscape where archaeological evidence is largely obliterated by subsequent development?

c) What is the relative importance of human and natural forces in shaping the hydraulic landscape of the Miyanab in long term? How have various human interventions and natural processes triggered major developments of the system?

d) Does the water history of the Miyanab show continuity or radical change, especially in the transition from Late Antiquity to the Middle Ages? How significantly (if at all) does the water history correspond to political history? More

[60] Rosen, *Civilizing Climate*; Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane."

specifically, does the data from the Miyanab support the image of an unprecedented development of irrigation in the Sasanian period and a post-Sasanian decline?

e) How can a micro-study of irrigation on Miyanab contribute more generally to our understanding of Near Eastern water history and agricultural economy? How does it contribute to the anthropological discourse on the subject of water and authority?

1.5. Structure of the Thesis

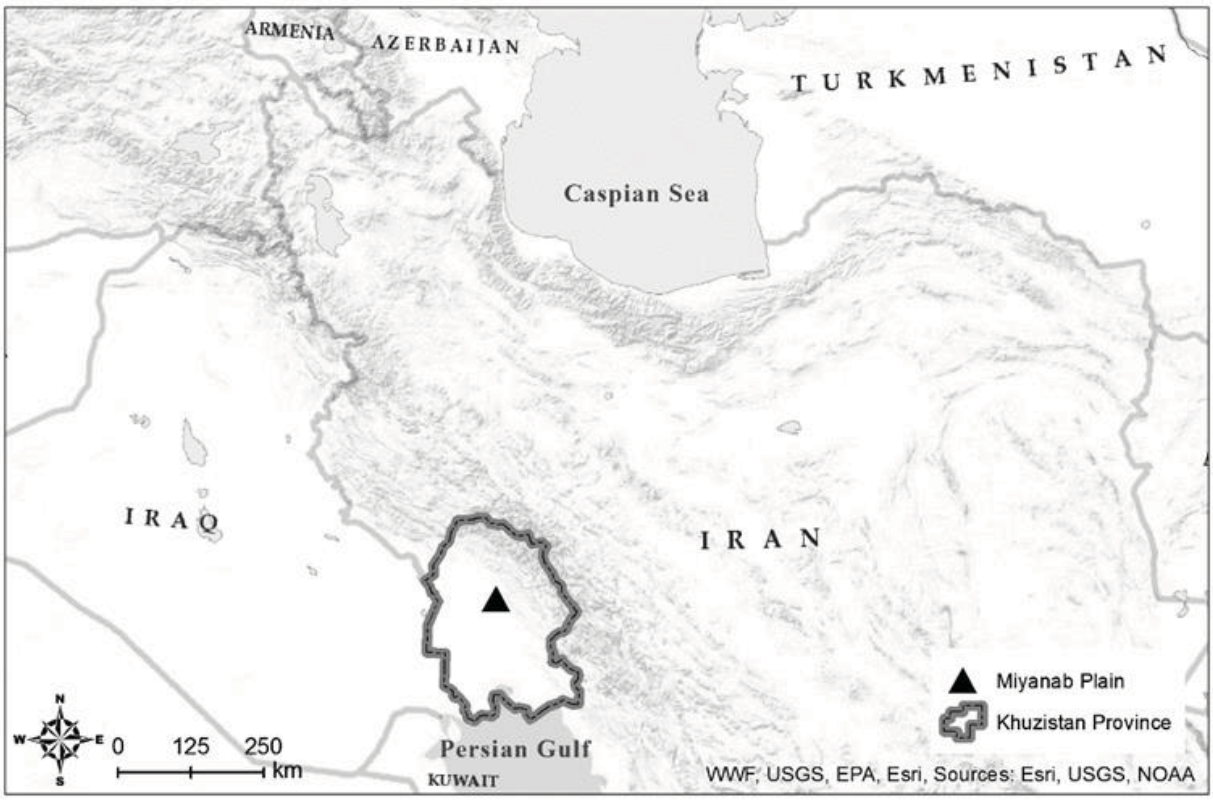
This thesis is composed of seven chapters and three appendices. Following this introduction, Chapter Two will provide the context and background of the research. Geography and environment of the plain are described. Then, a detailed description of the hydraulic landscape of the Miyanab and its main elements is offered along with the current state of knowledge about their history. In addition, the state of research on the dynamics of settlement and irrigation on the plain is discussed. The gap in our knowledge of water history and the evolution of major waterworks on the plain is outlined, guiding the investigations and analyses of the subsequent chapters. The research methodology and an overview of data is presented in Chapter Three.

Chapters Four and Five present the bulk of the data that was collected and analyzed in this study. In Chapter Four, the findings of the remote sensing study of the relict canal systems and a detailed discussion of the remote sensing data is offered. The results include detailed mapping of relict canal systems, analysis of their spatial distribution and structure, a relational analysis of canal evolution, and the use of air photos for creating a historic topography of the plain. Appendix B deals with the results of the topographic modeling. Chapter five furnishes the findings of the

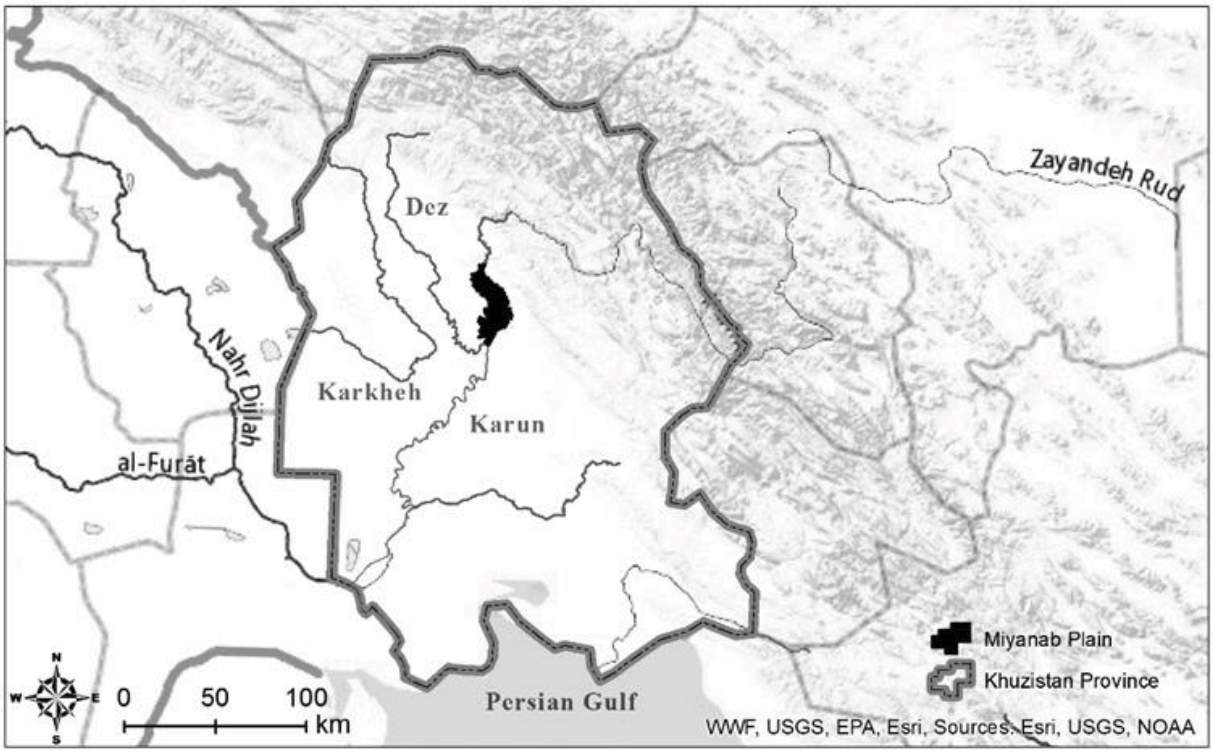
archaeological field work that was undertaken on the Miyanab as a part of this dissertation research in 2014. The data that is presented include examination of patterns of settlement as well as the results of the ground-truthing of the remote sensing construction of canal systems. The ceramic catalog of the survey is supplied in Appendix A. The reason why the results of the remote sensing study of the canals is presented prior to the ceramic and topographic evidence is that the survey questions and the choice of locations to be examined was based on the results of the hydraulic study of the canals. This sequence would help the reader better understand the logic of the survey strategy and the significance of the results.

Chapter Six integrates the results of remote sensing and fieldwork with a survey of the medieval and early modern textual data in order to shed light on the history of water management on the plain and on the evolution of major elements of irrigated landscape. This synthesis provides a long term perspective on the evolution of irrigated landscape and on aspects of continuity and rupture in water management. A sizable part of this final discussion deals with the agricultural investments of the Sasanian and Islamic periods. Finally, Chapter Seven discusses the contribution of the study of the Miyanab, from a historical and theoretical perspective. It is argued that water history on the Miyanab presents a much more complicated picture than previously thought. On one hand, a complex pattern of interaction between hydrogeological processes and human interventions seems to have contributed to the development of the irrigated landscape of the Miyanab, specifically with regard to the history of the Gargar. On the other hand, strong continuity in water management practices on the plain is suggested, with an expansion into the marginal areas in the Islamic period. The Sasanian headwork(s) at Shushtar established a well-engineered and durable foundation for irrigation on the plain, but investments in the construction, maintenance

and restoration of the waterworks appear to have continued in the medieval period. Local elites seems to have had a pivotal role in the coordination for the construction of headworks, at least in the medieval period.



Map 1.1 The geographical setting of the Miyanab plain



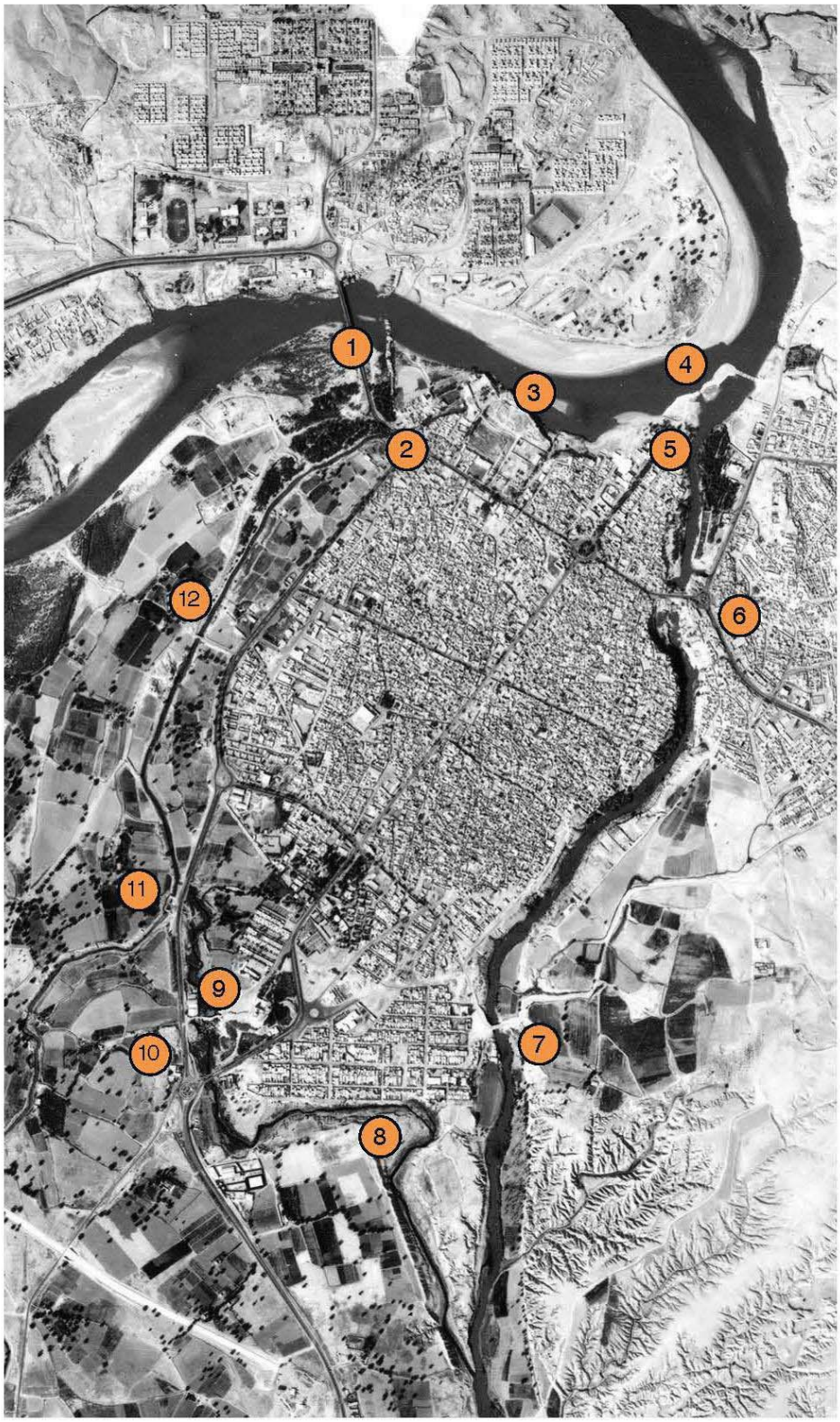
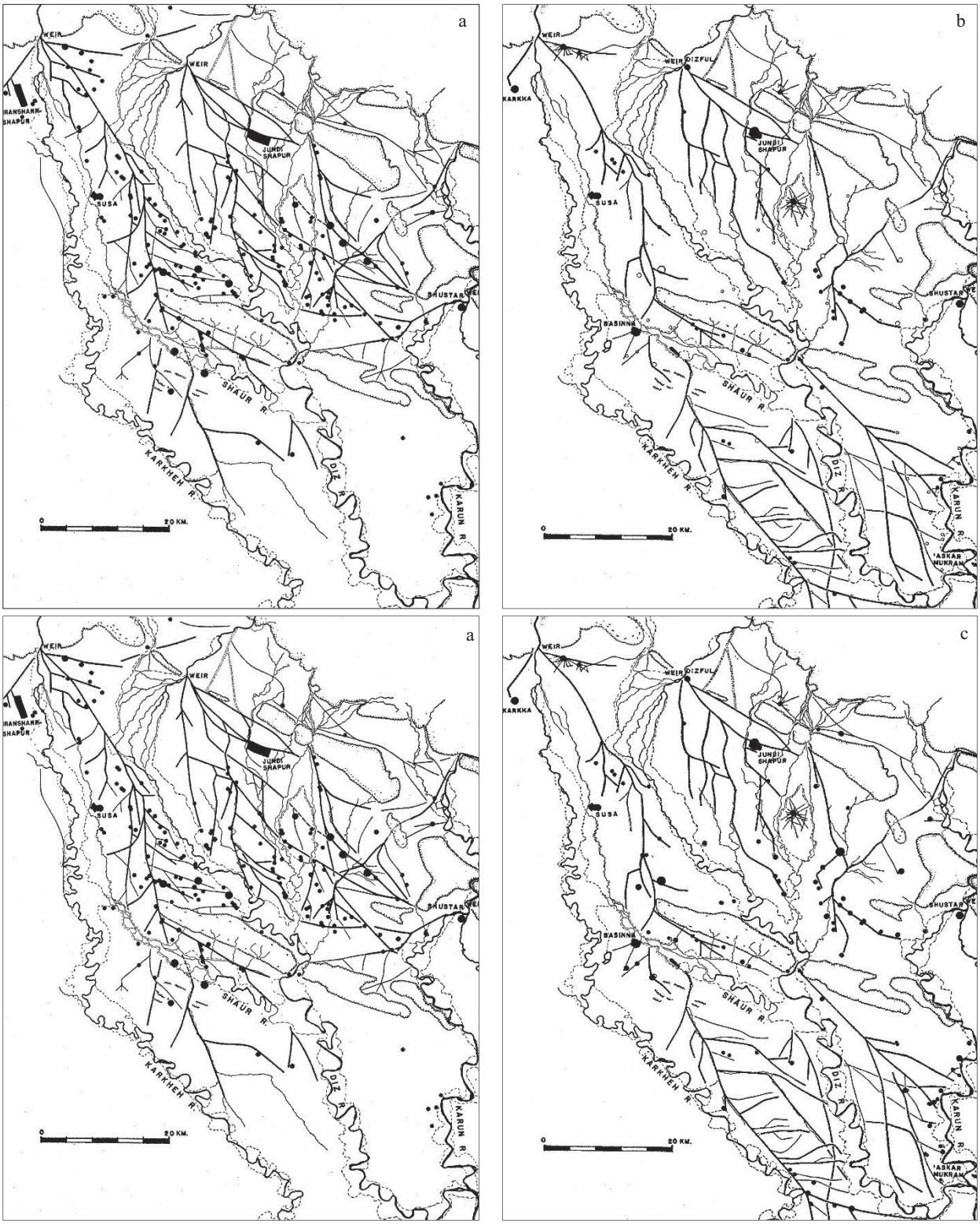


Figure 1.1 The monuments inscribed as Shushtar Historic Hydraulic System World Heritage site.
1. Shadorwan
2. The Mustawfi and Bateni Bridges
3. The Salasel Castle
4. Band-i Mizan
5. The Kolah Farangi Monument
6. The Watermills Complex
7. The Mandaean Sanctuary and Band-i Ayyar
8. Band-i Sharabdar
9. The Lashkar Bridge
10. The Shah ‘Ali Bridge
11. Band-i Khak
12. The Haj Khodaee Bridge

Figure 1.2 In Adams's publication of the Susiana plain survey (1962), the choice of map graphics exaggerates the contrast between the settlement map of the Sasanian and Islamic period. Top: original publication maps (a) Sasanian settlements (3rd-mid 7th century) compared to (b) Early Islamic settlements, black fill (7th-9th century) hollow (continued occupation after 9th century). Bottom: a) Sasanian settlements c) Early Islamic settlements, same symbology is applied to the two categories of the Early Islamic period.



Chapter 2
Context and Background

2.1. The Miyanab Plain

2.1.1. Geographical Setting

The study area, the Miyanab plain, is located in the northeastern part of Khuzistan province in southwestern Iran. It is confined between two watercourses: the Karun to the west, and the Gargar to the east. The Karun is the largest perennial river in Iran. The Gargar is a relatively small water course and the history of its evolution is poorly understood. In fact, while the geographical boundary of this study is the Miyanab plain, it is an open question as to when the present course of the Gargar developed, and the Miyanab plain became constrained by its present boundaries.

The historic town of Shushtar is located at the northernmost part of the Miyanab plain. Approximately sixty kilometers south of Shushtar, the Karun joins with its main tributary, the river Dez. Nearly half a kilometer downstream from the Dez-Karun confluence, the Gargar joins the Karun, forming the Miyanab plain. Miyanab is a Persian word meaning 'between' (miyān) the 'water/watercourse' (āb), hence the area confined between the rivers.[61]

[61] In the local Shushtarī dialect, Miyānāb is shortened and pronounced *Meynow*, which is a homograph of word *Mīnū* (paradise). This has led to a good deal of misunderstanding. The shortened name has been frequently misunderstood as *Mīnū*, and seen as a reflection of the agricultural fertility of the Miyānāb Plain, i.e., the website of the UNESCO; World Heritage List; 1315; Shushtar Historic Hydraulic System. In other cases, Miyānāb has been understood as an abbreviated form of *Miyān-do-Āb* (between the two waters/watercourses), i.e.,Rawlinson, "Notes on a March from Zoháb," 75–76. In this case, the confusion is derived from the assumption that the name of the plain should contain *do* (two), referring to an island between two water courses. While the name *Miyān-do-Āb* exists in Persian, this assumption is wrong and the combination of *miyān* and āb (water course) makes perfect sense.

Geologically speaking, the Miyanab is part of the upper Khuzistan plains of lowland south-western Iran (Fig. 2.4).[62] Different terminologies have been used in the archaeological literature to describe the lowlands of southwestern Iran and the environmental zones found within them. These differences in terminology reflect scholars' understanding of the environmental and cultural similarities or differences between the lowlands of southwestern Iran and southern Iraq. The terms "southwestern lowlands of Iran" and "Greater Susiana" have been frequently used by archaeologists to describe the region. The southwestern lowlands are usually defined by the Zagros Mountains to the north and east, the lowland regions of southern Mesopotamia to the west and southwest, and the northern low-lying plains of the Persian Gulf coast. Such a definition, however, encompasses only the *upper* southwestern plains, stretching from the small valley of Mehran in the northwest to the Zohreh valley in the southeast. As a result of the particular geological history of Khuzistan, a chain of low, outlying folds separates the upper plains from the lower plains of Khuzistan which are in many ways similar to the southern lowlands of Mesopotamia.[63] In this study, the geologically specific terms—lowlands of southwestern Iran, upper Khuzistan plains, or upper plains of lowland southwestern Iran—are preferred to the archaeological terms — southwestern lowlands of Iran and Greater Susiana— because of their accuracy and neutrality.

The prevailing view in most general studies of the past is that the southwestern lowlands of Iran are geographically, and to a great extent, culturally an extension of the lower Mesopotamian plain. However, several scholars have emphasized the cultural as well as geographical distinction

[62] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 34.
[63] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 1.

between the two zones.[64] The lowlands of southwestern Iran can be considered an "ecotone" between the adjacent ecological ecosystems of the highland Zagros, the lowland Mesopotamia, and the marshes of lower Khuzistan. Formed by tectonic uplift and alluvial deposition, the region is bisected by several permanent rivers and agricultural plains which are capable of sustaining both dry farming and irrigation agriculture.[65] The geography and environment of the region have been thoroughly described in several archaeological studies of Khuzistan.[66] For the Miyanab plain, Moghaddam has recently provided a detailed description of the geographical setting. Therefore, in this section, I will limit my review of the natural setting to aspects that are critical to understanding the water history of the region.[67]

2.1.2. Geology and Hydrology

The southwestern plains of Iran were formed by a combination of tectonic uplift and alluvial deposition. Therefore, both geological and hydrological aspects of the region need to be considered in tandem. Recent decades have witnessed an emerging interest in the geoarchaeological study of the lowland plains of southwestern Iran, although this has primarily focused on the lower Khuzistan plains.[68] A recent study by Woodbridge, however, provides a

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[64] Ibid.; Hole and Flannery, "The Prehistory of Southwestern Iran," 148–149; Nissen, *The Early History of the Ancient Near East, 9000-2000 B.C.*, 87.

[65] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 1–2.

[66] Hole and Flannery, "The Prehistory of Southwestern Iran"; Hole, *The Archaeology of Western Iran*; Kouchoukos, "Landscape and Social Change in Late Prehistoric Mesopotamia."

[67] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 12–42.

[68] Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers: A Geo-Archaeological Approach: A Joint Belgo-Iranian Project: First Progress Report - Part 1"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 2"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 3"; Walstra, Heyvaert, and

useful discussion of geological and hydrological processes in upper Khuzistan from a larger regional scale to the micro-scale of individual land forms along the Karun river. The information in this section is primarily based on the latter source. [69]

The Zagros Mountains, the Persian Gulf and the fluvial plains of Iraq and Iran were formed as a result of a long process of plate convergence combined with high rates of river sediment transport into zones of subsidence. The Zagros Mountains are one of the youngest fold mountain ranges on Earth, formed as a result of ongoing collision between the Arabian Plate and the Iranian Block of the Eurasian Plate. In southwestern Iran, the Zagros Mountains are effectively narrower due to the Dezful Embayment, a feature which acts as a drainage node for the five major rivers flowing across the Khuzistan plains. [70]

Within an area of continental collision, major rivers frequently form in foreland basins which develop along the length of collisional plate margins or along compressional destructive margins. A foreland basin is a depression that develops adjacent to and parallel to a mountain belt (or orogen), mainly as a result of the large mass of crustal thickening associated with the formation of the orogen causing flexural bending of the relatively thin, elastic lithosphere of the tectonic plate floating above the relatively fluid substrate of mantle .[71]

The Mesopotamian-Persian Gulf Foreland Basin extends from northern Syria and Turkey to the Gulf of Oman and is adjacent to and parallel with the generally NW-SE trending Zagros

Verkinderen, "Remote Sensing for the Study of Fluvial Landscapes in Lower Khuzestan, SW Iran"; Heyvaert et al., "Susa and Elam."

[69] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran."

[70] Ibid., 49–50.

[71] Ibid., 9.

Mountains. It is the foreland basin for the major rivers of southwestern Iran. Foreland basin systems are comprised of four discrete sedimentary depozones: the wedge-top, the foredeep, the forebulge and the backbuldge (though the latter two maybe poorly developed or absent) (Fig. 2.1). Rivers develop with time in a peripheral foreland basin, and are the principal agent of transfer of sediments from the orogen and the wedge-top to the foredeep. A succession of folds frequently develops in a foreland basin parallel to the orogenic axis, with progressively younger folds rising further away from the highlands. In the lowlands of southwestern Iran, the upper plains are separated from the lower plains by such folds. Fig. 2.3 demonstrates the major folds in the lowlands of southwestern Iran, which follow the general NW-SE direction of the Zagros orogenic axis. The Miyanab plain is circumscribed by several folds: the Shushtar anticline to the north, the Sardarabad/Haft Tappeh anticline to the west, the Naft-i Sefid anticline to the east, and the Kupal anticline to the south.[72]

Rivers in foreland basins may be longitudinal (axial), flowing mostly parallel to the axis of the foreland basin and the majority of the folds and thrusts, or transverse, flowing mostly across the axis of the foreland basin, and the majority of the folds and thrusts. The Tigris and Euphrates are longitudinal rivers, while the main rivers of Khuzistan, such as the Karun and the Dez, are transverse. This is a feature that differentiates the upper plains of Khuzistan from the Mesopotamian fluvial plains. Note that the terms longitudinal and transverse apply only to the general course of a river. The transverse rivers of southwestern Iran including the Karun, for example, follow a longitudinal course in their fluvial plains in lower Khuzistan.[73]

[72] Ibid., 9–11,49–50.
[73] Ibid., 10–11.

The overall form of a peripheral foreland basin and that of its rivers depends on the relative balance between river sediment transfer and tectonic movements. Models of interactions between rivers and growing folds indicate that where rates of river aggradation exceed rates of structural uplift associated with the fold, a transverse river will flow across the fold. Where a fold does develop a surface topographic expression, as is the case in the upper Khuzistan plains, the river will either flow in a course across the fold; be diverted around the fold by channel migrations or avulsions; or will be ponded in a basin upstream the fold. The influence of tectonic uplift on the course of transverse rivers is poorly understood. Paradoxically, these rivers have a tendency to cut across many growing anticlines at locations of their greatest structural and topographic relief, and to be diverted around the "nose" of the anticline. However, this is only a tendency and rivers may cross a growing fold near the nose of the fold. The reasons for this variation are unclear. Another complicating factor in the interaction between rivers and topography is direct human intervention, particularly, channel straightening.[74]

The main watercourse in the study area is the Karun river (Fig. 2.4). The Karun is c. 870 km long. It originates in the Zard Kuh (Yellow Mountain) region of the Zagros and forms Iran's largest river basin (estimated at 71,980 km^2). The Zard Kuh region is an area of abundant springs. Unlike the Tigris and Euphrates, which receive their water only from snowing melt, the Karun is fed by annual recharged aquifers and is already a relatively large river at its source. The mean monthly flow regime of the Karun River is characterized by snow-melt dominated peak flows in March and April and low flows in September and October. The Karun and its main tributaries (the Wanak, Bazuft, Khirsan and Kiyar) wind their way through the Zagros, often in accordance with

[74] Ibid., 11,16,18,19.

the generally NW-SE oriented folds. Near the town of Gotvand (25 km northeast of Shushtar), the Karun exits a narrow gorge in the Turkalaki anticline and crosses the alluvial fan of the Aghili plain (Fig. 2.3, 2.4). After receiving the salty water of the Ab-i Shur, the Karun first crosses the Shushtar anticline and then the alluvial fan of the upper Miyanab plain. Immediately north of Shushtar, the Karun splits into two branches. The main branch delineates the western boundary of the Miyanab plain, while the smaller branch, the Gargar, defines the eastern boundary of the plain. After bifurcation, the Karun flows for approximately 10 km to the southwest before being diverted around the nose of the Sardarabad (or Haft-Tappe) anticline. It then flows to the southeast and south for 40 km until it is joined by its main tributary, the Dez, and immediately thereafter by the Gargar, at the Band-i Qir. Historically, the segment of the Karun located between Shushtar and the Band-i Qir is called the Shotayt. Before the Band-i Qir, the Karun takes a slightly southeasterly direction diversion around the nose of the Kupal anticline. From the confluence of the rivers to the village of Wais (Veys),[75] the Karun runs south in a very straight course. Considering that the Dez flows for approximately 7 kms upstream before joining the Karun and that traces of a large paleochannel exist immediately west of the present course of the Karun, there is a consensus that the Karun migrated from its natural eastern course into a man-made channel, and that the river Dez now flows in part of the older course of the Karun before joining it. The reasons for this shift and for the fact that Karun has maintained its straight course are still the subject of much discussion.[76] Below Wais, the Karun runs southwest across the lower Khuzistan plains before joining the Shatt

[75] Now, the small city of Wais.

[76] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 282–286; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 86–87,259, 268; Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 81–82; Moghaddam, "A Note on the Gargar Irrigation System"; Bakker, "Iran - the Development of Land and Water Resources in Khuzistan - Report to the Government."

al-Arab (Arvand Rud) which debouches into the Persian Gulf. Two features of the lower Karun need to be highlighted. First, at Ahwaz, the Karun has incised its bed across the large Ahwaz anticline. Second, a near straight course between Darkhovin and the confluence with the Shatt al-Arab seems to reflect human activities. The 4-km segment at the end of this course, between Khorramshahr and the Shatt al-Arab, is named the Ḥaffār Canal and is attested to the Buyid period with a good level of certainty. [77]

In the upper Khuzistan plains, the effect of changes in the sea-level of the Persian Gulf on major rivers, including the Karun, has been negligible due to the distance from the shoreline. The base-level for the Karun in the upper plains is effectively the rapids in the vicinity of "Band-i Ahwaz", where the river crosses the Ahwaz anticline. This series of rapids, with a total fall of about 2.5 m due to the greater erosion resistance of the Agha Jari Formation bedrock[78] and the uplift of the Ahwaz anticline, effectively shields the Karun upstream of Ahwaz from the effects of sea-level changes.[79]

Immediately after branching off the Karun, the Gargar cuts through the rocky outcrop on which Shushtar is built, in a deep and narrow channel c. 55 m deep and c. 30 m wide (Fig. 2.37).[80] The Gargar flows for nearly 5 km in a relatively straight and narrow southerly course for nearly 6 km, its channel never exceeding 200 m in width. Past the remains of a hydraulic structure named

[77] "Inventory of Shared Water Resources in Western Asia," 16–161; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 41–42; Potts, *The Archaeology of Elam*, 16; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 259–261, 345–345; "Environmental Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System."

[78] The steepness and incision force of a river that crosses an anticline is proportional to the erosion resistance of the geological formation in its way. When the resistance is great, a river will need to maintain a higher incision force by maintaining a steeper and straighter channel. Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 240.

[79] Ibid., 75; Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 253.

[80] Curzon, *Persia and the Persian Question.*, 2:372.

Mahibazan, the Gargar makes a large bend towards the east and then towards the west. Thereafter, it cut its way for c. 10 kms across the Kupal anticline before joining the Karun. The Gargar is a relatively young, meandering channel, with no evidence for mature scroll bars or oxbows. The river has sunk deep below the surface of the plain. Downstream from Mahibazan and the outcrop of Dastowa, the channel bed is wide (up to 1 km) and a few meters below the plain level (Fig. 5.6). From the middle of the plain onward, the river flows up to 10 m below the plain surface (Fig. 5.42, 5.61).[81]

The area that extends from the Gargar to the westernmost folds of the Zagros Mountains to the east has a very dynamic environment, with extremely high rates of erosion. The Gargar river basin has deeply incised its bed relative to the surrounding plain surface; several ephemeral streams run toward the river in a general east west direction creating an extremely truncated terrain on the east bank. Two major drainage channels, the Darreh Naft and the Darreh Haddam intersect with the Gargar basin north of the Kupal anticline (Fig. 2.5). These saline seasonal streams contain water only during the rainy months of January, February, and March. The surface water that flows toward the Gargar from east originates in three small wadi systems. From northwest to southwest their local names are Dar Khazineh, Ab-i Gonji, and Naft-i Sefid. Dar Khazineh, with a radial extent of about 13 km has a gently sloping incline. Much of this fan has been destroyed as a result of the increased incision caused by the more recently formed the Gargar Channel. Alluvial fans of the Ab-i Gonji zone, covering a radial extent of about 11 km, are flatter than those of Dar Khazineh. The streams in this zone seem to have had a lower level of flow, and the processes of fan

[81] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 253; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 261.

development are currently inactive. Alluvial fans within the Naft-i Sefid zone extend much deeper into the Zagros range. The deepest canyon, Naft-i Sefid, carries water that is both saline and contaminated by several nearby oil seeps.[82] While the alluvial fans just discussed are visible on global DEMs, the radical expansion of fish farms along the eastern bank of the Gargar entailing large scale land leveling activities has largely destroyed the fan systems of Dar Khazineh and Ab-i Gonji and is advancing toward the Naft-i Sefid zone.

The surface geological formations in the study area are Upper Miocene and younger. From old to young, the geological layers include the Middle Miocene-Middle Pliocene Agha Jari Formation (mainly sandstones interspersed with layers of marl and mudstones)[83], the Middle Pliocene-Pleistocene Bakhtyari Formation (mainly conglomerates, as well as sandstones and mudstones), and Quaternary fluvial deposits.[84]

2.1.3. Environmental History of the Miyanab plain in the Quaternary

Since the 1950s, it has been noted that the processes of land formation and the morphology of rivers in the Upper Khuzistan plains have occurred as a result of both tectonic and depositional activities. Upstream from Ahwaz, the Karun can be classified as mixed bedrock-alluvial valley. Over the long term (10^6 years), the river has been in a state of incision and deepening at a rate that reflects the balance between the incision and uplift forces.[85] Further, studies have suggested that

[82] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 21–23.
[83] The Agha Jari Formation is the bedrock in and around Shushtar and supplies the primary building material for hydraulic structures on the plain, as will be discussed in the next section.
[84] "The Renovation and Restoration Plan of SHHS-Vol 7," 189; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 57.
[85] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 75.

late Quaternary land forms in Upper Khuzistan are characterized by a shift between river aggradation and river incision. Despite the clear implication of these geo-hydrological processes for the archaeological study of hydraulic and settlement histories, both the rates of tectonic uplift and the structural development of southwestern Iran during the Quaternary are very poorly known. Nevertheless, a few geological studies in the upper plains that have focused specifically on archaeological issues provide important insight into the role of the uplift, incision and aggradation in the Holocene Human-Environmental interaction in this zone.

Lees and Falcon disagreed with de Morgan's hypothesis that after the initial period of orogenic formation, alluvial deposition and sea level changes in have been the primary geological agents in the region.[86] They emphasized that various land forms in the Mesopotamian-Persian Gulf basin are a result of the balance between sedimentation, tectonic uplift and subsidence. As an example, they studied the geo-archaeological stratigraphy at Dar Khazineh, a site on the eastern bank of the Gargar that had just been excavated (Fig. 2.6 left). At the site, the highest layers containing archaeological finds were nearly 2.5 m below the top of the terrace. From there, archaeological layers extended as much as 3 m deeper, and include flint, copper and black on buff Late Susiana painted pottery. The sections suggested that the site was occupied for millennia, during which time the alluvial plain built up to at least 3 m. The site seems to have become uninhabitable due to flooding. From the latest archaeological layer upward are layers of "water-washed" appearance, coarse river gravels, 13 cm of silt, and then 18 cm of coarse sand and thin gravel lenses. The last depositional stratum seem to be evidence for a winding river course. These fluvial deposits were overlain by 2 m of fine laminated silts containing *Lymnea*, which according

[86] Lees and Falcon, "The Geographical History of the Mesopotamian Plains"; Morgan, *MDP 1*, 4–48.

to the authors implies a lacustrine environment. They suggest that the upper silt layer was surface of the alluvial plain for an extended period, given that evidence of small Sasanian settlements[87] were scattered over the ground surface. The next event was a rapid river incision to a depth of 5 m. Lees and Falcon interpret this final phase as "rejuvenation of the Karun system" for reasons that have yet to be determined. They speculate that this hydro-geological change happened because of renewed subsidence of the plains to the southwest, a tilting of the hills to the northeast, or a combination of both. For any scenario, the increased gradient of the rivers caused them to trench into the alluvial deposits which had been accumulating during the still-stand period. Lees and Falcon acknowledge that the incision might have started earlier than the date suggested by the surface pottery, but it is clear that between the Late Susiana period and modern times, there was a build-up of the land surface by sedimentation to about 2.5 m, followed by an entrenchment of the rivers by 5 m. Lees and Falcon admit that this evidence might be a rather local effect, due to the impounding of a local lake by a temporary barrier or to recent movements of the Naft-i Sefid anticline. [88]

Recently, Alizadeh and colleagues conducted a geo-archaeological study on the Miyanab plain, particularly focusing on the area and the site of Dar Khazineh (Fig. 2.6 right). Excavation at the site and observations of nearby wadi sections confirmed Lees and Falcon's hypothesis that during the Late Susiana period, a transition happened on the plain from the relatively stable land to one marked by continuous aggradation. During this phase, the base level of the wadi systems east of the Gargar River were significantly higher than at the present. However, the team found

[87] Given the still very poor knowledge of the later historical pottery sequence, which was certainly more severe in the 1950s, I prefer to interpret this evidence as suggesting "later historical settlement" and not necessarily "Sasanian".
[88] Lees and Falcon, "The Geographical History of the Mesopotamian Plains," 32–33.

cultural deposits of the Middle Elamite period (ca. 1300-1100 BCE) above the upper loam; and as such they speculate that the phase of aggradation must have lasted for nearly 3000 years. They also speculate that significant flooding and aggradation occurred only under specific conditions, given that some prehistoric deposits occur at plain level or at very shallow depth. The team has found traces of old channel beds several meters above the modern wadi floors. According to the authors, although the deposits in these handing wadi channels are occasionally gleyed, freshwater mollusks and other signs of sustained water logging and persistent flow are absent. Therefore, seasonal floods have been understood to account for the sustained aggradation. The authors suggest that at least by the Middle Holocene, seasonal floodwaters were distributed widely across the plains rather than confined to wadi channels. Yet, two statements in this report seem to undermine the argument for aggradation caused by a pattern of strong seasonal floods. First, marine mollusks have been mentioned in the list of recovered fauna from newly excavated trenches at Dar Khazineh. Second, Later Susiana occupation surfaces are reportedly interstratified with low energy over bank deposits.[89] Another point of divergence from the Lees and Falcon study is the fact that Alizadeh et al. attribute the incision event to the sudden appearance of the Gargar as a large manmade canal on the plain in the Sasanian period (Fig. 2.7). Prior to the existence of such a stream, wadis in the region flowed westward from their sources on the Naft-i Sefid anticline to the Karun. During this phase, they argue, wadi channels were longer and less steep than at present and flowed across the plain in an aggrading manner. In response to the sudden appearance of the

[89] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 72–74.

Gargar, wadis began to incise and erode the plain, resulting in the extension of the drainage network through gully and tributary head-cutting.[90]

Another geographical project that focused on archaeological issues was carried out on the Deh Luran plain by Kirkby.[91] In this thorough study, in addition to the geography and environment of the Deh Luran, several aspects of land and water sources in the upper Khuzistan plains were carefully examined. Kirkby studied the archaeological evidence from excavations across the upper plains and concluded that continuous aggradation after ca. 4000 BCE by river flows was in all likelihood simultaneously happening across the upper plains of Khuzistan. Around 1500 BCE the process ceased and was replaced by down-cutting that formed more stable river channels. Kirkby used historical and archaeological evidence to suggest that by 500 BCE at the latest, the rivers were more or less all in stable, incised channels. Stream regimes during the aggradation phase might be meandering with levees or braided. The former regime only occurs where sediments are sufficiently fine grained. In coarser material, meanders develop without appreciable levees as it can be seen today in upper plains. The absence of levees in the aggraded plains of Khuzistan confirms a braided regime that most likely once covered the whole of the Khuzistan plains. As we can see in his sketch of river fans of upper Khuzistan, the Upper Miyanab plain is characterized as having been covered with a braided fan (Fig. 2.8).[92]

Kirkby's estimation of the onset and the end of aggradation process can be aligned with the evidence from Dar Khazineh. But, he attempted to define the phenomenon in the larger context of the Khuzistan plains. He suggested that because the aggradation event was synchronized across

[90] Ibid., 80–81.
[91] Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains."
[92] Ibid., 280–283.

Khuzistan, the causes must have been widespread and regional. Kirkby disputed the argument put forth by Lees and Falcon. He argued that the impact of tectonic uplifts is limited and cannot account for the scale and uniformity of the phenomenon. He argued that environmental change offers the best answer for a phenomenon at this scale. Kirkby hypothesized that the aridity following the Pleistocene (ca. 8000 BCE) was the primary cause of aggradation. So, his study diverged from the two earlier ones in suggesting that aggradation which was recorded in the archaeological sequence of Dar Khazineh was part of a process that started around 8000 BCE and continued until ca. 1000 BCE. From c. 4000 BCE onward plain aggradation was stabilized. In drier periods, the plain cover in the upstream areas is reduced, which results in more surface run-off and erosion upstream and increased sediment load. As channel incision is needed to carry sediments, the changes first happen in the upstream areas and progressively move downstream. There is a transition between headwater erosion and downstream aggradation. As the upstream erosion reaches equilibrium, the transition point moves downstream. Kirkby suggested that over thousands of years, erosion areas spread downstream into the Khuzistan plain. Overgrazing can have similar effect on upstream plant coverage as drought. But, the increased grazing of domesticated animals after 8000 BCE seems to have had limited impact. Agriculture is not considered relevant because large-scale cultivation only began at the end of this process. Furthermore, large-scale canal agriculture affects low-water regimes and not peak flows, which are the main force responsible for the geomorphological changes described above.[93]

Kirkby's further contribution was his study of micro-environmental zones on plains and along rivers. He emphasized that the environmental zones he delineated for Deh Luran have

[93] Ibid., 283–285.

parallels in many plains in northern Khuzistan. Kirkby defined three environmental zones. First, the "dry steppe" near the mountains, which has the worst condition for dry farming because the soils have low-moisture retention. This zone is almost entirely given to grazing—even though the best grazing zones gradually shift to the river valleys. Second, the heavily used "alluvial plain," where fine soil and low slope provide good moisture conditions for agriculture while allowing enough passage of water to minimize salinity. Third, the "seasonal marsh," which is created after winter floods[94]. In this zone, high calcareous silt and slow drainage has increased salt level to the extent that cultivation is prevented. But, it is impotent to note that the salinity is natural and not the result of excessive irrigation. In addition, Kirkby argued, four distinct but shifting zones existed along the length of a river systems in Khuzistan after 8000 BCE; (1) a head water area of erosion; (2) an incising alluvial area that had been deposited previously—most of the current study area lies within this zone; (3) an area of active aggradation, where stream levels are close to the surface and change course frequently. This zone is optimal for agriculture, as water can be brought to the fields with a simple diversion system. Zone 3 is liable to floods while active sedimentation prevents salinity. Kirkby argued that while this zone does not exist today in Deh Luran, it was the most favorable location for early settlements. Similarly, zone 3 does not exist on the Miyanab plain today, but, the archaeological evidence from Dar Khazineh that was described above suggests an active aggrading zone since the late fifth millennium BCE; (4) a downstream area where distributaries formed in the aggradation area gradually came together, usually reuniting in the old downstream river bed. This is a rather disorganized drainage zone and is particularly susceptible to marsh formation. The possibility of such a zone playing a role in the settlement history of the

[94] Although this zone is absent on present day Miyānāb, it might have existed before and might have had a crucial role in the distribution of pre-Parthian settlements.

Miyanab will be discussed in chapter 6. Kirkby emphasized the need to think about the dynamics of these zones as they were affected by thousands of years of environmental change. As a general trend, he speculated that between ca. 8000 BCE and ca. 1000 BCE, areas of aggradation gradually moved downstream while marshes first contracted and then expanded. Between ca. 8000-4000 BCE, sedimentation and marsh zones both moved downstream as the marshes were shrinking. In this period, agriculture was possible in zone 3, which also benefited from high water table near the marsh zone. After 4000 BCE, the marshes tended to expand while deposition zones continued to move downstream; for the first time, the marshes began to expand to the dissected parts of the plain. Likewise agricultural land was to be found in the zones that had begun to be incised. For smaller tributaries the channel bed was still shallow enough to allow agriculture with primitive water diversion methods, but, water extraction from rivers had become impossible without large canal systems. [95]

Woodbridge's study of the impact of human interventions and tectonic movements on the course of the Karun and its tributaries confirms the hypothesis presented by Lees and Falcon. Namely, the tectonic uplifts of folds in the upper plains might have triggered hydrological changes at a regional scale. Unfortunately, six decades after Lees and Falcon's investigation, the rates of active uplift and subsidence as well as the geomorphology and structural development of southwestern Iran during the Quaternary are still very poorly known. The role of tectonic uplifts in vertical surface movements is very difficult to determine due to complex factors such as extensive sedimentation, sea-level changes and shoreline retreat and advances. However, studies have proven that regional uplift northeast of the Zagros Deformation Front (ZDF) increases with

[95] Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 285–87.

distance from the ZDF, while general subsidence is happening southwest of the ZDF. At locations roughly 60-130 km to the northeast of the ZDF, which includes Miyanab, moderate rates of tectonic uplift, in the range of about 0.2-2.3 mm yr^{-1} are estimated. Within this rate, Woodbridge has used OSL dating of river terraces as well as the archaeological literature on the history of construction of hydraulic structures at Shushtar to estimate the rates of uplift of individual anticlines that delimit the Miyanab plain. In addition to vertical Earth movements, the difference in uplift rates in the area between the ZDF (c. zero) and within the Dezful Embayment (c. 0.2-2.3 mm yr^{-1}) is sufficient to produce regional tilting. This regional tilting would occur from northeast and east northeast to southeast and west southwest, at average rates of 1.5×10^{-6} to 3.8×10^{-5} radians kyr^{-1}. These directions of tilt are consistent with the tendency for major rivers in the upper Khuzistan plains to migrate toward the west and south-west over millennial timescales. Thus, the Karun now occupies a course near the west and southwest margin of the Miyanab plain. [96]

In sum, despite the fact that reasons for the Late Quaternary geological and hydrological processes are still debated, a loosely defined, two-fold fluvial aggradation sequence separated by erosion and river incision has been established by archaeological and geological research in southwestern Iran. An older fill (c. 50/38 ka-7.3/6 ka) of mainly alluvial gravel was probably deposited in a cold and fairly dry climate. It was followed by an Early-Middle Holocene floodplain aggradation of sand and mud (ca. 8000/6500 BCE-1500BCE/500BCE). A period of incision followed this phase which resulted in rivers being established in their present incised valleys. While the beginning and end of this process are not well established, it seems that the second phase

[96] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 66–68, 196–99, 206–207. These rates of tilting, however, are considerably less than the threshold suggested in former studies as necessary for avulsion. Therefore, other factors might be involved in the avulsion of rivers in Upper Khuzistan. Ibid., 206–207.

of aggradation, comprised of silty sands and clays, started by ca. 700 AD.[97] It is important to note that while in geological terms this sequence may be considered "synchronous" across the upper plains, in archaeological terms temporal and geographical variations are considerable.

2.1.4. Climate[98]

Generally speaking the Miyanab plain is located in the semi-arid zone. Specific climatic conditions of the plain are briefly described below.

Precipitation

The Miyanab plain is situated between the 250 mm and 340 mm isohyets, but most of the Miyanab receives 300 mm or less of annual rainfall. The relationship between elevation and rainfall in Khuzistan is not linear. In the southern plains, rainfall is minimal. In the upper plains and nearer to the mountain front, precipitation almost doubles. Thereafter, the increase of rainfall with elevation is much less. Furthermore, in southwestern Iran, average precipitation rates do not reflect the great inter-annual variability in precipitation that may occur: some areas may receive as little as 85 mm rain in some years and as much as 580 mm in others. On the Miyanab, as in other areas of low elevation in Khuzistan, rainfall peaks in December. Almost half the annual precipitation on the Miyanab falls between November and January. At high elevations, a second peak is observed in March, which is reflected in the spring peak river flows.[99]

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[97] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 57, 68.

[98] For climatic data, the LAR report has been consulted primarily because it is focused on Shushtar and Miyānāb, utilizing the weather and gauging stations on and near the plain.

[99] "The Renovation and Restoration Plan of SHHS-Vol 7," 173–74; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 77; Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 268.

Temperature

The maximum average annual temperature recorded at Shushtar, between 1969 and 2001, is 26˚C. December and July are respectively the coldest and warmest months of the year. The maximum and minimum temperature recorded in this period are 50˚C and -1˚C.[100]

Evaporation

The high air temperatures of summer produce high evaporation rates between c. 2,000 and 3,000 mm yr-1 in Khuzestan, of which 66 % occurs during May - September. Hence, evaporation greatly exceeds precipitation throughout the region. The average open water evaporation on Miyanab, between 1969 and 2001, is 2963 mm. The maximum and minimum evaporation is recorded in Jul-Aug and Dec respectively.[101]

Flow and Floods

Low and peak flows in the Karun occur in Sept-Oct and Mar-Apr (Fig. 2.9). High flow starts with winter rainfall and peaks, generally in spring, with snow-melt and rainfall in Zagros. The average flow, 1955-2001 (1334-1380 AH) in the two branches of the Shotayt and the Gargar was 379 and 43 m^3/s, respectively. The maximum flow of both branches during this period was almost twice this figure (Fig. 2.10). Flood records do not exist for the entire period. Based on the existing data, the biggest flood recorded for the Karun at Gotvand was 6164 m^3/s, in 1980. For the Shotayt, this figure was 4015 m^3/s, in 1998. For the Gargar, the biggest recorded flow flood was 406 m^3/s, in 1980. Construction of several reservoir and regulating dams on the Karun since the

[100] "The Renovation and Restoration Plan of SHHS-Vol 7," 174.
[101] Ibid.; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 78; Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 269.

1970s has significantly reduced both the frequency and flow of the floods of the Karun. However, frequently occurring floods (2-5 year return period) can amount to 7-10 times the average flow of the river.[102]

Water Quality

Based on the Wilcox water quality index, the Karun's water is good for agriculture and acceptable for drinking. Among the tributaries of the Karun, the Dez has the best and the Shur has the worst water quality. Almost all of the chloride occurs in the form of NaCl (salt) and the sulphate occurs mostly as $SaCo_4$ (gypsum).[103] It should be noted that the water quality index describes the natural composition of the waters and the dramatic effect of domestic and industrial waste on Karun water quality is not taken into account.

[102] "The Renovation and Restoration Plan of SHHS-Vol 7," 9–17; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," 39–40.
[103] "The Renovation and Restoration Plan of SHHS-Vol 7," 174–75; Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 272–73.

2.2. The Hydraulic Landscape of Miyanab: An Introduction.

In this section, I will introduce the main elements of the historic hydraulic landscape of the Miyanab plain (Fig. 2.1). For each case, a description will be followed by a brief discussion of the known and unknown aspects of the origin, function and development of each feature. A final analytical discussion of the elements of the hydraulic landscape of the Miyanab is provided in chapters 6. The sources that are used here include works of the medieval geographers and historians, publications of 19th and 20th century travelers, as well as recent scholarship about the water history of the Miyanab plain. Five sources in particular are briefly introduced here in the order of publication:

1) An account of the hydraulic structures at Shushtar published by the Dutch engineer Graadt Van Roggen in 1906: Van Roggen was appointed by the Qajar government to investigate the remains of the waterworks of Khuzistan so that they could be repaired and so that the impoverished province could be restored to its former agricultural prosperity. He visited Shushtar and several other locations in 1900. Although the restoration plans were not carried out, Van Roggen left us with a detailed analytical documentation of the headworks at Shushtar at a time when the archaeological landscape was relatively intact.

2) The travelogue of an Iranian engineer, Mīrzā ʻAbd al-Ġaffār Najm al-Mulk: Najm al-Mulk was one of the first people to teach and apply modern sciences in Iran, and he created the famous map of Tehran in the Naseri period. He was appointed by Nasir al-Din Shah to undertake this task some twenty years before van Roggen, and began work in the winter of 1882 CE. Najm al-Mulk's report to the king was published in Persian in 1962, under the title *Safarnāme-yi Ḫuzistān* (The Khuzistan Travelogue). Ahmad Kasrawi mentioned that the original report

accompanied Najm al-Mulk's maps of hydraulic remains, but the editor of the travelogue failed to find either the original maps or their copies.[104] Nevertheless, the travelogue provides one of the richest descriptions of agricultural production and hydraulic infrastructure in early modern Iran. In addition to detailed descriptions of water sources, the travelogue provides a vivid picture of socioeconomic conditions in the region. Moreover, it records the names of features and locations accurately, for unlike European travelers, Najm al-Mulk spoke and wrote in Persian.

3) The report of the Lar Consulting Engineers Co's (Iran) study of hydraulic headworks at Shushtar which was submitted in the winter of 2005, to the patron of the project "Ganjineh-yi melli-yi āb-i Iran" (The National Hydraulic Treasures of Iran): Ganjineh is the research department in the Ministry of Power that is concerned with the study, documentation and restoration of historic hydraulic infrastructure. In 2000, a large-scale irrigation project was lunched on the Miyanab plain that was to result in significant alteration/destruction of the hydraulic and archaeological landscape. The goal was to intensively irrigate the entire 36000 ha of cultivable land on the Miyanab plain. Although the planning for modernization of irrigation on the plain began in the early 1980s, the plans did not go into effect until 2000. In anticipation of the expected destruction of the archaeological record, the project triggered two comprehensive studies of the hydraulic landscape of Miyanab, which had been largely left out of modern archaeological research on Khuzistan. One of them was a multi-disciplinary study of the best known hydraulic remains at Shushtar, assigned to the Lar Co. Many of the ambitious goals of the project remained unrealized

[104] I have heard of some other scholars who more recently looked for the maps and could not find them. In 2013-2014 an Iranian colleague and I tried to find the maps, which we heard were kept in the archive of the Ministry of Foreign Affairs. After much back and forth, we were given only a sample of the digitized maps in that archive that related to the documentation of rivers and hydraulic remains. Among them, one of Najm al-Mulk's maps was found. I will include it in my images. I heard that another researcher is publishing a few other maps of his.

mainly because it is difficult to document hydraulic remains in a river. But, for the first time a systematic study of the hydraulic function of these structures as a group was conducted and the findings of this study have contributed greatly to the present research.

4) The Archaeological Survey of the Miyanab plain, directed by Abbas Moghaddam from the Iranian Center for Archaeological Research (ICAR): This was another important study undertaken in anticipation of large scale landscape change on the plain. More information about this project will be provided in this chapter, in the discussion of the settlement pattern of the plain. The comprehensive reports of this project were published in Persian and English in 2005 and 2012, respectively.

5) Peter Verkindern's dissertation research on the waterways of lower Iraq and Khuzistan in the Early Islamic period:[105] The research is an excellent critical study of the works of Muslim geographers and historians as well as the reports of modern travelers. The work combines the author's competence in Islamic historiography with a close reading of the archaeological literature. My research has greatly benefited with this excellent and compelling synthesis of the historical sources on the water courses and hydraulic structures of Miyanab.

2.2.1. Hydraulic Landscape of Miyanab: An Overview

The hydraulic landscape of the Miyanab is composed of three groups of elements: the two rivers that encircle and define the plain, namely the Karun (the Shotayt) and the Gargar, which were described at the beginning of this chapter; the Dariun feeder canal and the associated canal

[105] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period." The dissertation was recently published (2015) under the title "The Waterways of Iraq and Iran in the Early Islamic Period: Changing Rivers and Landscapes of the Mesopotamian Plain."

network that crisscrossed and irrigated the plain prior to the recent large-scale modernization projects;[106] the hydraulic structures which regulated the flow of water in the aforementioned canals. Most of the remaining structures are located in the historic town of Shushtar (Fig 1.1, 2.13). In addition, certain structures outside Shushtar will be presented and discussed. This chapter is meant to present an overview of the features that are to be studied and is not an exhaustive survey of the textual and archaeological evidence. Additional archaeological and textual evidence will be presented in the discussion chapter. For ease of reference, relevant passages from all of the historical sources which were consulted are provided in Appendix C.

2.2.2. The Karun /The Shotayt/Čāhār Dāngeh

Immediately northeast of Shushtar, the Karun River divides into two branches. The main branch of the Karun, between its bifurcation and confluence with the Gargar, is called the *Shotayt*[107] (Fig. 2.11-2.13). Shotayt is the diminutive of the Arabic word *Shatt*, meaning a large river. It flows around the north of the rocky outcrop of Shushtar for ca. 1.5 km. It then turns southwest to the Sardarabad (or Haft Tappeh) anticline where it begins to flow toward the southeast. In this stretch of the river, c. 25 km, its course is very unstable, with parallel channels, numerous old meanders, oxbow lakes and scroll bars. For the remaining 20 km, the river follows a generally southward course that is characterized by large, relatively stable meanders. As discussed earlier, the difference between the upper and lower course of the Karun in the Miyanab region can be attributed to variations in slope and sediments, between the fan to the north and the

[106] The recent agricultural modernization project, too, depends to a large degree on the Dariun canal. Hence, the project is dived into seven phases, Dariun 1-7. However, the modernized canal network was built by the destruction of the old canal and its famous intake from the Karun river. The new canals only generally follow the courses of the main old canals (Fig. 2.15-2.17).
[107] Šuṭayṭ

flat plain to the south. The Karun joins the Dez and shortly thereafter the Gargar (see infra) at the Band-i Qir (the Bitumen Dike), which marks the southern limit of the Miyanab plain.

The Gargar did not join the Karun at the Band-i Qir before the Middle Islamic period (see infra). Therefore, the earliest sources do not contain information on the name of this particular segment of the river. *Nahr-i Tustar*/*Āb-i Tustar*/*Dujail al-Ahwaz*/*Dujail*/*Nahr al-Ahwaz* are the names of the Karun in Medieval sources. These names were used interchangeably in contemporary sources even by the same author. [108] Yet, a difference between the choice of name between geographical and historical sources, and between earlier and later sources, can be discerned.

Dujail al-Ahwaz, often abbreviated as Dujail, the diminutive of Dijla, is the standard name of the Karun throughout the medieval period.[109] The 10th century geographers, however, use Nahr Tustar or Āb-i Tustar (the river of Shushtar) to refer to the Karun.[110] Gradually Āb-i Tustar was used only to refer to the river in the vicinity of Shushtar.[111] But, the works of later medieval authors who copied from multiple sources present a confusing picture as they used both names. The fact that *Dujail* is the more common name at this time is nevertheless clear from explanatory phrases added to the copied texts, e.g. "And, in the land of Khuzistan, there are flowing rivers and the biggest of all is Nahr Tustar, which is called Dujail al-Ahwaz"[112] or from the fact that an entry for Dujail al-Ahwaz is added along with the 10th century entry for Nahr Tustar.[113] Nahr al-Ahwaz, is the third name for the Karun in medieval sources, although it appears far less frequently.[114]

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[108] *Ya' Bld*, 361; *Ya' Trḫ*, Vol 1:180; *Yāq*, 285, 243; *Dim*, 97, 115.
[109] *Bal Fut*, 380; *Faq A*, 227; *Ya' Bld*, 361; *Ḫal*, 172; *Ḫur*, 172; *Rus*, 91; *Dim*, 115; *Suh*, 129; *Fid*, 57–58.
[110] *Iṣṭ*, 89; *Ḥaw*, 2:251–2; *Dlf*, 28; *Yāq*, v. 4:3.
[111] *Nuz D*, 165; *Juġ*, v 2:253; *Dim*, 97.
[112] *Idr Nzh*, 393.
[113] *Juġ*, v1:157, 161, 163.
[114] *Muq*, 19, 419; *Dim*, 97.

In modern literature, the Greater Karun (*Per*. Karun-i Bozorg) refers to the waterway formed after the Shotayt joins the Dez and the Gargar. A similar notion is observed in medieval sources. Prior to the joining of the Karun and the Gargar, the main landmark along the river between Shushtar and Ahwaz was its confluence with the Dez (*Nahr as-Sus* and *Āb-i Dezfūl* of Medieval and early Modern sources, respectively) which is frequently mentioned by Muslim geographers (see infra).[115]

While the date of the hydrological shift of the Karun that caused it to join the Gargar is debated, it is clear that by beginning of the 14th century the current situation was established: the Gargar and the Dez joined the Karun/Shotayt near the ruins of ʻAskar Mukram to form the Greater Karun.[116] By this time, the river had received a new name, Čāhār Dāng/Dāngeh (*Per*. The four-sixths), while the smaller branch was called Du Dāng/Dāngeh (*Per. The* two-thirds).[117] These names reflect the assumption that the water of the Karun is divided in such proportions between the Shotayt and the Gargar branches.[118] Comparing the accounts of European travelers with the travelogue of Najm al-Mulk suggests that in the 19th century, Čāhār Dāngeh and Du Dāngeh were still the standard local names of these water courses, while the Shotayt and the Gargar had begun to dominate official literature: Europeans used the latter names and only mention the former when referring to the division of the water at Shushtar.[119] In contrast, Najm al-Mulk used only the former

[115] *Yāq*, 361; *Ḫur*, 176; *Rus*, 162; *Dim*, 115; *Suh*, 129.
[116] *Nuz S*, 207.
[117] Ibid.; *Ẓaf*, 702–3. All the non-Iranian sources (early modern and present-day) record these two names as Čāhār Danig and Du Danig, while the Persian word for "a sixth" is Dang and not Danig. It seems to be a mistake that has persisted since the 19th century. Dang, which is the formal written word, often becomes Dangeh in colloquial pronunciation of the combinations such as four sixths (Čāhār Dangeh). Najm al-Mulk Persian recording of these names confirms my initial speculation that Danig is a mistake that has been repeated to the present day.
[118] *Nuz S*, 207; Rawlinson, "Notes on a March from Zoháb," 74.
[119] Rawlinson, "Notes on a March from Zoháb," 74.

names and in one instance mentioned that Čāhār Dāng/Dāngeh is also called the Shotayt.[120] This trend persisted. While Čāhār Dāng/Dāngeh is still remembered as the name of the segment of the Karun between Shushtar and the Band-i Qir, the water course is at present called the Shotayt or simply the Karun. [121]

Before the Gargar and the Karun joined, the main landmark along the Karun between Ahwaz and Shushtar was the Early Islamic town of 'Askar Mukram, the ruins of which are found approximately 2-3 km north of the Band-i Qir. The history and evolution of this Islamic town will be discussed in detail in chapter 6. It was the only Islamic city founded in Khuzistan after the Conquest, most likely in the later 7th century/early 8th century, and grew to eclipse Ahwaz and Shushtar by the 10th century. The standard 10th century description, repeated in later medieval sources, states that the Nahr Tustar passes behind (warā'i) 'Askar Mukram until it reaches Ahwaz.[122] Ya'qūbī's account is interesting in that it includes Jundi Shapur as a settlement along the Karun: "the water of Nahr al-Ahwaz comes from two wadis (rivers), one originates from Isfahan (i.e., the Shotayt) and flows to pass the Shadorwan of Tustar and 'Askar Mukram and Jundi Shapur. The other (the Dez river) originates in Hamadan and flows toward Sūs; then the two rivers flow toward Manāḏīr-i Kobrā[123] where they join and become one river which is called Dujail al-Ahwaz."[124] Beside this uncommon reference to Jundi Shapur, which is not on the Miyanab,

[120] Najm al-Mulk, *Naj*, 27–35.
[121] At least for the Shoteyt, the sudden appearance and dominance of the name in the early modern literature could be explained by the general trend of Arabization of the province which was encouraged by the British. While some Iranian scholars have opposed the use of this name, I decided to maintain and use it because it is still commonly used by local people and development agencies.
[122] *Iṣṭ*, 79; *Ḥaw*, 2:252; *Idr Nzh*, 393.
[123] An Early Islamic Kura (Province) and settlement which seem to have been deserted by 10th century (ref).
[124] *Ya' Bld*, 203.Verkinderen is puzzled by this account and proposes a translation that does not place Jundi Shapur along the Karun. I disagree with his translation as it does not accord with the tenses of the verbs. Yaqubi's conception is eccentric but not unacceptable, as Jundi Shapur is indeed depicted along the Karun in some of the 10th century

‘Askar Mukram is the only settlement on the plain that is frequently mentioned by medieval authors as a landmark along Nahr Tustar. Verkinderen has speculated that the lack of geographical names along the upper course of the Karun is due to the fact that no major roads passed along it. That might well be true. It is important to note, however, that the main land route from Iraq (al-Wasīt) to Fars connected Jundi Shapur and ‘Askar Mukram and crossed Nahr Tustar most likely somewhere near the nose of the Haft Tappeh anticline. The location of this crossing in not mentioned anywhere in our sources. Therefore, this silence might also relate to the fact that no important settlement existed along this course, as suggested by the map of archaeological sites on the Miyanab. The next settlement that is located along Nahr Tustar or Dujail al-Ahwaz after ‘Askar Mukram is al-Ahwaz (also called Sūq al-Ahwaz and al-Hurmuz). There is a consensus that, prior to the Middle Islamic period, the Karun continued its course to the south in a meandering bed that was later abandoned, traces of which are clearly visible on satellite imagery (Map 6.12).

2.2.3. The Gargar/ al-Masruqān/ Du Dāngeh

Today, the smaller stream that is created after the bifurcation of the Karun at Shushtar is called the Gargar River (Fig. 2.11-2.13). The Medieval name of the river was al-Masruqān (al-Mašruqān). This water course is the most frequently mentioned component of the irrigated landscape of Miyanab. The two aspects that were raised by medieval authors continue to form the basis of intellectual inquiries about water history in the region: First, when and how did the river form? Second, what was the role of the Gargar in irrigation agriculture and what areas were irrigated by it?

maps; see Kramer’s Ibn Hawqal for example. In fact, neither Askar Mukram nor Jundi Shapur are in that sense actually located along the Karun.

As explained earlier, by the 14th century, the river had received a new name: Du Dāngeh. The fact that later medieval authorities continued to copy earlier sources makes it difficult to know when the name Masruqān was abandoned. It is likely that it occurred in association with the hydrological event south of the Miyanab that transformed the hydraulic landscape of the region. It seems likely that by late 14th century, the name Masruqān had gone out of use. This is suggested by the fact that Hafiz Abrū was unaware that Masruqān and Du Dāngeh refer to the same water course. In his account of Shushtar, which is based on first or second hand information, Hafiz Abrū describes the hydrology of the city surrounded by Du Dāngeh and Čāhār Dāngeh.[125] In his geographical list, however, which is copied from earlier sources, he names the Masruqān and modifies the description, adding that it originates in the environs (*Nawāḥī*) of Shushtar. Likewise, he states that Nahr Tustar arose from behind ʻAskar Mukram and does not link it to Shushtar.[126] It is nonetheless unclear whether the names Du Dāngeh and Čāhār Dāngeh first appear in the Middle Islamic period or whether they were already used by locals during earlier times.

By the late 18th century, the name Gargar was frequently used alongside Du Dāngeh.[127] Rawlinson tells us that the name derived from the easternmost city quarter of Shushtar.[128] Two local histories of Shushtar in the 18th and 19th centuries inform us that post-Safavid sectarian strife caused the clustering of neighborhoods to two zones: Dastowa, west of the city, and Gargar east of the city and near the Gargar river.[129] Whether the river gave its name to the city quarters or the

[125] *Juġ*, v2:93.
[126] Ibid., v1: 162–63.
[127] It has been become common in modern Persian usage (even in scholarly literature) to assert that the name Gargar was in use in the 14th century. All sources cite Mustawfī as saying the city had four gates, one of which was called Gargar. Mustawfī writes, however, only that the city had four gates and does not name them. *Nuz S*; *Nuz D*.
[128] Rawlinson, "Notes on a March from Zoháb," 74.
[129] *Tuḥ*, 58–59.

converse is not clear, in particular as the meaning of the name Gargar is not understood. There are several folk etymologies for the name Gargar, one of which concerns certain water lifting devices along the river.[130] However, since Gargar appears in certain placenames, e.g., Ṣahra-yi Gargar (*Per*. The Gargar plain) or the Gargar neighborhoods, I favor the idea that the river was named after a place called Gargar, around the 18th century.

There is no ambiguity about where the stream begins. Medieval authors state that the Masruqān branched off the Nahr Tustar at or near Shushtar. Very often the description makes it clear that the river was separated from the Karun upstream from the Shadorwan (see infra) of Tustar.[131] The fact that the present configuration of the city, surrounded by canals on all sides, was established by the time of the Muslim Conquest is proven by a 7th century Syriac text, known as the Chronicle of Khuzistan or the Anonymous Chronicle. There is a consensus that the text was written during or immediately after the conquest of Khuzistan (no later than 680s) by a resident of the region, and is not influenced by the Islamic historiographical tradition.[132] The text reports that all of the fortified towns of Khuzistan were conquered except for Shush and Shushtar, which were very strong. The conquest of Shushtar was extremely difficult because "This Shushtra is very extensive and strong, because of the mighty rivers and canals that surround it on every side like moats. One of these was called Ardašīrgān, after Ardašīr who dug it; another, which crossed it, was called Šamīrām, after the queen; and another, Dārāyāgān, after Darius. The largest of all of them was a mighty torrent, which flowed down from the northern mountains."[133]

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[130] Ibid.
[131] *Ḫur*, 176; *Rus*, 90; *Ḥaw*, 2:251; *Juġ*, v2:93.
[132] Robinson, "The Conquest of Khuzistan," 15.
[133] Ibid., 17.

There is almost no doubt that Ardašīrgān is to be identified with al-Masruqān, Dārāyāgān with the Dariun canal (see infra) and the mighty torrent with Karun or more specifically the Shotayt. The identification of Šamīrām is more problematic.[134] The fact that Shushtar at the time of conquest was unassailable owing to the large canals that surrounded it on all sides is corroborated also by futūḥ accounts.[135] Unfortunately, the texts do not offer any information on the lower course of the Gargar.

Another fixed location along the Masruqān is the Islamic settlement of ʻAskar Mukram, the ruins of which are located south of the Miyanab plain. The 10th century geographers report that ʻAskar Mukram was built on both sides of the Masruqān.[136] The course of the Masruqān after passing through ʻAskar Mukram is less clear. The Karun flows in the old bed of the Masruqān between the Band-i Qir and the village (now town) of Wais. This is an extremely straight channel for near 20 km, and the traces of the old meandering bed of Karun are found c. 5 km west of the present course. There is less consensus as to how the river continued its course after Wais and where it ended. The 9th and 10th century geographers offer two possibilities: first, that the Masruqān ended in Ahwaz;[137] second, that it flowed past Ahwaz and debouched into the Persian Gulf.[138] As will be discussed in chapter 6, modern scholarship has attempted to reconcile these conflicting accounts.

Since the 19th century, many scholars have attempted to illuminate the development of the Masruqān in antiquity. The origin and the history of the channel is, however, still a mystery. There

[134] See also: Moghaddam, "A Note on the Gargar Irrigation System"; Verkinderen, *The Waterways of Iraq and Iran*, 120–21.
[135] *Bal Fut*, 380; Ḫalīfa b. Ḫayyāt, *Ḫal*, 81; *Ṭab*, 2553–3.
[136] *Iṣṭ*, 89; *Ḥaw*, 2:252; *Muq*, 410; *Dlf*, 28.
[137] *Ḥud*, 372; *Iṣṭ*, 89; *Ḥaw*, 2:251.
[138] *Ḫur*, 176; *Rus*, 91; *Suh*, 162.

is no indication as to when and how the river was created in the first place. Nor is there any clue about whether the course of the river described in the Early Islamic period was dramatically different from the channel that flowed in the pre-Islamic period or not. Past scholarship has taken the claim of medieval texts for granted that the river was a canal built as a massive state-sponsored project by a Sasanian king in the 3rd or 4th centuries.[139] Nonetheless, these textual references are inconsistent and problematic.

Also unclear is the role of the Masruqān in irrigation. Textual sources indicate that the Masruqān area was a most prosperous agricultural zone.[140] However, the river currently flows c. 10-20 m below the plain, and its role in irrigation is limited to small fields on the lowest terrace of the river channel. Past scholarship has attempted to explain the irrigation function of the Gargar and the reasons for its failure in the medieval period.[141] This question is pursued in chapters 6-7.

2.2.4. The Dariun

A third important watercourse that originates at Shushtar is the Dariun[142] canal (Fig. 2.13-2.17). The history and function of the canal is linked with that of the Shadorwan Weir. The weir creates a reservoir which feeds the Dariun canal. The two main canal heads of the Dariun were located on the left bank of the Shotayt, c. 300 m east of the weir under the Salasel Castle. From there, two c. 3-4.5 m wide canals originated. They joined after c. 100 m and formed the Dariun

[139] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 174–87; Rawlinson, "Notes on a March from Zoháb," 73–74; Curzon, *Persia and the Persian Question.*, 2:377–79; Verkinderen, *The Waterways of Iraq and Iran*, 111–36; Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 80–82; Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran"; Moghaddam, "A Note on the Gargar Irrigation System."
[140] *Iṣṭ*, 90–91; Abū Dulaf, *Dlf*, 30.
[141] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 80–82; Moghaddam, "A Note on the Gargar Irrigation System."
[142] Dāriyūn

canal. In 2002, during the first phase of the MIDP, the ancient canal heads were destroyed and replaced with modern headworks which pump water from the Karun to the Dariun.[143]

In addition to these main headworks, it is said that six subsidiary canal heads and two subsidiary canals existed under the Castle and downstream from the main intakes. Given that the Dariun canal head has never been properly documented, the configuration and function of the subsidiary canal heads is not fully understood. According to the local cultural heritage authorities,[144] these facilities came into play during seasons of high water. They directed the overflow of the main canal and protected the canal network from destruction by flooding.

The configuration of the Dariun canal system after it emerges out of the Salasel Castle was first documented by Graadt van Roggen in the beginning of the 20th century. He reports that the first 500 meters of the Dariun canal was protected from the river floods by means of a masonry wall on its right bank. Nonetheless, the wall did not seem to have been very effective. The bed of the Dariun was filled with pebbles from the river and the canal had become useless.[145] Less than 2 km south of the castle is an ancient weir, named Band-i Khak (*Per. The* earthen dam). At this location, the Dariun branches off into two channels. One, the Raqqat[146] canal, flows toward the southeast, flanks the city on the southern side and empties into the Gargar. About 400 m south of

[143] One of the main concerns and design criteria for the modern canal system of Miyānāb was to overcome the problem of dropping water level at the head of the Dariun. The initial design-by Mahāb Quds Consulting Co. was based on raising the Karun water level at the canal head of the Dariun through a new weir downstream the Shadorwan. In this plan, the Miyānāb canal system continued to function by gravity flow. Nonetheless, a new idea was offered by Āb Warzān Consulting Co. in the late 1990s that proposed destroying the ancient canal head and replacing it with pumping facilities. The main argument was that the ancient Dariun canal head was the best configuration for the irrigation of the plain, and that a pumping facility would eliminate the problem of dropping water level in the canal forever. Unfortunately, after much debate between Cultural Heritage activists and the KWPA, the latter design was implemented and the old canal heads were destroyed.

[144] E.g. http://omurpaygah.ichto.ir/Default.aspx?tabid=4898&language=fa-IR

[145] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 178–79.

[146] Raqqaṭ

Band-i Khak, a weir and bridge named Lashkar is built on this stream. The Raqqat canal completes the moat that has encircled the city at least since the Muslim conquest. The second canal runs to the southwest and is the main irrigation branch of the Dariun. The canal distributes water on the northern part of the Miyanab plain and empties into the Karun near the village of Arab Hasan, c. 20 km south of the Salasel citadel.

References to the uppermost part of the Dariun canal system are abundant in the futūh accounts, which inform us that the most difficult stage of the conquest of Khuzistan was at Shushtar. The city was surrounded on all sides by water and the Muslims besieged the city for a long time.[147] Eventually, the conquest was made possible when one of the inhabitants of Shushtar offered to show the Muslim army the hidden way through the city if they promised to save his life and that of his family members. The vanguard of the Muslim army followed him and swam from a location where water exits the city (*Ar.* maḫraj al-mā')[148]. They opened the gates and the Muslim army was able to enter and conquer the city. While the story does not locate the tunnel under discussion, the general configuration and condition of the Dariun canal heads under the castle makes it the likely site of the story.[149] According to Ṭabari, the Persian commander Hurmuzān, once informed of the situation, ran away toward the Salasel citadel and was caught by the Muslim vanguard who had found their way through the hidden tunnel. This account provides more support for theory that the betrayer guided the Muslims into the city wall by means of the Dariun canal.

[147] Couple of months up to two years is mentioned in various accounts.
[148] A key word in these excerpts is the adjective used to describe the water passage: Ṭabari (Tarikh, v1.5: 2555) calls it the outlet of water (Makhraj al-Ma') while Khalifat (Tarikh: 81) calls it an inlet. The Dariun is the outlet of the water from beneath the city. In this case, only Ṭabari's account can refer to the Dariun. Nevertheless, a few lines after, Ḫalifat gives a longer description: The subterranean channel through which the water enters/goes (Naqb al-ladhi dakhal al-Ma'r minhu), which can apply to the Dariun. Therefore, it is possible that his use of inlet instead of outlet abbreviates this longer description.
[149] *Bal Fut*, 380; *Ḫal*, 81; *Ṭab*, v1: 2553–55.

Despite the gradual decline of the Dariun canal system, medieval and pre-modern irrigation agriculture on the Miyanab plain depended solely on this canal. This is indirectly expressed by medieval sources emphasizing the significance of the Shadorwan for irrigation of the plan. The first explicit reference is by Mustawfī who writes that the province of Shushtar owes its well-being/glory (Pers. *madār*) to the canal (*Per*. jūy) of Daštābād (i.e. Dariun).[150] After the weir of the Shadorwan collapsed in the late 19th century, the canal heads were below the water level during low waters. Thereafter, water supply through the system was possible only during high water and was intermittent at best.[151] Hydraulic modeling of the historic headworks at Shushtar suggests that a discharge of 15-20 m^3/s could have been supplied by the Dariun when fully functional. The number had dropped to 5 m^3/s in the Pahlavi period and 2.5 m^3/s in the late 1990s before MIDP launched.[152]

The date of the construction of the Dariun is not known. A popular legend that has persisted since the 7th century associates the name of the canal and its builder. According to the Chronicle of Khuzistan, the canal was named "Dārāyāgān, after Darius". Modern scholars have generally accepted this explanation, even though no particular argument has been offered.[153] In the 18th century, the local history of Shushtar attributes the construction of this canal to the mythological king of the Kayanid Dynasty, Dara and his son.[154] The core of the legend that is

[150] *Nuz S*, 165.
[151] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 266.
[152] "The Renovation and Restoration Plan of SHHS-Vol 7"; "Environmental Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System."
[153] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 179; "The Renovation and Restoration Plan of SHHS-Vol 7," 123.
[154] *Taẕ*, 4; *Tuḥ*, 42.

corroborated in modern scholarship as well is that the construction of the Dariun canal happened before the construction of the Gargar and before the Sasanian period.[155]

While a name derived from Dāriyā/Darius seems to have persisted for the canal since antiquity, other names have also been recorded for the canal. Furthermore, the Dariun canal system is composed of several canals which may have had different names. As mentioned above, in the 14th century, Mustawfī called the canal jūy-i Daštābād. At the same time, Ibn Baṭṭūṭa wrote that the canal that encircled the city was called Nahr al-Azraq (*Ar. The* blue canal). If the latter name was in fact used, it might have only referred to the branch that forms the moat of the city, similar to the present name Raqqat. The Šamīrām of the Khuzistan Chronicle might refer to the same canal. In the 19th century, Nahr-i Miyanab (the canal of Miyanab) was used along with the name Dāriyān.[156]

2.2.5. The Salasel Castle

While not a hydraulic feature, the Salasel[157] castle is an important element of the irrigated landscape of Shushtar owing to the fat that the Dariun canal heads are located beneath it (Fig. 2.1, 2.6-2.7, 2.19). The castle footprint is an irregular oval that covers an area of c. 3.5 ha. It is located north of the city, on the left bank of a large meander of the Karun overlooking the river and the Shadorwan. In addition to the headworks of the Dariun canal, ruins of administrative buildings from the 19th and 20th century stand inside the walls of the castle. At least in the 19th century, the

[155] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*.
[156] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 178; *Naj*, 29; *Tuḥ*, 42.
[157] Salāsel

southern side of the castle, not naturally protected by the river, was flanked by a moat (2.19).[158] Aerial photos demonstrate that the northern side of the castle has been gradually away since at least the 1950s. This process might have been ongoing for a long time.

As explained above, the futūḥ accounts leaves no doubt that the citadel and canal heads underneath it existed at least since the late Sasanian period. The medieval authors refer to it simply as qal'a (Ar. citadel); the name Salasel is mentioned for the first time in the local history of Shushtar that was written in the 18th century. According to legend, Salasel was the ġulām (*Ar*. slave) of a certain governor of Fars who ruled Shushtar on his behalf and built the castle. He then revolted against his overlord, but, eventually peace was made and Salasel was reappointed to rule Shushtar.[159]

According to a local history of Shushtar, the 17th century, the Safavid governor of Shushtar, Fatḥ 'Ali Ḫān, repaired the buildings of the castle, which were in ruins.[160] Regardless, a century later, in the early Qajar period, all the administrative buildings of the castle were in ruins and the governor resided inside the town.[161] Three other restoration projects were undertaken later in the Qajar period and the castle was used again as the official residence of the governor of Shushtar: first, in 1237 AH/1821 CE by Muḥammad 'Ali Mīrzā; second, in 1299 AH/1881 CE; third, in 1307 AH/1889 CE by Huseyn Qulī Ḫān-i Māfī. Eventually, the buildings fell victim to heavy rain and an earthquake in the 1920s and were never repaired. In 1963, most of were

[158] *Tuḥ*, 60.
[159] *Taz̲*, 22–23; *Tuḥ*, 60.
[160] *Taz̲*, 62.
[161] *Tuḥ*, 61.

destroyed by the Bureau of Finance (*Per.* idāri-yi dārā'i). Various organizations have since then occupied the area within the castle.[162]

2.2.6. The Band-i Mizan

The Band-i Mizan[163] (the Mizan weir) is located on the Gargar where it separates from the Karun (Fig. 2.11-2.13, 2.20-2.22). At first glance, the geometry of the weir is striking. It is formed of two perpendicular arms. The weir proper is the eastern arm, which faces the flow of the river and regulates water that is diverted to the Gargar. It is c. 70 m long and has a trapezoidal section: the straight side faces the flow and the slanting side (c. 45˚) faces south to maximize resistance. Average crest height, above the river bed, is 6 m. The weir has nine main sluices and two small sluices. The main sluices are c. 1.8-2.5 m wide. Their height ranges from 1-3 m. The apexes of the sluices are located c. 0.5-2.5 m below the crest of the weir. One of the small sluices is located after the first main sluice and the other before the last sluice. Their width and height are 1 m and 1.2 m, respectively. Their apexes are located 3.5 m below the crest of the weir. At present, the weir is not equipped with sluice gates, but it appears to have been in the past. The western arm of the weir is more a stabilizing structure, c. 300 m long. The shape, height and width of the structures does not remain constant across its length. The maximum height of the crest from river bed is 9 m. The western structure has one sluice, 4 m width, 3 m height. The western arm widens significantly at the junction with the eastern arm, and takes a round form. The weir is generally made of sandstone

[162] Iqtidari, *Āṯār-I Khūzistān*, 668; "The Renovation and Restoration Plan of SHHS-Vol 7."
[163] Band-i Mīzān

and *sarūj* mortar. Like other hydraulic structures in Shushtar, however, variation is observed in the material used in different parts of the structure owing to past restorations.[164]

The name of the weir reflects its commonly assumed function in the bifurcation of Karun. Mizan means balance, measure, amount etc. A widely accepted idea is that this weir regulates the flow of the Karun so that two-sixths of it is directed to the Gargar/ Du Dāngeh and four-sixths to the Shotayt/Čāhār Dāngeh. The sources have described this function variably, noting that the weir allows, directs or guarantees a certain portion of the river Karun to pass to the Gargar.[165] The Lar project was the first to model and analyze the Shushtar Historic Hydraulic System and its possible variations. The modeling study assumed the situation where the Shadorwan was still functioning and a reservoir existed behind the dam. The study disproved the idea that the Band-i Mizan directs a fixed proportion of the flow of the Karun into the Gargar. First, the proportion of the water that flows into the Gargar and the Shotayt depended on the discharge of the Karun. Second, the weir could have had a significant impact on the division of the water between the two streams only if it had sluice gates. *Without* sluice gates, the proportion of the water that was distributed between the two water courses was determined by the velocity of the flow, the relative elevation of the Gargar and the Shotayt, and the elevation of the Gargar Dam. The Band-i Mizan had negligible hydraulic impact. In this situation, at low water most of the Karun would have flowed through to the Gargar. As the water level rose the proportion would have reversed. During floods, only a small percentage of water flowed through the Gargar. During high floods, the weir is usually under water and is hydraulically ineffective. If the weir was equipped with sluice gates, it would have been possible

[164] "The Renovation and Restoration Plan of SHHS-Vol 7."
[165] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 268; Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 184; *Naj*, 29.

to adjust the flow of the Gargar during low waters and the Band-i Mizan would have a hydraulic role in distribution of water between the Karun and the Gargar.[166]

No unequivocal reference to the Band-i Mizan is found in the medieval sources. In Balāḏurī's account of the conquest of Shushtar Abu Musa dispatched one of his people with the traitor to Dujail on a pavement of stone (*'Araq min Hijarat*). Verkindern has suggested that this passage might refer to the Band-i Mizan since the weir functions as a paved stone bridge during low water.[167] More support for this theory may come from the fact that the Muslim army approached Shushtar from the southeast, the area of Ram Hurmuz. Thus, it is not unlikely that they camped on this side of the city wall. Nevertheless, other details mentioned in the story, in particular a water channel that could take the swimmers inside the city, best fits the Dariun channels. The small water distributor channels on the bank of the Gargar that were connected to the inside of the city are downstream from the Gargar Dam, and are too far from Mizan and too small to correspond with the story. The small water distributor channels on the bank of the Gargar that were connected to the inside of the city are downstream from the Gargar Dam, and are too far from Mizan and too small to correspond with the story.

The only story that is unquestionably relevant to the weir appears for the first time in the local histories of Shushtar written in the 18th and 19th century. They relate that Shapur II divided the Karun into two streams and built both the Shadorwan and the Band-i Mizan in the following sequence: first, a large canal (i.e., the Gargar) was built to divert the water of the Karun. Second,

[166] "The Renovation and Restoration Plan of SHHS-Vol 7," 116; "Environmental Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System"; "Hydraulic Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System."
[167] *Bal Fut*, 380."Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 277 ff. 636.

the Shadorwan was built. Third, the Band-i Mizan was built in order to facilitate the movements of animals and people across the canal, reflecting the fact that the weir was a major transportation causeway during times of low water. Another function of the weir was to allow a certain amount of water (two-sixths) to flow into the Gargar through its openings.[168] Modern scholars have generally accepted this story and assumed a Sasanian date for the structure. Van Roggen is the only person who has attempted to explain the process whereby such a project was undertaken. This hypothesis will be more thoroughly discussed in chapter 7.[169]

The weir has also been called Band-i Šahzādeh (*Per*. The princess's weir) or Band-i Muḥammad ʻAli Mīrzā, or Band-i Dawlatšāhī, reflecting major restoration of the structure in the early 19th century under the patronage of the Qajar prince, Muḥammad ʻAli Mīrzā. The weir seems to have always been a solid structure and did not suffer major damage until it was purposefully breached in the 17th century. In 1078 H/1667 CE, Fatḥ-ʻAli Ḫān, the governor of Shushtar, partly destroyed the weir in order to divert the flow of the Karun into the Gargar and to make it possible to repair the bridge of the Shadorwan.[170] The restoration of the bridge took fourteen years, after which Fatḥ-ʻAli Ḫān was summoned from Shushtar before he was able to repair the weir. The damage worsened over time, especially after a flood in 1106 AH/1694 CE, and left a severe impact on the agricultural production and hydraulic structures on the Gargar. Attempts to restore the weir under the patronage of Nadir Shah in 1142 AH/1730 CE failed and were not pursued again for 80

[168] *Taz*, 4–6; *Tuḥ*, 46–47.
[169] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 184.
[170] A major technical obstacle which has hindered the study of hydraulic structures at Shushtar is that they are fully or partially submerged. In particular, the Shadorwan and Mizan are in the untamable currents of the Karun. As this overview shows, since antiquity, it has seemed logical that the construction of the Shadorwan required diversion of water. The incentive of Fath-ʻAli Khan to breach the weir might have also been related to the legend that the Gargar carried the entire flow of the Karun until the Band-i Mizan was built and the flow of the Gargar was restricted.

years. Under Muḥammad ‘Ali Mīrzā, the weir was successfully restored between 1221-1231 AH/1806-1815 CE, and remains solidly in place to this day. Najm al-Mulk expressed surprise at the level of investment in the project and the quality of the restoration under the patronage of the prince. [171]

A certain confusion has persisted in western scholarship as to whether the name Band-i Qaiṣar (*Per*. The Caesar’s weir) was applied to this weir or to the Shadorwan (infra). Some 19th-century travelers have even attributed the name the Band-i Mizan to the Shadorwan weir.[172] Persian sources rule out the idea that the name the Band-i Mizan was ever applied to any other hydraulic structure. In addition, the local building legend only makes sense for a weir that is located at a bifurcation of the river. There is no textual reference that suggests Band-i Qaiṣar was ever used to refer to the Band-i Mizan. Likewise, in modern times this usage is not attested locally. It is very likely that the confusion in western scholarship stems from Rawlinson’s mistake. This idea might be further supported by the fact that Van Roggen, the only western scholar who spent enough time in Shushtar studying the structures, did not confuse the names. Nonetheless, Mir ‘Abd al-Laṭīf writes that after the Valerian's (Caesar) Roman engineers completed the hydraulic project of Shushtar for Shapur II, water was allowed to flow into Du Dāngeh by means of the Caesar’s openings/holes (*Per.* forjeh-ha-yi Qaiṣarī).[173] This may suggest that in 19th century some kind of

[171] *Taz*, 62–66; “The Renovation and Restoration Plan of SHHS-Vol 7,” 120; *Naj*, 29. Verkinderen notes that while the repairs of Mohammad ‘Ali Mirza at the Shadorwan are well-known, no independent source corroborates Rawlinson’s statement that the weir on the Gargar was also repaired by him. As shown here, however, Persian sources describe these repairs at the Band-i Mizan in great detail. Verkinderen, “Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period,” 603f.
[172] Verkinderen, “Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period,” 268; Rawlinson, “Notes on a March from Zoháb,” 75; Alizadeh et al., “Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations,” 70.
[173] *Tuḥ*, 47.

relationship was posited between the Band-i Mizan and the story of Qaiṣar which may have created the confusion in the literary sources.

2.2.7. The Shadorwan

The most well-known hydraulic feature of Shushtar, and of Khuzistan in general, is the Shadorwan [174] weir-bridge, also known in historical sources as Shadorwan-i Tustar. The Shadorwan is located on the Shotayt, c. 1300 m downstream from the bifurcation (Fig. 2.11, 2.13, 2.18-2.19, 2.23-2.27, 2.53). The structure, as it has survived to modern times, consists of a weir over which a bridge was built. The hydraulic function of the weir was to raise the water in a reservoir which would feed the Dariun canal system. Despite the fame of the monument, very little is known about it. By the time Van Roggen properly documented the Shadorwan, the structure had collapsed and fallen victim to the currents of the Karun for a couple of years. Therefore, even the exact number of arches of the bridge are not known for sure. Also, differing measurements of the structure and its components appear in medieval and modern sources. It is likely that this variation is caused by the difficulty of documenting a monument that stood in the middle of the Karun, by the existence of extensions and installations near the weir which may or may have not been included as belonging to the monument, as well as by errors of transmission on the part of the medieval authors who copied from earlier sources when writing about the monument.

The monument, as preserved today, is c. 530 m long. We do not know much about the substructure, i.e., the weir, which is submerged. In the few locations where the weir is visible, the irregular geometry of the structure across the river suggests that it followed a natural outcrop in

[174] Šādurwān

the river bed.[175] This is typical of hydraulic structures in northern Khuzistan. In section, the weir takes the form of an isosceles trapezoid made of large sandstone blocks and sārūj mortar. The upper surface, which forms the base of the bridge, is c. 20 m wide. The height of the weir above the river bed averages c. 4-5 m. In the middle of the river where the bed has been highly eroded, the crest of the weir is c. 10 m higher than the river bed.

Our understanding of the original bridge construction is also limited, primarily due to past restoration and modern alterations and destruction. In its current state, the bridge can be divided into three segments. The southern segment is c. 280 m long, and is composed of 24 large arches as well as 11 small arches at a higher elevation. The middle segment, c. 120 m long, is washed away. Van Roggen estimated that this section 5 five arches. The northern section is c. 130 m long and includes 11 main arches as well as 2 small arches at a lower elevation. In total, it has been suggested that the bridge, when intact, had 40-44 main arches. There is significant variation in the form, construction, and dimensions of the arches caused in part by several phases of construction and restoration of the structure.[176]

The bridge in general has four main components. The piers, the main arches, the small arches and the deck. The piers have five sides whose cross section is formed by a rectangle and an isosceles triangle, the end of which faces the flow. Their rough ashlar masonry is cemented with sārūj mortar. The sections of some of the fallen piers suggests that the core of the pillars was filled with irregularly-shaped stone pieces. The arches are heterogeneous in form and material. They are primarily built of brick, with lime and gypsum mortar; sometimes on springs made of rough ashlar

[175] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 176; "The Renovation and Restoration Plan of SHHS-Vol 7," 266.
[176] "The Renovation and Restoration Plan of SHHS-Vol 7," 100, 225–26; *Naj*, 26.

and sārūj. In general, the piers and the arches are wider in the southern segment. In the southern segment, large piers are c. 7-11 m wide and small ones c. 4-5 m wide (2.53 top). In the northern segment, piers are c. 3-4.3 m wide. The span of the main arches is c. 5.5-7.5 m wide in the southern segment and 3-4.2 m wide in the north. The first 15 arches, from the left bank, are c. 4 m high and the rest are c. 5-6 m high. Given the fact that recent restoration was undertaken on the southern arches, they might have been originally higher, too. The deck has a rough ashlar façade filled with rubble masonry with sārūj mortar. Between every two main arches, smaller arches are built in order to reduce the weight of the structure. Like the main arches, the small arches, when preserved, are generally built of brick on stone pillars. In the southern and northern segments, the small arches are c. 3 and 2 m wide, respectively. Their height averages c. 2-4 m. In addition to the deck arches, two small arches are preserved on the southern edge of the northern segment. The crest of these arches is more or less level with the top of the weir. The average height of the bridge is c. 10 m.[177]

While the name Shadorwan appears in most medieval geographical sources, we have little information about the phases of its construction and restoration. The first reliable information concerns the restorations undertaken by Fatḥ-'Ali Ḫān, a Safavid governor of Shushtar. As mentioned earlier, the Band-i Mizan was breached and severely damaged (supra) in the course of this project. The restoration started in 1078 AH/1667 CE and took fourteen years.[178] In the 19th century, the masonry of the bridge was deteriorating. British travel accounts provide information on several restorations attempts between 1810 and 1889. Each repair lasted a short time and the arches of the bridge repeatedly fell victim to spring floods. Eventually, after two unsuccessful

[177] "The Renovation and Restoration Plan of SHHS-Vol 7," 100, 225–26; *Naj*, 26.
[178] Some sources mention 12 and some 14 years. The difference might be related to the difference in the length of Hijri and Georgian calendars.

attempts in 1889, restoration efforts were finally abandoned.[179] When Van Roggen was appointed to survey the state of the hydraulic works of Khuzistan, the central segment of the bridge had been already washed away.[180]

The evidence supporting the general consensus that the monument was built in the Sasanian period is textual and circumstantial. A major problem that has received little attention in modern scholarship is whether the bridge and the weir were built at the same time. [181] No reference to the Shadorwan is found in the futūḥ accounts. Nonetheless, since we know that the city was surrounded on all sides by canals, and since the reservoir behind the Shadorwan is the source of water for the Dariun, it has been generally assumed that the monument was built in the Sasanian period. This idea has been corroborated by medieval sources, which ascribe the Shadorwan to the extraordinary feats of Shapur I/Shapur II.[182] According to a popular story, which has been narrated in many versions, king Shapur II defeated and held captive the Roman emperor (*Ar.* Qaiṣar) and his army. Shapur forced the emperor to build the Shadorwan. Several names referring to the weir and/or bridge reflect this story, including Band-i Qaiṣar, Pol-i Qaiṣar, Pol-Band-i Šapūr, Šādūrwān-i Šapūrī. A more recent name, Pol-i Fatḥ-Ali Ḫāni, appeared after the major restoration project under his patronage.

A chronological comparison of the sources provides an interesting glimpse into the development of the legend. The early sources often attribute the building of the Shadorwan to a certain king Shapur (*Ar.* Šapūr al-malak), without much detail. The two earliest sources which

[179] For a detailed account, see: Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 263 ff.
[180] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 179.
[181] The only exception being verkindern (2009, p 273-274).
[182] *Faq M*, 303; *Ya' Bld*, 361; *Ḫur*, 162, 176; *Ṭab*, v1: 827.

contextualize the construction of the monument in relationship to the Roman war captives in Khuzistan relate the story to the victory of Shapur I over the Roman Emperor Valerian.[183] Mas'ūdī is the first author who elaborated on this story and set the scene within the legend of the travels of Shapur II incognito through the Roman territories.[184] The king is captured and imprisoned, and the Roman army conquers Madā'īn, Jundi Shapur. Shapur is carried with the army as they advance through Iran. Afterwards, the Roman army lays siege to Shushtar. There, Shapur manages to escape during a feast when the soldiers are drunk and he is able to get into the city and lead the Iranians to defeat the Roman army. He forces the Qaiṣar (no name is provided) to repair everything destroyed in the region by his army, and he asks him to build the Shadorwan in Shushtar. Ibn Balḫī refers to this confusion in his account of the reign of Shapur I: "Some say he built the Shadorwan of Shushtar, but, the truth is that Shapur II (*Ar.* ḏu l-aktāf) made it."[185] At this point, the story is permanently linked with Shapur II. It appears in the account of Mustawfī with less details, and a new version with elaborate extraordinary elements is presented in the local histories of Shushtar.[186]

A major lacuna in our understanding of the Shadorwan concerns the original configuration of the monument, its structural components and its building techniques. Descriptions by medieval authors fall into a repeated pattern with inconsistent details.[187] Two aspects of such descriptions are frequently discussed in modern literature. First, the Shadorwan was built of stone, sārūj and metal clamps. Second, the bed of the river behind the weir (up to the Band-i Mizan according to

[183] *Ṭab*, v1: 827; *Ḥmz*, 2:48; *Ya' Bld*, v1:180.
[184] *Mur*, 282–83.
[185] *Far*, 178.
[186] *Nuz D*, 165; *Tuḥ*, 45–49.
[187] *Ṭab*, v1: 827; *Faq M*, 303; *Ḫur*, 162; *Idr Nzh*, 393.While I have dismissed these references as unreliable, Verkindern (2009: 272-3) has provided a good overview and has attempted to reconcile the available descriptions with what we know of the monument.

some sources) was paved with stone.[188] No evidence for such elements has been found in recent investigations by the Lar project. Van Roggen also states that he looked for the flagstones and iron clamps, but found no trace of them.[189] Several hypotheses have been offered for the etymology of the word Shadorwan, all equally speculative.[190] There is, however, little doubt that the medieval authors understood the Shadorwan as a dam, or the dam and the basin behind it.[191] Interestingly, the sources are silent about the bridge.

Modern scholarship and public media have taken for granted that the bridge and the weir were built at the same time and that the bridge was destroyed after the Muslim conquest. Nevertheless, there is no information about the bridge prior to the 17th century, when the local history of Shushtar states that Fatḥ-ʻAli Ḫān restored the Qaiṣar's bridge which had been destroyed by Ḥajjāj.[192] Prior to that, the only reference to crossing along the Shotayt is found in Ibn Baṭṭūṭa, who informs us that the passengers would enter the city through darwāzi-yi desbūl (*Per. The* Dezful gate).[193] This is the gate that opens towards the Shadorwan and has been called by this name up to the 20th century. According to Ibn Baṭṭūṭa, a very long pontoon bridge was built here. He does not mention traces of an old bridge. As a result, scholars have assumed that the bridge was destroyed at some point after the conquest. As will be discussed later, the textual references that have been used for this argument are very problematic.

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[188] Rawlinson, "Notes on a March from Zoháb," 74; Curzon, *Persia and the Persian Question.*, 2:377–79.
[189] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 183.
[190] "The Renovation and Restoration Plan of SHHS-Vol 7," 102–6; khazraee, "Shadorvan, and the Difficulties of Shushtar Historical Studies"; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 272–73.One of the most frequently mentioned scenarios about the meaning of Shadorwan relates it to hypothetical stone pavement, which as mentioned, has never been documented on the ground.
[191] For a detailed discussion see: Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 272–73.
[192] *Taz*, 8, 24. This story is fictional; it will be discussed in chapter 7.
[193] *Baṭ*, v2: 24.

2.2.8. The Boleyti/The Gargar Dam, the Watermill Complex/the Waterfalls

While the Shadorwan was the most famous waterworks of Shushtar in antiquity, Shushtar is today best known for another hydraulic site known as the Watermills, the Watermill complex, or the Waterfalls. The site is located on the Gargar canal, c. 800 m south of the Band-i Mizan (Fig. 2.11-2.13). It is a multi-functional complex consisting of numerous structures over c. 2 ha (Fig. 2.28-2.37). The beauty and spectacular visual aspect of the site was celebrated by nearly all the early modern travelers who visited Shushtar and continues to mesmerize modern visitors.

The first component as one moves downstream from the Band-i Mizan is an impressive structure, known as the Gargar or Boleyti dam, which closes off the entire channel (Fig. 2.30-2.31, 2.34). The dam is made of a huge sloping foundation wall, c. 12 m high,[194] and a vertical wall of almost the same height built on top of it. A roadway runs on top of the dam and connects the eastern and western neighborhoods of the city.[195] The visible construction material is sandstone. Nevertheless, different structural components were built in various phases. The Lar project found that the core of the sloping foundation is a natural formation of sandstone that was left in place in the course of digging of the canal. The sloping surface is covered with dressed sandstone. The straight wall was built in two phases. The lower part, c. 8 m high, was built of rough ashlar sandstone in the Qajar period. The Lar studies suggested that this part too, has a natural sandstone core. This masonry wall is backed on the north by a massive earthen wall. The width of the dam,

[194] Different sources provide different figures for the height of the dam and its various components. The figures presented here are based on my comparison of the figures and my observations.

[195] Since the Pahlavi period, this road has been the main thoroughfare inside the city for the movement of people and vehicles between the two banks. The heavy load and vibration that is caused by motor vehicles using this roadway has been the main threat for the watermill complex and caused heated debate concerning the management of the site. After several minor collapses of the subterranean channels, a major collapse in 2008 caused the temporary closing of the road.

including the earthen structure, is estimated at 12-16 m. The upper part of the vertical wall, c. 4 m high, was added early in the Pahlavi period when modern streets were built through the old city. The outer surface is ashlar masonry. The inside material is not known.[196]

The water collected behind the dam is forced to flow through three subterranean tunnels (Fig. 2.35-2.36). They are cut through the sandstone rock that forms the foundation of the complex, as described above. They used to distribute water to more than 40 watermills that were built south of the dam. The excess water jets back to the river, creating the waterfall aspect for which the site is famous (Fig. 2.29, 2.32-2.33). On the western bank is one tunnel, Seh Kureh (*Per.* of three tunnels). *kūreh* is the local term for the subterranean tunnels that connected the famous deep basements, *šawādāns*. The name is derived from the particular shape of the intake of the tunnel, made of three small channels. Seh Kureh is c. 100 m long, c. 2 m wide and c. 3 m high. Two channels are located on the eastern bank: Shahr (*Per.* City) and Boleyti. It is said that the name of the former comes from the fact that it supplies the city with water. This does not seem very reliable, as the city proper is located on the other side. The meaning of Boleyti is not known. It is the name of the neighborhood adjacent to the site and probably gave its name to the tunnel. The Shahr tunnel is c. 80 m long, c. 4.5 m w, c. 6 m high. The Boleyti tunnel is c. 350 m, c. 3.5 m, c. 7 m high. The Boleyti has one main outlet and several smaller ones. The Shahr does not have a main outlet and its excess water empties into the outlets of the Boleyti. The intakes of the tunnels are located at different elevations. From lowest to highest are the Seh Kureh, Shahr, and Boleyti. The Seh Kureh

[196] "The Renovation and Restoration Plan of SHHS-Vol 7," 122; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 269.

is always filled with water and runs most of the watermills. The Boleyti works only during high water and functions as a safety valve for the system.[197]

The site downstream from the dam can be divided into a western, northern and eastern area (Fig. 2.28, 2.32). In addition to the historic structures, several modern industrial buildings were built on the site in the Pahlavi period in order to use the water and the hydropower. On the western side, which is the largest built area, are 21 watermills all in a state of ruin, a two-arch bridge, remains of modern industrial buildings including the first ice-making company, and several enigmatic structures/spaces, the functions of which are unknown. Installations in the northern area include three double-pen watermills, which are being restored for tourism, as well as three modern facilities including the first power plant of the city. The watermills of the eastern and northern areas are all turned by the water of the Seh Kureh tunnel. Ten watermills, five of which are restored, were built in the eastern area. [198]

Interestingly, no reference to the site or any component of it is found in written sources prior to the 19th century. Even the local histories of Shushtar are silent in this regard and British travelers provide us with the first account of the site, noting a major transformation of the dam. Until 1836, a bridge of one arch spanning the Gargar river connected the city to its eastern suburbs and to the road to Bakhtiyari and Ahwaz.[199] Kinneir, who visited Shushtar in 1810, describes the structure thus: "there is a bridge of one arch, upwards of eighty feet high, from the summit of which the Persians frequently throw themselves into the water, without sustaining the slightest

[197] "The Renovation and Restoration Plan of SHHS-Vol 7," 221–22, 231–59.
[198] Ibid. Several restoration projects have been carried out in the past two decades on the site. Most of these projects are extreme interventions and have had a negative impact on the authenticity and appearance of the site. One such example is a massive staircase on the western side which replaces a humble stair access to the site and is not authentic.
[199] Rawlinson, "Notes on a March from Zoháb," 77; Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 181.

injury."[200] In 1842, when Layard visited Shushtar, the dam had already replaced the one-arch bridge and he ascribes the new construction to Muḥammad ʻAli Mīrzā.[201] Van Roggen was informed by local people that the old weir had caused much concern because of several recent breakages. He hypothesized that an earthen barrage used to close the bed of the river was replaced by the present masonry weir. According to Van Roggen, the piers of the old bridge were preserved on both sides of the river.[202] Today, the remains of the earthen weir are visible behind the vertical wall of the dam (Fig. 2.34). The remains of a vertical brick structure that is preserved below the dam is the most likely candidate for the piers of the one-arch bridge, noted by Van Roggen.

2.2.9. The Band-i Khak (The Earthen Weir)

The Band-i Khak[203] is one of the three waterworks built on and alongside the Dariun canal, southwest of Shushtar, the two other being the bridges of Lashkar and Shah ʻAli (Fig. 2.11-2.13, 2.38-2.40). The original configuration of the site and the structure(s) is badly obscured. In addition to the modifications of the monument through time, the site has been significantly damaged and disturbed by the construction of the Shushtar ring road in the 1980s, followed by various irrigation and sewage projects since then. The weir divides the Dariun into two branches: the eastern branch, which is the main irrigation feeder of the Dariun, continues to the south for c. 33 km and drains into the Karun at the ʻArab Hasan village. The western branch is the Raqqat canal that completes the water ring around the city and drains into the Gargar. Given the c. 15 m elevation difference between the Dariun and the Gargar, a weir would have been necessary at this location to keep the

[200] Kinneir, *A Geographical Memoir of the Persian Empire*, 97.The practice of diving from atop bridges into the rivers has remained a very common pastime for people of Shushtar and Dezful until today.
[201] Layard, "A Description of the Province of Khuzistan," 28.
[202] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 181–82.
[203] Band-i Ḫāk

water in the main irrigation feeder of the Dariun. The weir stopped being used after the implementation of the MIDP in this area.

The signage of the Cultural Heritage Organization dates the structure to the Sasanian period, but no textual or archaeological data exists to confirm or disprove this. The building material, like most other hydraulic structures in Shushtar, is sandstone and sārūj mortar. The heterogeneity of the main structure, a U-shaped reservoir, suggests at least two construction phases. It consists of a stepped wall, c. 20 m long, which had been equipped with at least five sluices, each c. 1.7 m wide. The stepped side faces downstream. Two more recent walls have been built east and west of this feature, creating the U-shaped reservoir. The remains of at least one stone structure with sluices that was built with the same building structure as the linear stepped feature is found c. 10 m south of this reservoir.

2.2.10. The Lashkar Bridge

Nearly 300 m south of Band-i Khak is another hydraulic structure built over the Dariun canal: the Lashkar weir-bridge (2.11-2.13, 2.40-2.42). The structure is located next to an old gate of Shushtar, the Lashkar gate (darwāzeh-yi Laškar). Lashkar is the Persian equivalent of Arabic ‘Askar. There is little doubt that the gate and the bridge were so named because of their location at the beginning of the road to Ahwaz, which passed by the ruins of ‘Askar Mukram. Several 19th-century travelers, e.g., Rawlinson, Loftus, Schindler, and Bell, passed by this gate and wrote about the bridge.[204] The monument bears many similarities to the Shadorwan, albeit on a miniature scale.

[204] Verkinderen, “Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period,” 265, ff.

It consists of a weir that forms the foundation for a bridge.[205] Likewise, the axis of the monument is not straight and seems to follow a natural outcrop that functions as its foundation. Furthermore, the weir and the pillars of the bridge are built with rough ashlar sandstone while the arches are made of brick. The nature of the core of the weir as well as the pillars and the deck of the bridge is not known[206].

The bridge was originally c. 104 m long and c. 8 m wide. It had 13 spans, one of which is now sealed. [207] The pillars are equipped with piers and buttresses of different forms on the northern and southern side. The weir is c. 2 m above the canal bed. A watermill is built on the northwestern side of the bridge. When Najm al-Mulk visited Shushtar, five of the spans of the bridge had been destroyed. He reports that people had to use a temporary crossing made of wood which was washed away during every flood and had to be constantly rebuilt.[208] Typical of water works at Shushtar, past restorations are evident in the heterogeneity of structural elements of the monuments. It is commonly assumed that the monument was built in the Sasanian period and restored afterwards. Nevertheless, no textual or material evidence has been offered to support this hypothesis.

2.2.11. The Shah ʻAli Bridge

Immediately west of the Lashkar bridge is the small bridge of Shah ʻAli (Fig. 2.11-2.13, 2.40, 2.43). The bridge is positioned in a north-south direction. The road that started from the

[205] Unlike the Shadorwan which is called a pol-band (*Pers*. weir-bridge), this structure is only called a pol (*Per*. bridge), obscuring its role as a flow-regulating device.
[206] Some sources mention that the core is rubble masonry, but, there is no documentation or evidence to support that.
[207] *Naj*, 30. "Introduction to Shushtar Historic Hydraulic Structures", Shushtar Cultural Heritage and Tourism Organization, accessed Feb 2, 2016: http://omurpaygah.ichto.ir/Default.aspx?tabid=4898&language=fa-IR. Schinder and Bell wrote that the bridge had 8 spans. The reason is probably because 5 of the arches were destroyed at the time of their visited, as reported by Najm al-Mulk. Schindler, "Reisen Im Südwestlichen Persien," 103; Bell, "A Visit to the Kárún River and Kúm," 460.
[208] *Naj*, 30.

Lashkar gate and crossed the Raqqat branch of the Dariun by means of the Lashkar bridge, passed over a cliff and descended to the plain by crossing over the Shah-Ali bridge.[209] The bridge has three spans, just as it did in the time Najm al-Mulk.[210] The building technique is similar to that of the Lashkar bridge, with a façade of rough ashlar sandstone and brick arches. It is said that 'Ali Sultan, the governor of Shushtar during the reign of the Safavid king, Sulayman, built the bridge.[211]

2.2.12. The Mahibazan

Approximately 2 km south of Shushtar is the remains of an enigmatic structure known as Band-i Mahibazan[212] (less commonly as *ḫodā āfarīn*) (Fig. 2.44). The only visible architectural remains at the site are three pillars of rough ashlar masonry as well as parts of two parallel stone walls, found some 100 m west of the three pillars (Fig. 2.44-2.47). It is not clear whether these remains belong to the same original feature.

These remains are located on top of a very long and spectacular sandstone ridge, c. 600 m wide, across the valley of the Gargar. The river begins to widen after its narrow passage through the outcrop of Shushtar. At this location, the width of the river is suddenly doubled: the river takes a sharp turn around the ridge (as opposed to flowing over it) through a cut on its eastern side (Fig. 2.48).

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[209] The described configuration of the landscape and the relationship between the two bridges has been obscured by the construction of the Shushtar ring road.
[210] *Naj*, 30.
[211] "The Renovation and Restoration Plan of SHHS-Vol 7," 83. It is also said that an inscription bearing the name of Shah Sulayman Safavid king existed on the Lashkar bridge until 1047 CE. I was unable to find a reliable source on this, or even the identity and the dates of the rule of the so-called 'Ali Sultan.
[212] Band-i Māhībāzān

The origin of the name ḫodā āfarīn (*Per*. god-fashioned) is not clear. It is said that the name reflects the peculiarity of the structure and the spectacular scene. The Mahibazan seems to be related to the fishing in the reservoir that is created behind the ridge. It is commonly accepted that the remains were part of a weir, hence the name The Band-i Mahibazan.[213] At present, the site has become the center of a growing industry of fish farming that has had a negative impact on the environment and on the integrity of the historic remains. As a result, the site is now heavily disturbed.

There are no textual references to The Mahibazan that predate the 18th century. Nonetheless, Muqaddasī's account of his boat journey from Shushtar to 'Askar Mukram by way of The Masruqān may provide a clue. He mentions that whoever wants to travel by boat to 'Askar Mukram has to walk for almost one farsaḫ, to arrive at the point where the boats embarked.[214] We know from 19th-century travel accounts that natural ridges near Shushtar were an obstacle to boats. Therefore, all the boats used to load and unload upstream from the village of Shalili/Hesamabad, just before a major ridge barred the river. [215] The account of Muqaddasī seems to describe the same situation as in the19th century. The Mahibazan is located approximately 3.5 km (less than a farsaḫ) south of the old city. Assuming that a passenger would have walked from one of the city gates, probably the Laskhar gate southwest of the old city, the distance would be close to one farsaḫ. It is important to note, however, that these references are only to an outcrop that obstructs the course

[213] Ibid., 125; Moghaddam, "A Note on the Gargar Irrigation System"; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 270.
[214] *Muq*, 409.
[215]Selby, "Account of the Ascent of the Karun and Dizful Rivers and the Ab-I-Gargar Canal, to Shuster," 271; Layard, "A Description of the Province of Khuzistan," 52; *Naj*, 31. Both villages exist today, very close to each other. The historic aerial and CORONA imagery shows that the modern settlements have slightly moved, maybe because of the flood damage to the older settlments.

of the river, which *may* be the same as the outcrop of Mahibazan. There is no direct textual evidence for the architectural remains on the outcrop.

The only notable research on the structure was carried out by Moghaddam. He hypothesizes that the Mahibazan weir was an essential element of the Gargar irrigation system and was built by the Sasanian state. In the wake of post-conquest socio-political disturbances, the hydraulic system here was neglected and collapsed. The result was the avulsion of the Gargar Canal into its current meandering course.[216] This idea will be more thoroughly examined in chapter 4 & 6.

2.2.13. The ʻAyyar Weir

Approximately 1700 m south of the Watermills complex, the remains of an old weir, known as Band-i ʻAyyar[217] or Band-i Burj-i Ayyar, is found on the Gargar river (Fig. 2.11-2.13). The origin of the name is unknown. A local legend says that a woman sold her burj-i ʻayyar, a type of headgear jewelry, in order to provide the seed money for the construction of the weir.[218] *Burj* can have different meaning. The most common usage in Persian is a high building/tower (*Per.*), or each of the twelve divisions of Zodiac/months of the year (*Ar.*). It seems more likely that the weir took its name from its proximity to a high monument/tower at the site or nearby, a certain Burj-i ʻAyyar. Another version of the legend relates that the patron lady sold the jewelry which she kept in her Burj-i ʻAyyar to provide the money.[219] The site is also known to the local inhabitants of Shushtar as the Niyāyišgāh-i Ṣābi'īn (*Per. The* Mandaean sanctuary), and it is believed that

[216] Moghaddam, "A Note on the Gargar Irrigation System."
[217] Band-i ʻAyyār
[218] *Tuḥ*, 63.
[219] "The Renovation and Restoration Plan of SHHS-Vol 7," 127.

Mandaeans prayed at this site. Mīr ʻAbd al-Laṭīf does not mention this name, but reports that the Mandaeans of Shushtar lived in the nearby neighborhoods and performed their rituals in the river in the vicinity of the structure. [220]

The site is very disturbed. A roadway crosses the Gargar at the site and has eradicated its northern parts (Fig. 2.49). Also, domestic and construction trash has been dumped on the site, and as a result the eastern part of the site is almost completely buried. What is visible consists of a stone masonry structure, and a carved outcrop in the northern and eastern part of the site, respectively. The weir has a concave geometry (Fig. 2.49, 2.51-2.52). The part that used to close the river has disappeared. What is left on the eastern bank is c. 30 m long, and c. 5 m wide. Old aerial photos show that prior to the construction of the bridge, c. 60 m of the weir was preserved. The material is roughly dressed as well as undressed stone with sārūj mortar. The outer surface is partly plastered with similar mortar. The upper surface of the structure is paved with rubble stone and mortar.

The carved part of the site is more enigmatic (Fig. 2.50-2.51). It is partly covered with debris from construction waste and water erosion. What is left consists of several canals, and basins of various forms. Other features which resemble steps and sluices are also found on the outcrop. To my knowledge, no systematic study of the weir and its various features has been carried out. According to the locals, the canals directed water from behind the dam to the basins which were

[220] *Tuḥ*, 63–64.A sizable group of Mandaeans lived in Khuzistan, in the 18th and 19th century. Apparently, they were centered in Shushtar and Dezful, but moved to Ahwaz and other cities in southern Khuzistan in the 19th century.

used by Mandaeans for their water rituals.[221] This explanation is problematic as the Mandaean's are not known to build structures for their river rituals.

It has been said that in 1111 AH/1699 CE the weir collapsed and the gardens that relied on it were destroyed.[222] However, Mīr 'Abd al-Laṭīf, who wrote in the late 18th century, reports that watermills and lifting devices were installed on western bank of the river which relied on the supply from the weir, and, that the water that was raised from behind the dam was directed to the nearby gardens and houses.[223] Therefore, the destruction of the dam might have happened at a much later time. Alternatively, Mīr 'Abd al-Laṭīf might have simply repeated older stories.

2.2.14. The Band-i Qir (The Bitumen Dike)

The location of the confluence of the Gargar and the Shotayt is named Band-i Qir (*Per*. The bitumen dike/weir), one of the most intriguing elements of the hydraulic landscape of Miyanab. The name appears frequently in the 9th century British travel accounts, but with no description of the feature or its location. Since the location of the weir has not been established, speculations about the possible direction of the structure have varied in modern scholarship. In general, however, the fact that such a hydraulically significant location bears the name of a weir has made scholars associate the raison d'être of the weir with regulation of the flow of water between the two watercourses. Recently, Alizadeh et al. argued that since the Kupal anticline forces the modern Gargar toward the Karun, the Band-i Qir was built to keep the two watercourses

[221] "Introduction to Shushtar Historic Hydraulic Structures", Shushtar Cultural Heritage and Tourism Organization, accessed Feb 2, 2016: http://omurpaygah.ichto.ir/Default.aspx?tabid=4898&language=fa-IR.
[222] Iqtidari, *Āṯsār-I Khūzistān*, 585.
[223] *Tuḥ*, 63.

separate below the nose of the Kupal.[224] Moghaddam, on the other hand, argues that the purpose of this weir was to force the water of the Gargar, which flows through the nose of the Kupal anticline, to continue to run along its southern face.[225] He does not elaborate further on how such dam worked or where it might have been located. Woodbridge, referring to the fact that the major weirs in the region are usually built along an anticline, suggests that the intersection of the Ramin anticline and the Karun would be a good candidate for the location of the dam.[226]

Interestingly, the mystery of the Band-i Qir was created as a result of a simple error: confusion between the location of the weir and that of a fort/village which bears the same name. Najm al-Mulk describes the village and the weir after which it is named thus:

"The second way station [in the course of his travel from Shushtar to Ahwaz] is the Band-i Qir. It used to have a nice and prosperous fort, of which only the walls and few mud houses are left. The population is 30 men and 100 women and children, from the Arab tribe *'Anāqičih*, who live in the lands between Dezful and Āb-i Shushtar (The Shushtar river). Their main occupation is dry farming of the field in the lower Miyanab. They also have few sheep and a *balam* (*Per.* canoe) to pass people across the three water courses of Dezful, Shushtar and Du Dāngeh (the Gargar). Three quarters of Farsang (farsaḫ) north of the fort of the Band-i Qir, there used to be a weir across the width of Du Dāngeh, between 70 to 100 zar'. It seems that the weir/dam was built of brick and bitumen. It is now in ruins and the foundation of what remains is under water. It is possible to carry bricks from the remains in late summer. On both side of the weir, in the lands of than Miyanab and

[224] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 81.
[225] Moghaddam, "A Note on the Gargar Irrigation System."
[226] Woodbridge, "Responses of River Karun and the River Dez to Human Activities," 31–32, 34.

toward Ahwaz, there used to be a big city the ruins of which are still visible. The weir made it possible to make a large canal to flow toward Ahwaz….The two rivers join approximately 700 zar' south of the Band-i Qir fort."[227]

The fact that the weir was in a different location from the village is also corroborated by the account of Mīr 'Abd al-Laṭīf in the 18th century:

"Further downstream [from Hesamabad], there is the Band-i Qir, in which bitumen is used [as mortar] instead of sārūj and gypsum to provide further strength. In the vicinity, there is a village inhabited by Arabs; there is also a fort that has been known with the same name [i.e. Band-i Qir]."[228]

2.3. Summary

In this chapter, the geographical setting of the Miyanab plain, the physical aspects of the major hydraulic structures on the plain, and the historical background of the hydraulic monuments were described. The Miyanab is part of the upper plains of southwestern lowlands of Iran. The geological and hydrological characteristics of these plains are defined by tectonic uplifts and sedimentation. The plain is bounded by the Karun and Gargar rivers. The Karun is the biggest river in Iran. The origin and evolution of the Gargar is poorly understood. It is widely accepted that a combination of human and natural agents has formed the waterway.

The geological history of the Upper Khuzistan plain, including the Miyanab plain is not very well understood. Nevertheless, it seems that the geomorphological history of these plains in the past 8000 years has been defined by two phases of aggradation and one phase of channel

[227] *Naj*, 32. Each zar' is c. one meter.
[228] *Tuḥ*, 65.

incision. The precise dating and causes of these processes are not known. Based on the archaeological evidence from the site of Dar Khazineh, the chronology of these processes in the study area has been established as such: between 6000 and 1500 BCE water flowing near the surface provided the optimum condition for agricultural production for the early sedentary societies. Sometime between 1500 BCE and the first few centuries of Common Era, a phase of channel incision started whereby the rivers were established more or less in their current position. It seems that at least since 700 CE a new phase of aggradation has started on the plains.

Early work on the upper plains hypothesized that the rather synchronous date of the phases of aggradation and degradation point to causes that operate at regional scale, including geological processes and environmental change. However, Alizadeh et al. associate the processes of channel incision documented at Dar Khazineh to a manmade cause, namely, the digging of the Gargar canal in the Sasanian period. While the evolution of the Gargar River is not well understood, it is widely accepted that the agricultural collapse was due to lack of investment in the maintenance of the canal system in the Islamic period. Similar to the case of the Gargar, very little is known about the history and past transformations of various historic hydraulic structures of the Miyanab. While most of these structures are generally attributed to the Sasanian state-sponsored irrigation projects, the only given fact is that the hydraulic configuration of Shushtar as surrounded by the canals, and the Shadorwan weir existed at the time of conquest

Figure 2.1 Schematic cross-section of a foreland basin system, showing the depozones. (Modified from DeCelles and Giles, 1996)

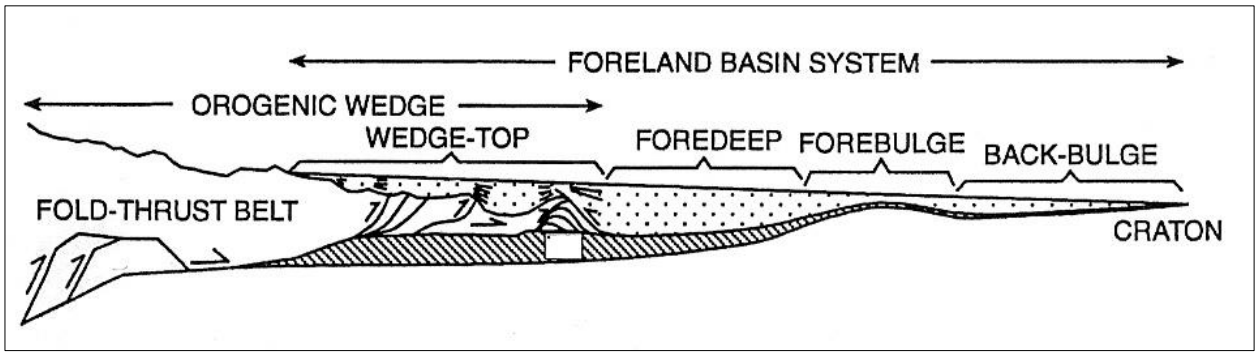


Figure 2.2 Key to Fig 2.3, next page (After Woodbridge 2013, Fig 4.1)

— — — — — — **ZDF** Zagros Deformation Front

 Axis of anticline (arrow indicates direction of plunge)

 Oilfield

 Oilfield anticline

 "Concealed fault/deep-seated lineament" oriented E-W at 31°47′N

Abbreviations for selected anticlines and oilfields

AGA	Abu ul-Gharib Anticline	**AHA**	Ahvaz Anticline
AJA	Agha Jari Anticline	**AOA**	Ab-e Teymur Oilfield Anticline
AZO	Azadegan Oilfield	**BIA**	Binak Anticline
BKA	Band-e Karkheh Anticline	**DMO**	Dasht-e Mishan Oilfield
DOA	Dorquain Oilfield Anticline	**DPA**	Dal Parri Anticline
DVA	Darreh-ye Viza Anticline	**DZU**	Dezful Uplift
GMA	Gach-e Moh Anticline	**HAA**	Hamidiyyeh Anticline
HKA	Haft Kel Anticline	**JFO**	Jufeyr Oilfield
KHO	Khorramshahr Oilfield	**KNA**	Kuhanak Anticline
KUA	Kupal Anticline	**MAO**	Mahshahr Oilfield
MEO	Mehr Oilfield	**MQO**	Mushtaq Oilfield
MRA	Marun Anticline	**MSO**	Mansuri Oilfield
NSA	Naft-e Safid Anticline	**OMO**	Omid Oilfield
PZA	Pazanan Anticline	**QSA**	Qal'eh Surkheh Anticline
RGA	Rag-e Safid Anticline	**ROA**	Ramin Oilfield Anticline
RRO	Ramshir Oilfield	**SDA**	Sardarabad Anticline
SDO	Shadegan Oilfield	**SHA**	Shahur Anticline
SIO	Siba Oilfield	**SMA**	Siah Makan Anticline
STA	Shushtar Anticline	**SUO**	Susangerd Oilfield
TKA	Turkalaki Anticline	**ZUA**	Zeyn ul-Abbas Anticline

Figure 2.3 Geological map of south-west Iran showing selected anticlines, oilfields, and oilfield anticlines in the lowlands (After Woordbridge 2013, Fig 4.1 a)

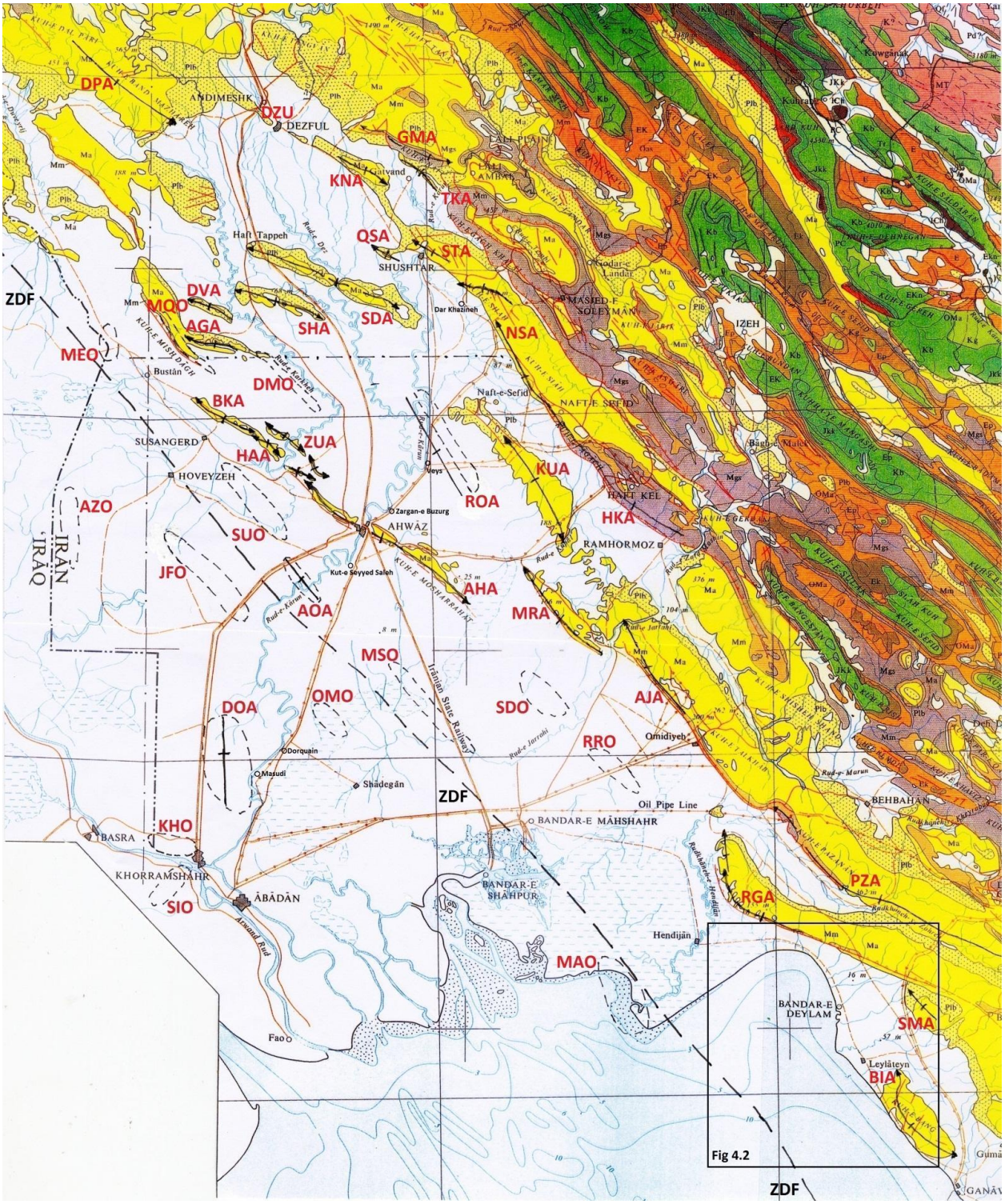


Figure 2.4 The Karun river and other main rivers of the province of Khuzestan (After Woodbridge 2003, Fig 2.3)

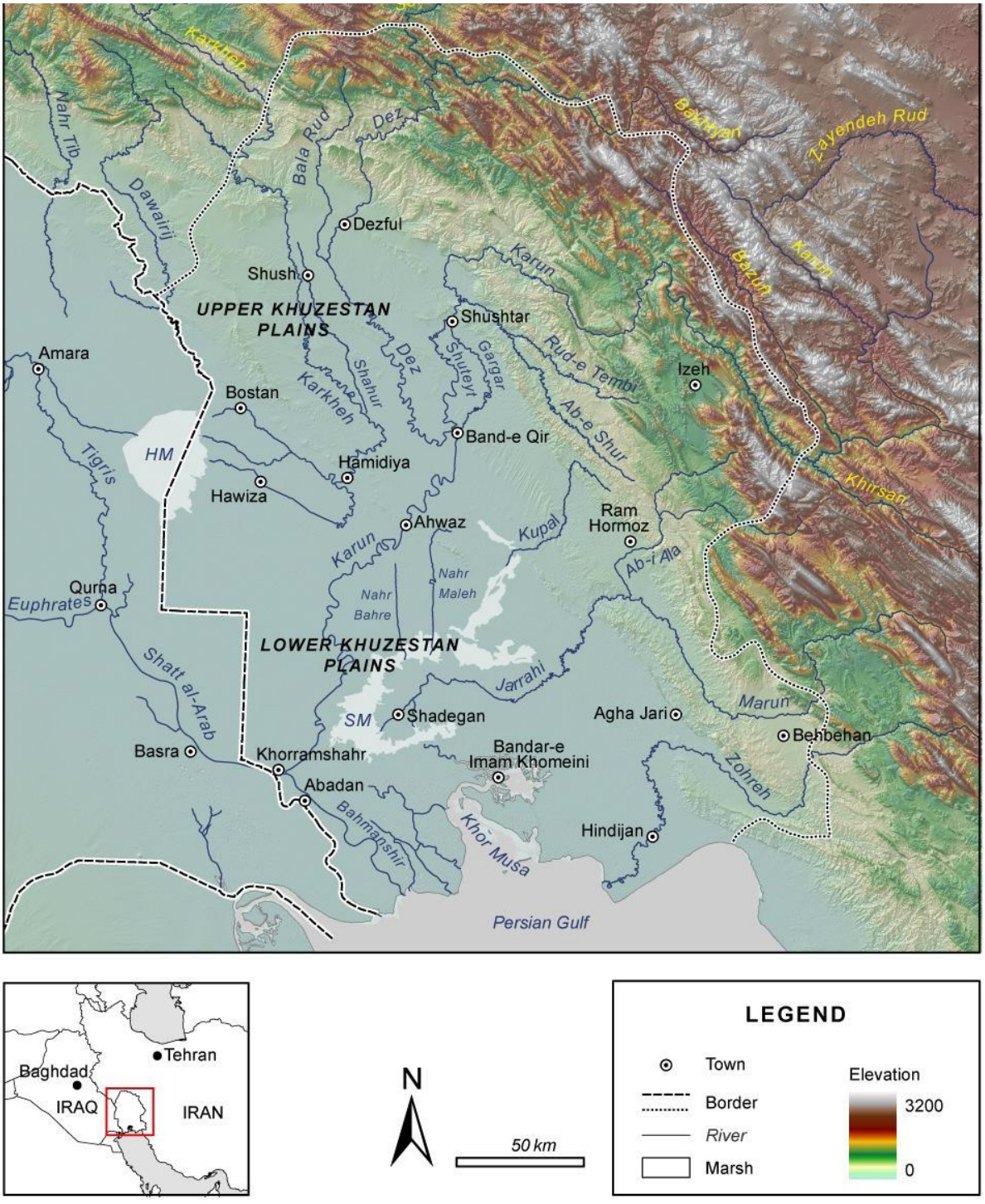


Figure 2.5 Map showing the geological features of the study area (After Moghaddam 2012, Map 3.1)

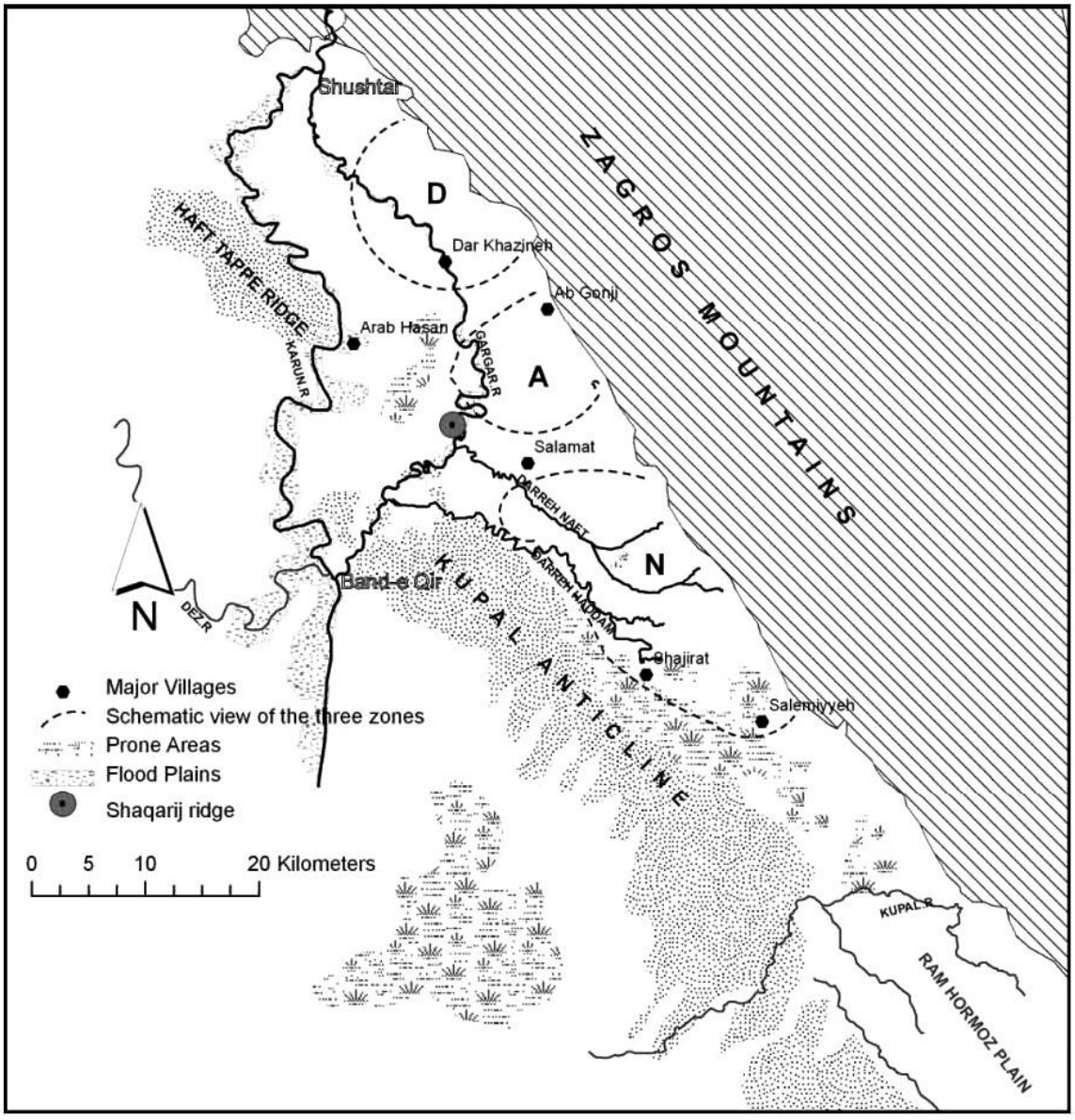
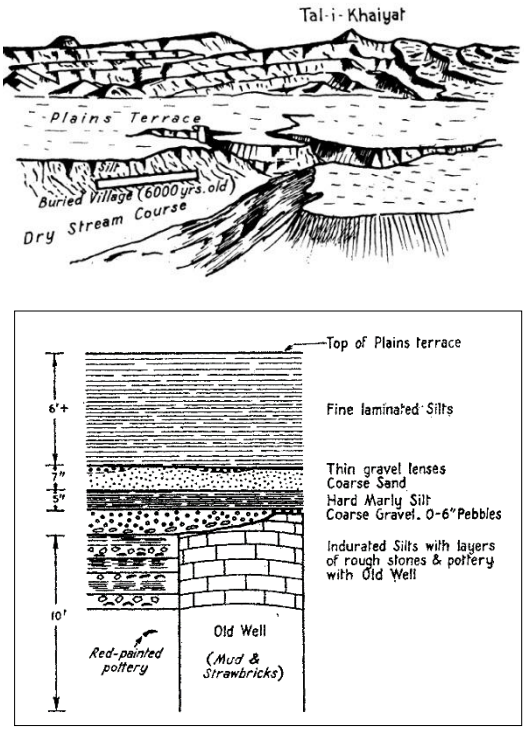


Figure 2.6 Left: sketch drawing (top) and the section (bottom) of the Dar Khazineh site (After Lees & Falcon 1952, Fig 4, 6). Right: Study area of Alizadeh et al. (top) and the wadi section near Dar Khazineh (bottom; site KS1626) (After Alizadeh et al. 2004, Fig 2, 3)



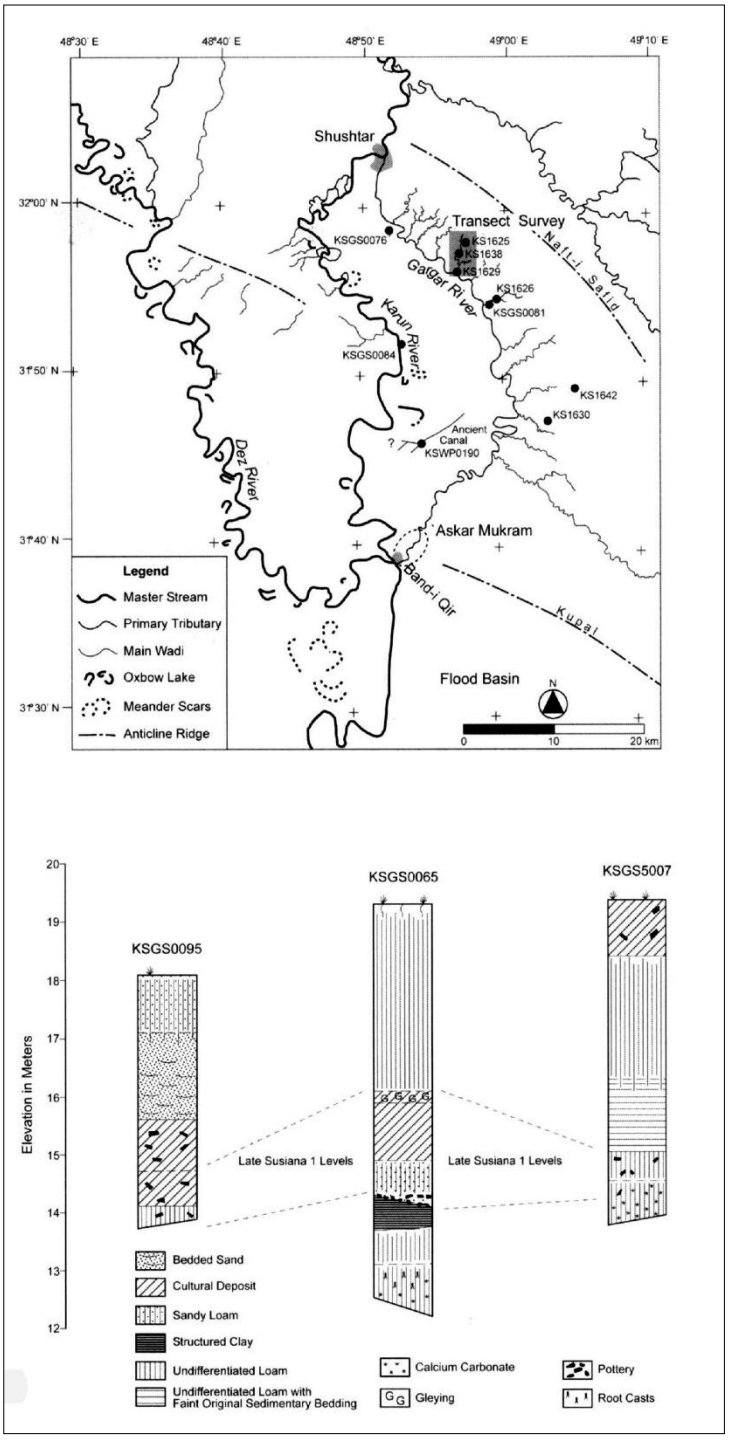


Figure 2.7 Development of irrigation and drainage systems on the left bank of the Karun river (After Alizadeh et al. 2004, Fig 13)

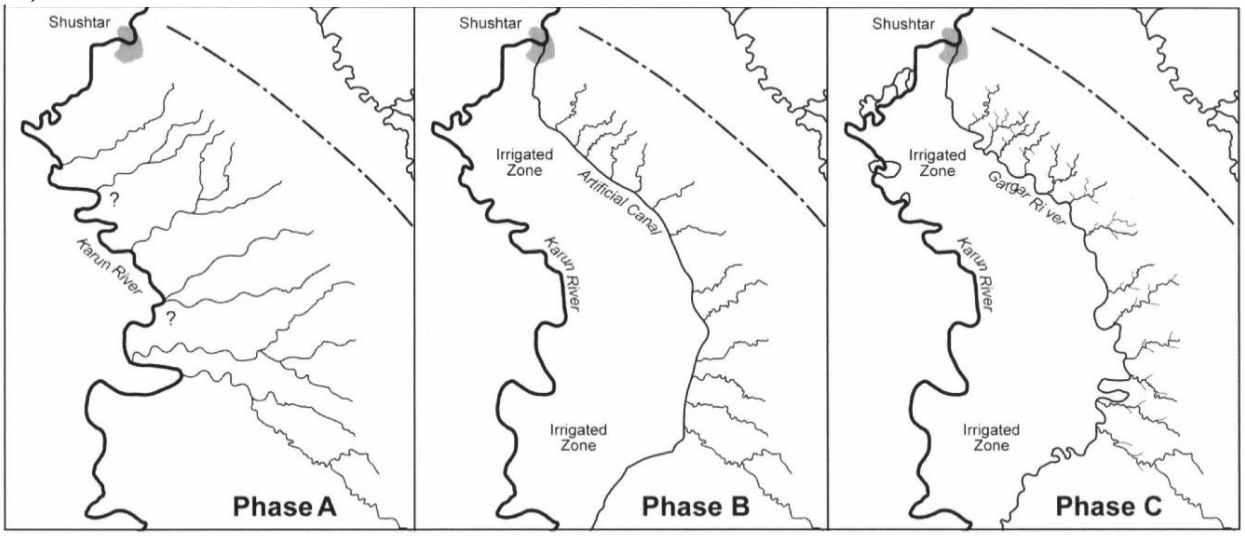
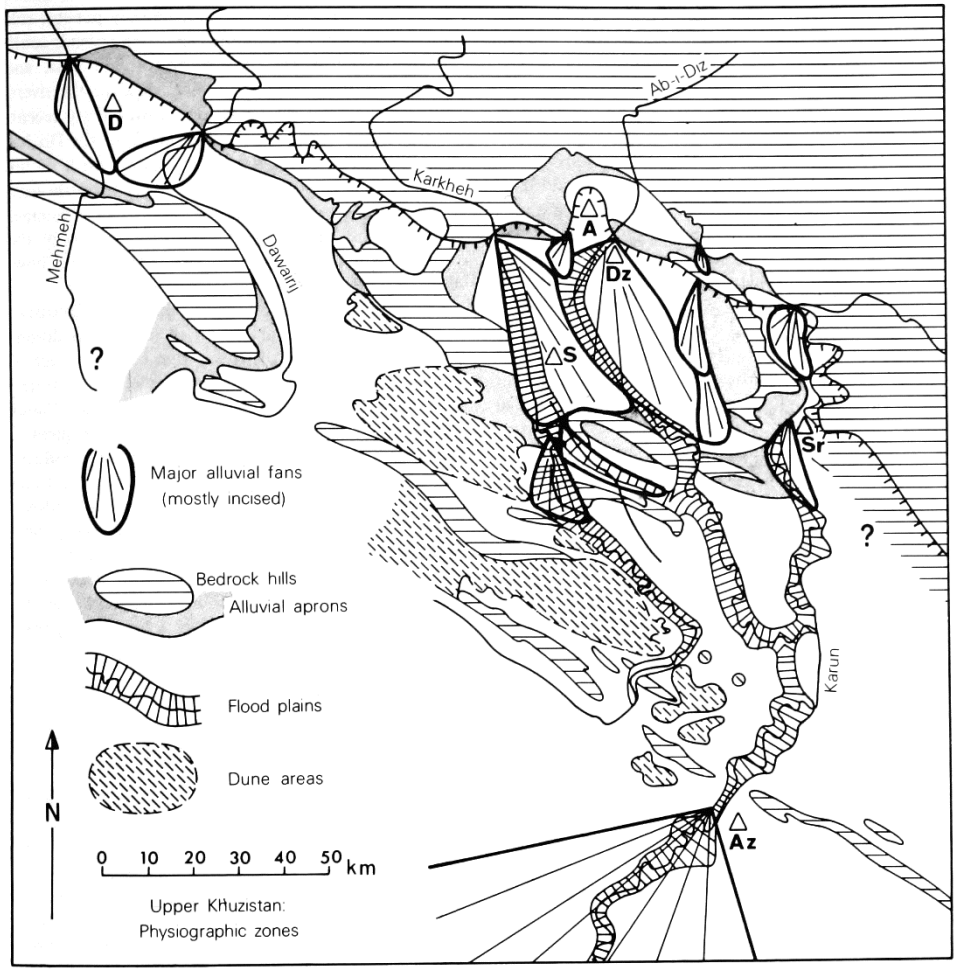


Figure 2.8 Upper Khuzistan: principal physiographic zones and features (After Kirkby 1977, Fig. 101)



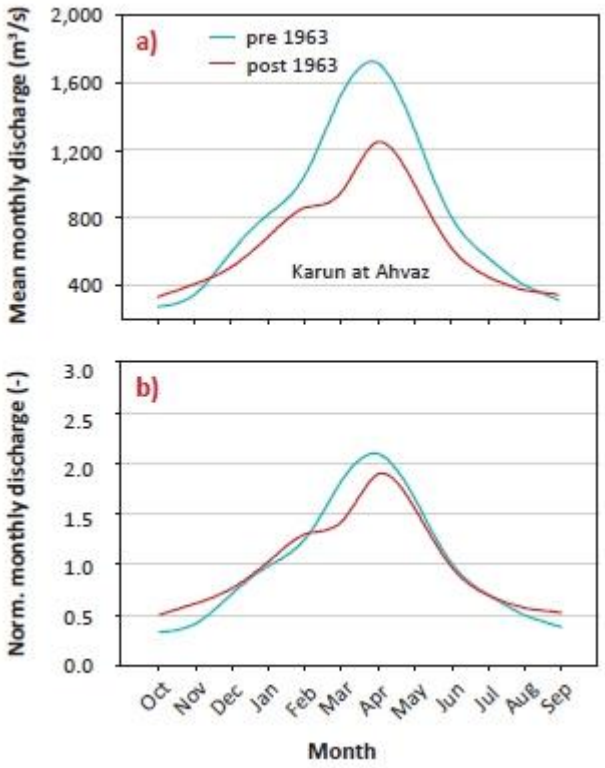


Figure 2.9 Mean monthly flow regime of the Karun River at Ahwaz for period 1894-1985. The highest mean monthly discharge was recorded in April 1969 (2,995 m3/s) and the lowest discharge in October 1949 (163 m3/s). (After Inventory of Shared Water Resources in West 2013, Ch-5, Fig. 8)

Figure 2.10 High discharge of the watercourses in the study area, according to various flood return periods. (After Environmental Report 2005)

Location	Area sqkm	Return Period												
		2	5	10	20	25	50	100	200	500	1000	2000	5000	10000
Karun at the Gotvand Station	32425	2540	3757	4610	5460	5735	6603	7496	8418	9689	10693	11736	13180	14324
Karun at Band-i Mizan	35643	2662	3966	4886	5805	6104	7047	8019	9025	10416	11517	12664	14255	15517
Gargar at the Shushtar Station	35643	182	265	323	381	399	458	518	579	663	730	799	894	869
Shotayt at the Arab Hasan Station	35643	2396	3569	4398	5224	5493	6342	7217	8123	9374	10366	11398	12829	13965

Figure 2.11 Bifurcation of the Karun into the Shoteyt (left of picture) and the Gargar (right of picture). The Band-i Mizan is visible in the background at the bifurcation.

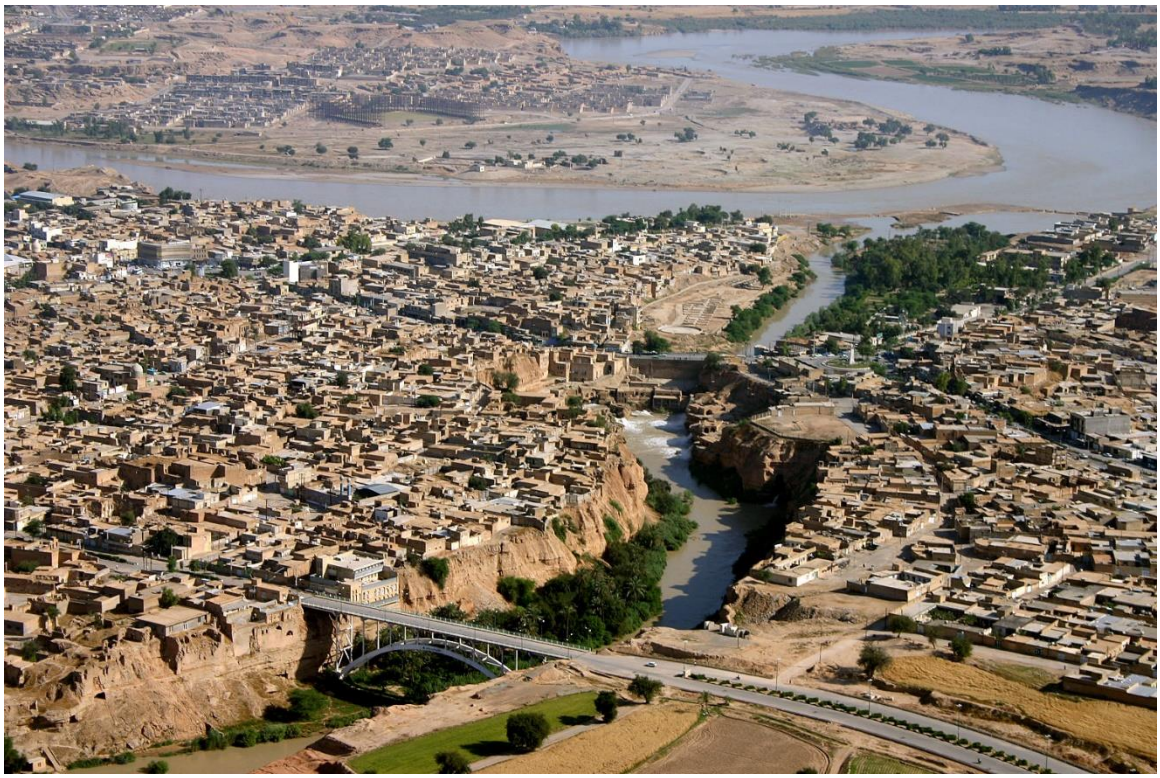


Figure 2.12 Waterworks at Shushtar: 1. Band-i Mizan; 2. The Salasel Castle; 3. Shadorwan; 4. The Watermill Complex

Figure 2.13 3D model of Shushtar and its environs, created from aerial imagery acquired in 1956. The numbered structures are 1) The Band-i Mizan; 2) The Salasel Castle and the intake of the Dariun; 3) The Shadorwan; 4) The Band-i Khak; 5) The Lashakr Bridge; 6) The Shah ʻAli Bridge; 7) The Band-i Sharabdar; 8) The Mandaean Sanctuary and Band-i ʻAyyar; 9) The Gargar Dam, the Waterfalls, and the tunnels.

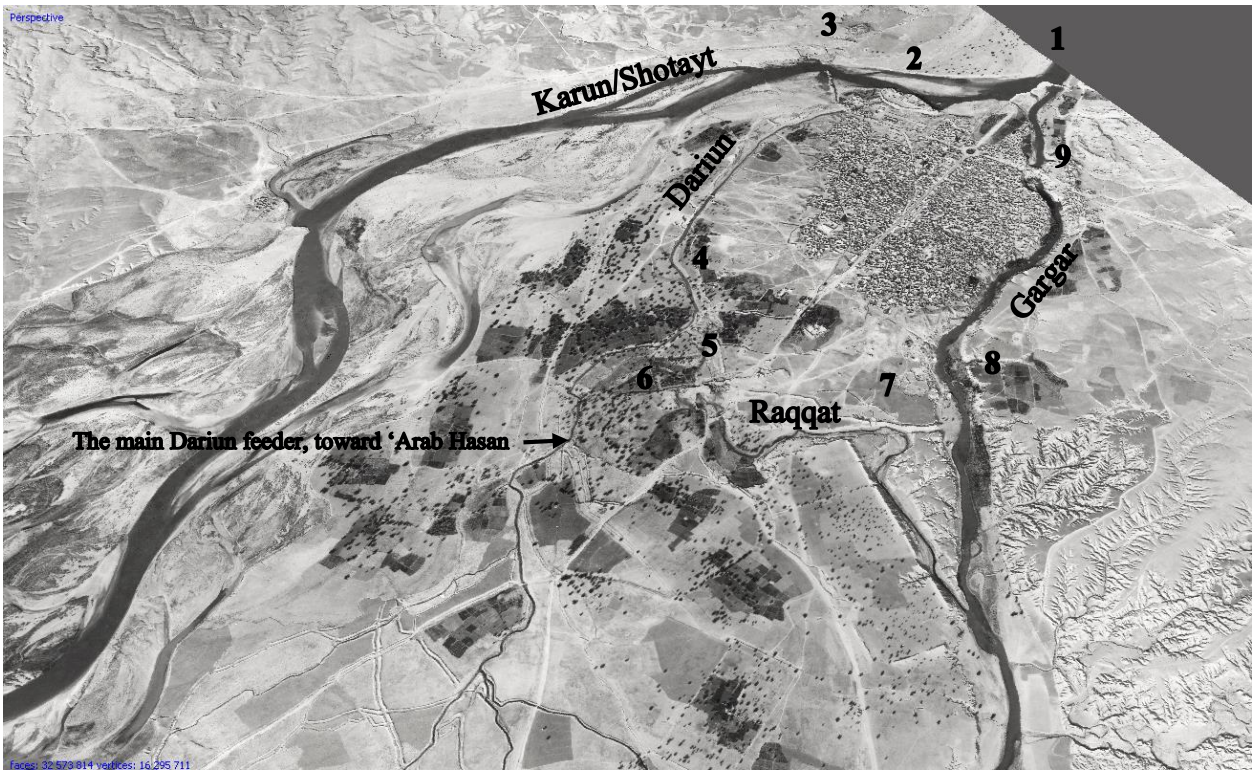


Figure 2.14 The Dariun, view from south to north after it exits the Castle. The Mustawfi Bridge is in the background. For location see Figure 2.19.

Figure 2.15 The Dariun, inside the Castle, at the beginning of its course over the ground. Photo taken in 2002, when the constructions of the new intake of Dariun had started.

Figure 2.16 Main channel of the Dariun after renovation: a cement canal replaced the old channel.

Figure 2.17 The old intakes of Dariun beneath the Salasel Castle; To the right: new intake that replaced the main headwork of the canal.

Figure 2.18 The Citadel and Shadorwan in the late Qajar period; view from a tower inside the citadel to NW.

Figure 2.19 Top: Aerial photo acquired 1956 showing the hydraulic monuments and features northwest of Shushtar. 1) the wall and the location of the moat protecting the southern side of the Salasel Castle; 2) The Shadorwan; 3) The intake of the Dariun; 4) The Mustawfi Bridge; 4) The Haj Khodaee Bridge. Bottom: The map of Shushtar prepared by the Russian army in the early 19th century, during the reign of Fath'Ali Shah shows that a moat used to circumscribe the southern side of the Castle (After Pictorial documents of Iranian cities 1999.)

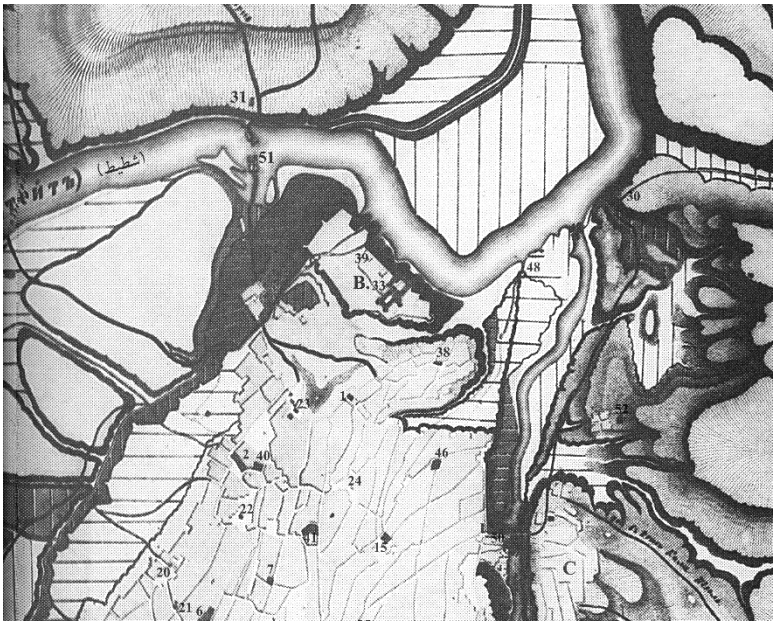


Figure 2.20 The Band-i Mizan. The eastern wing of the weir with 9 sluices is in the lower right.

Figure 2.21 View from the eastern bank of the Gargar to the west, upstream of the Band-i Mizan.

Figure 2.22 View from the eastern bank of the Gargar to the north, downstream of the Band-i Mizan.

Figure 2.23 Aerial view to the Shadorwan from south.

Figure 2.24 Drawing by Madame Dieulafoy, 1881. View from right bank of the Shoteyt to south toward the city and Citadel. They used the bridge, which was in bad condition, to cross the Karun.

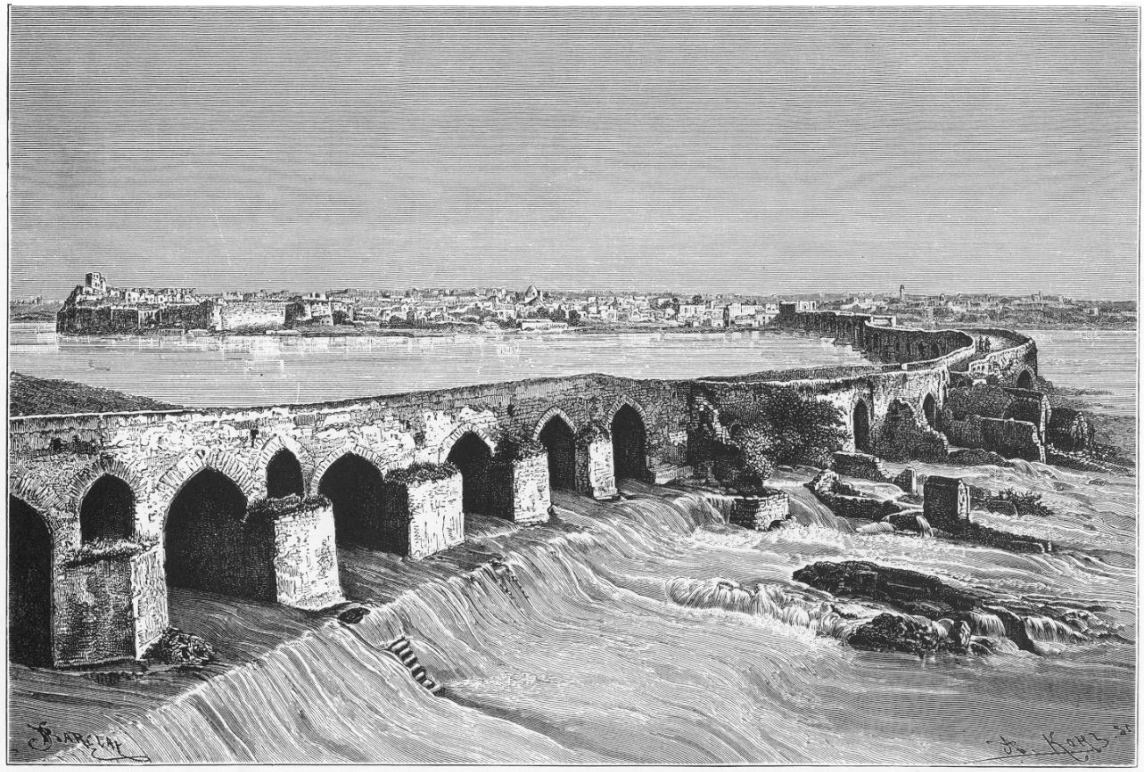


Figure 2.25 The Shadorwan, the northern remains, view to east.

Figure 2.26 The Shadorwan, southern remains, view from north to southeast.

Figure 2.27 The southern arches are very poorly preserved and at the same time significantly modified through intrusive renovations.

Figure 2.28 View from the south of the Watermills Complex to the north. The Gargar Dam is in the top center of the picture.

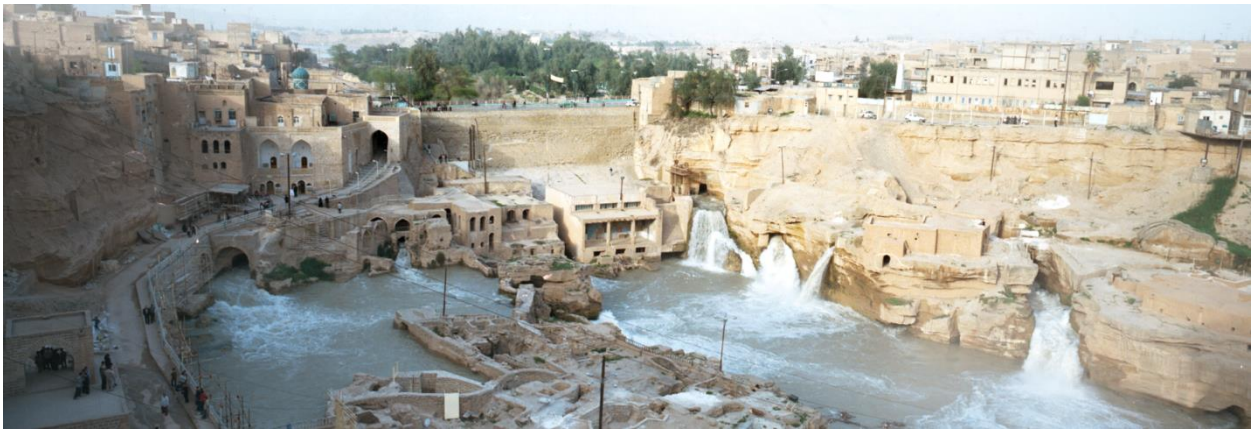


Figure 2.29 Downstream the Gargar Dam, view from the center of the Waterfalls to the east, at the outlets of the Boleyti tunnel.

Figure 2.30 The southern face of the Gargar Dam. The sloping part and two phases of the straight wall are visible on the image. To the left are the additional buildings of the Pahlavi period.

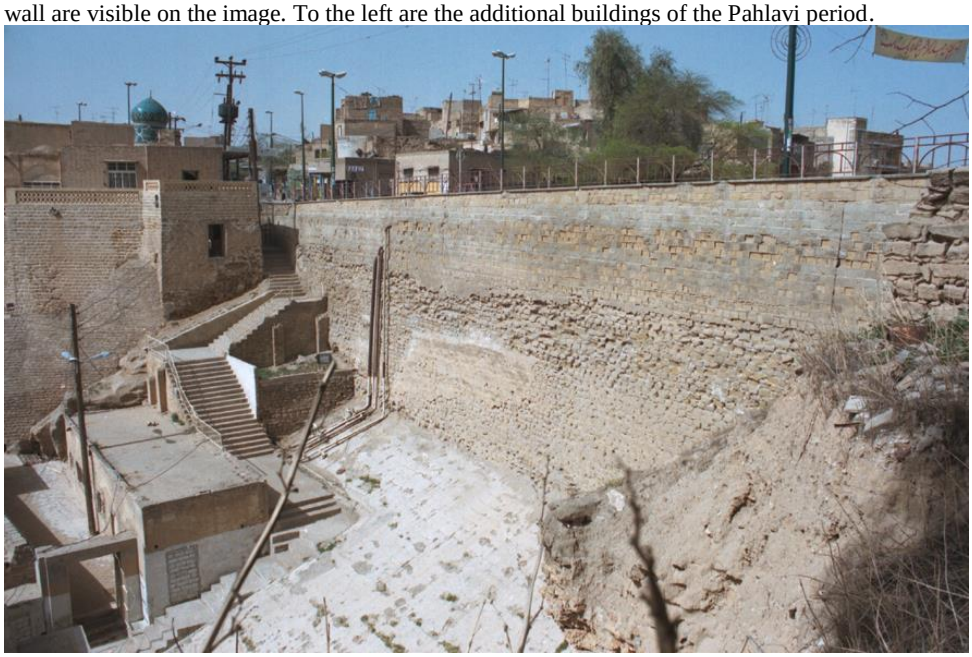


Figure 2.31 The remains of a brick building might relate to the piers of the one-arch bridge that was destroyed in the Qajar period.

Figure 2.32 View from the northern area of the Waterfalls to the south at the central part of the complex (foreground) and the watermills on the eastern bank (background).

Figure 2.33 The renovated watermills and waterfalls of the eastern part.

Figure 2.34 Upstream the Gargar Dam during renovations of tunnels in 2000. People sitting on the earthen wall.

Figure 2.35 The intake of the Boleyti Tunnel.

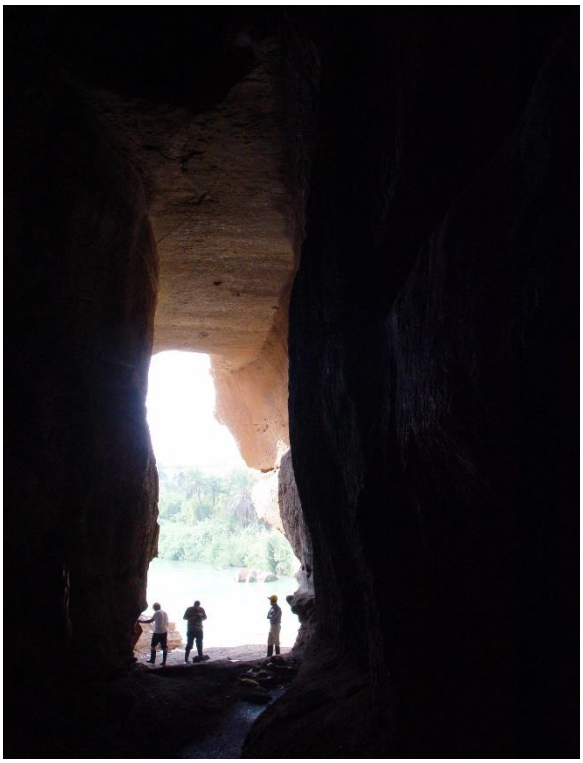


Figure 2.36 The intake of the Seh Kureh Tunnel.

Figure 2.37 The Gargar, immediately downstream the Waterfalls Complex.

Figure 2.38 The Band-i Khak, before excavation.

Figure 2.39 The Band-i Khak, in the final phase of functioning.

Figure 2.40 Southwestern area of the old city of Shushtar: 1. The Lashkar Bridge; 2. The Shah-'Ali Bridge; 3. The Imamzadeh 'Abdullah; 4. The Band-i Khak; 5: The Raqqat Canal.

Figure 2.41 Upstream of the Lashkar, view from east to west.

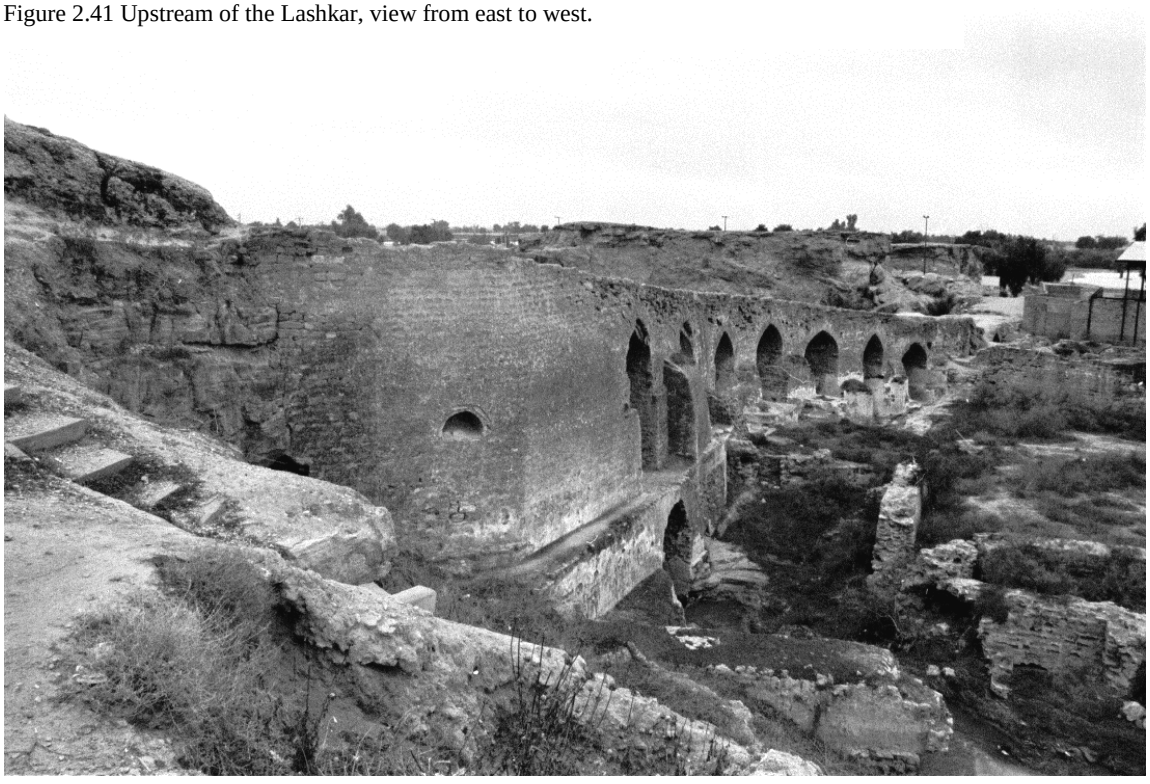


Figure 2.42 Drawing by Madame Dieulafoy view from the western bank of canal to the east toward Imamzadeh 'Abdullah.

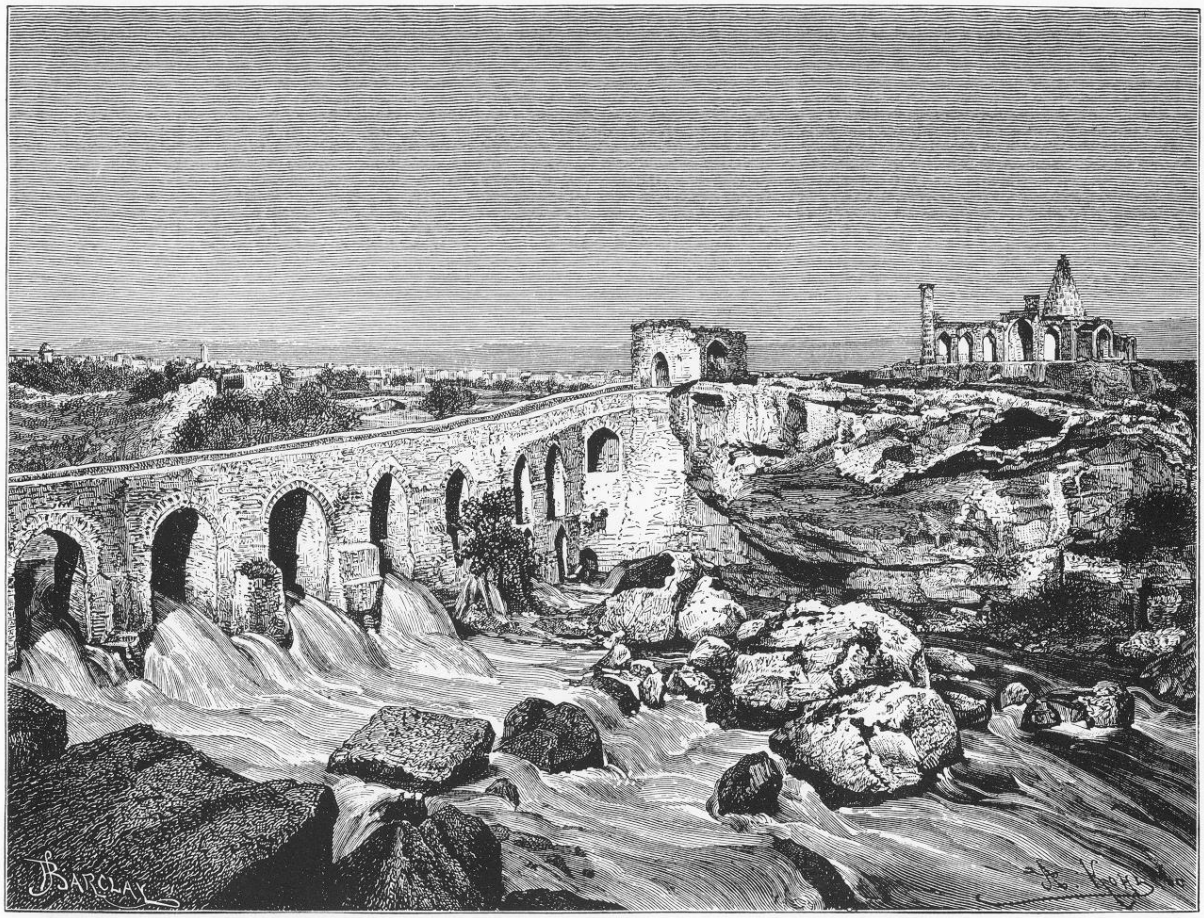


Figure 2.43 The Shah-'Ali Bridge.

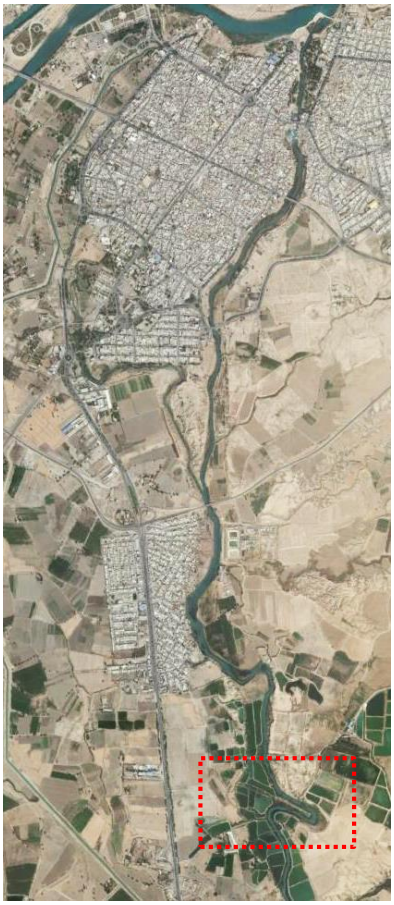


Figure 2.44 The Mahibazan. Location c. 5 km south of Shushtar (top left). The site is extremely disturbed and damage as a result of the expansion of fish farms (top right). Air photograph of the site 1956 (bottom); the arrow shows the length of the sandstone ridge that forms the base of the structure. The only architectural remains are 1) three stone pillars that seem to have supported arches (Fig. 2.45-2.46) and 2) two parallel stone walls (Fig. 2.47). 3) The ridge is cut at the eastern end (Fig. 2.48).

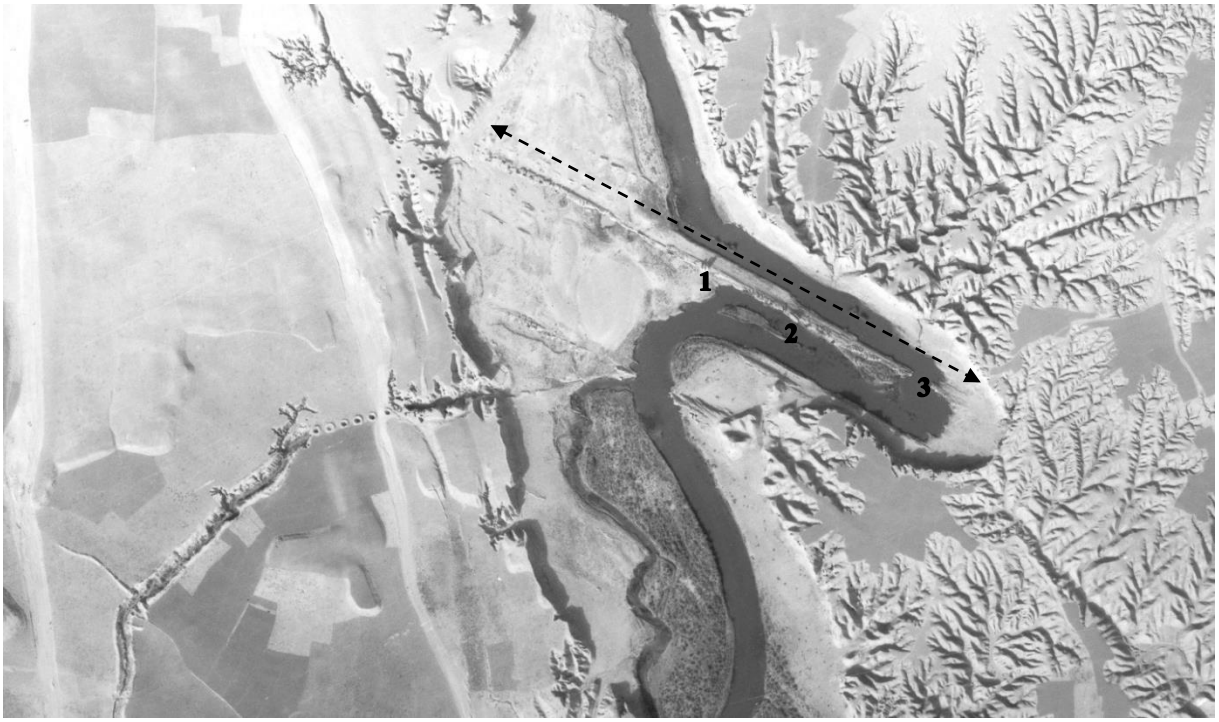


Figure 2.45 The Mahibazan, architectural remains; trace of a spring is preserved on the better preserve pillar to the left.

Figure 2.46 The Mahibazan: The sandstone ridge, with the three stone pillars in the background, view to the west.

Figure 2.47 The Mahibazan, remains of two stone walls is preserved on the eastern side of the ridge.

Figure 2.48 The Mahibazan, the sandstone ridge is cut on the eastern end.

Figure 2.49 The Band-i 'Ayyar; The site is very disturbed, visible remains include: 1. The weir; 2. the canals and features that are carved into a sandstone rock

Figure 2.50 The Band-i 'Ayyar, in addition to canals, basin-like features are cut out of the sandstone outcrop.

Figure 2.51 Band-i 'Ayyar: the rock cut canals and basins.

Figure 2.52 The Band-i 'Ayyar: architectural remains of the weir.

Figure 2.53. Recent restorations in the southern part of the Shadorwan have affected the authenticity of the monument. In particular, the heterogeneity of the shape and size of the arches is completely covered hidden under the renovated façade. Top, south arches in 1958-59. (Photo taken by Charles Schroeder, copyright, Harvard Fine Arts Library, Special Collections. Bottom, south arches in 2004.

Chapter 3
Methodology

3.1. Near Eastern Landscapes of Irrigation

Irrigation, probably more than any other technology, is capable of providing a structure for the landscape. By forming the alignment of water supply, irrigation channels determine the pattern of settlement and even in some cases the internal street and building plan of a settlement.[229] Sedentary life in the arid and semi-arid environment of West Asia has been necessarily bound to some degree to supplementary water supplied from canals.[230] As a result of this ecological and spatial significance, mapping and analyzing the patterns of canal irrigation has become one of the main objectives of nearly all regional archaeological surveys in the Mesopotamian plains since the late 1950s. Research into the origin of artificial irrigation and the growth of early civilizations are inevitably tied to each other as archaeologists are still trying to assess the impact of one on the evolution of the other. It is, however, clear that as the socio-political complexity of Near Eastern societies increased, canal systems also progressively grew in scale and complexity. At least since the end of the third millennium BC, there is textual evidence for the involvement of the state in irrigation projects.[231] But, textual references have limited coverage, shedding light on certain historical moments, specific locations and circumstances. Regional archaeological studies of irrigated landscapes have attempted to obtain a more comprehensive view of the relationship between the dynamics and structure of settlements and irrigation in time and space.

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[229] Wilkinson, Archaeological Landscapes of the Near East, 71.
[230] Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 17.
[231] Wilkinson, *Archaeological Landscapes of the Near East*, 89.

A crucial question and the fundamental difficulty for irrigation research is dating the canals. Actual sediments or contained organic material can directly date a relict canal.[232] However, the scale of the research agenda, the palimpsest nature of relict canal systems, and the complex geomorphological processes on the alluvial plains limit the application of direct dating. Obtaining and dating samples across a large study area can require human and financial resources far in excess of the budgets of entire survey projects. Mineral and organic samples may be contaminated; acquiring a set of reliable samples is much easier for a canal section or segment than it is for the complex palimpsest of relict channels across fluvial plain. As Adams points out, "Most irrigation systems not only are endlessly, incrementally modified in the course of regular desilting and maintenance operations but also are repeatedly subject to modifications on a larger scale. Frequently they newly incorporate remnants of extensive old systems conforming to entirely different basic patterns, and they are in turn incorporated into dissimilar later ones. "[233] Even when good samples are obtained from a location and dated, it is not always straightforward to ascertain what phase of the evolution of the regional irrigation structure is represented by the dated feature.

A breakthrough in the historical interpretation of irrigation was made during the Diyala project when Jacobson proposed that the linear alignments of settlements reveal the course of natural and artificial canals; he argued that if settlements of known date line up with a canal segment, it can be assumed that the canal was in use when the sites were occupied. Regional surveys by Adams and colleagues in the late 1950s to the 1970s, which applied this site-canal association method systematically across large areas in southern Iraq and southwestern Iran,

[232] Ibid., 83.
[233] Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 27.

yielded enormous amount of information about the structure and the evolution of irrigation in the long-term history of Mesopotamian civilizations. In the meantime, already in the 1960s, the use of cuneiform texts that refer to the sites being located along the named watercourses resulted in more sophisticated reconstructions of ancient waterways and in the revision of some of the conclusions that were made based on site alignments only. The methodology of the study of water history was significantly improved in the 1980s-1990s, when the physical traces of channels on the detailed topographic maps (levees) and on the historic aerial and satellite imagery were identified and analyzed according to textual data, as well as geological sampling.[234] As a result, it became clear that some of the levee systems did not correspond to the channel systems that had been mapped according to site alignments.[235] Today, the value of an interdisciplinary approach that combines textual, archaeological (remote sensing and fieldwork), and geological information is well recognized, and projects that can afford to utilize all three categories significantly contribute to our knowledge about the formation and transformation of relict waterways.[236] However, given the practical difficulties of geologically dating the channels on a regional scale, mainstream research in water history in West Asia is still based on, at least in the early stages, the application of a revised site-canal association methodology. This modified approach involves identifying the physical trace of the relict canals (primarily by means of remote sensing) and interpreting their evolution according to the settlement alignments. Geological and geomorphological studies often

[234] Gasche and Tanret, *Changing Watercourses in Babylonia*.
[235] Gasche and Cole, "Second-and First-Millennium BC Rivers in Northern Babylonia"; Wilkinson, *Archaeological Landscapes of the Near East*, 87.
[236] E.g., Gasche and Tanret, *Changing Watercourses in Babylonia*; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers: A Geo-Archaeological Approach: A Joint Belgo-Iranian Project: First Progress Report - Part 1"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 2"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 3"; Pournelle, "Marshland of Cities."

provide supplementary evidence in the more advanced phases of the projects[237]. Field identification of canals, and even ground-truthing of the remotely studied ones, plays a smaller role as development has obliterated much of the landscapes of irrigation in the Near East.

Despite significant increase in our understanding of the long term pattern of the evolution of ancient waterways in West Asia since the 1930s, some major theoretical questions have remained unresolved in Near Eastern studies. One of the main reasons is that our methodologies have still not improved enough to securely date canal systems on a regional scale. A classic example is the role of canal irrigation in the growth of early Mesopotamian civilizations. A second, less openly admitted problem is the extent of the direct involvement of the Iron Age and Late Antique empires in the construction of large-scale irrigation systems. Related to this question is the impact of the Muslim Conquest and Islamic rule on the irrigated landscapes of West Asia, and the extent of agricultural intensification in the medieval period (chapter 1). While archaeological research on water history is to a large extent based on the examination of sites dated from surface collections, ceramic chronology of much of West Asia between the Hellenistic and Middle Islamic period is poorly understood; several ceramic types that are generally defined as "Sasanian" are gritty plainwares with at most basic decoration that remained in use and were produced long into the medieval period. Moreover, Islamic archaeologists debate the short chronologies established by art historical approaches to the dating of the diagnostic types of Islamic period. The handful of excavated sites from the Sasanian and early centuries of Islamic rule are spread over large geographical distances. All the sites that are loosely-dated as Sasanian-Early Islamic by

[237] Even when project are designed from the very beginning to adopt a multidisciplinary approach, integrating archaeological, historical, and geological data with dramatically different time scales and resolution is a major research channels and may become frustrating.

archeologists—thus admitting the uncertainty of the date-- always appear on the Sasanian site-canal maps based on the widely held assumption that they were first founded in the Sasanian period and perhaps continued into the Islamic period.

The other major difficulty in water history research is the palimpsest nature of the irrigated landscape, especially in the fertile fluvial basins that were the primary scene of Near Eastern sedentary life. Related to this question is the impact of the Muslim Conquest and Islamic rule on the irrigated landscapes of West Asia, and the extent of agricultural intensification in the medieval period by the small scale modification of natural channels. With increasing human management, irrigation channels assumed a more canal-like regime and eventually canal systems with an unmistakably artificial character emerged. These complex paths blur the distinction between the natural and human origins of the channels. Also, the designed character of the early canal systems is usually very difficult to discern beneath the succession of its evolving forms.[238] Archaeologists often have to make subjective decisions about the evolutionary phases of the long-lived canal systems, before attempting to date them.

Aspects of land use within and beyond the major settlements is also a very thorny subject. The "empty" areas between the recorded archeological sites are often defined as the realm of pastoralism and mobile communities. Accordingly, the spatial organization of the mapped settlement patterns makes a significant contribution in the discourse about the relationship between sedentary and pastoral communities in Near Eastern history. Nevertheless, the extensive strategy that has been standard in Near Eastern regional surveys is based on the vehicular examination of

[238] Wilkinson, *Archaeological Landscapes of the Near East*, 71–91; Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 27.

mounded features, so it is likely to dismiss smaller and more transitory sites. Unfortunately, the landscape destruction caused by development schemes has eliminated the chance for resampling previously studied areas by more intensive survey methods. Steinkeller's study of the Ur III texts suggested that the number of the settlements were probably far more than those mapped by Adams and Nissen.[239] This difference might have resulted because the settlements were small, made of perishable materials or had a seasonal function (e.g., agricultural processing).[240] Since the late 1990s, the recovery rates in the Mesopotamian surveys has dramatically increased, which probably has as much to do with the original site density as with methodological advances and taphonomic reasons. Surveys are using better maps along with a wide range of modern and historical satellite imagery, and sophisticated recording technologies.[241] Depending on the availability of time, money and personnel as well as research questions, Near Eastern archaeologists are now able to consult a wide range of satellite data in order to intensify regional vehicular surveys to look for smaller and more ephemeral sites. The methodology of this research is adopted based on the advantages and disadvantages of previous approaches, and is inspired by the research questions and the nature of available data and resources.

3.2. Data

3.2.1. Archaeological Data

The study area forms the eastern edge of Susiana. In the 1960s and 1970s, regional surveys of Robert McCormick Adams and Robert Wenke recorded settlements and relict canal systems on

[239] Steinkeller, "City and Countryside in Third-Millennium Southern Babylonia"; Adams and Nissen, *The Uruk Countryside*.
[240] Wilkinson, *Archaeological Landscapes of the Near East*, 90.
[241] Ur et al., "Ancient Cities and Landscapes in the Kurdistan Region of Iraq," 111, 112: Fig. 16.

the Susiana plain, applying a methodology similar to that which had been used in the Mesopotamian plain in southern Iraq. These surveys were limited to the area west of the Karun and did not cover areas farther to the east, including the Miyanab. Beginning in 2001, two survey projects on the Miyanab plain and on the Eastern Gargar plain, directed by Abbas Moghaddam from ICAR, provided the first comprehensive record of settlement and irrigation in the far eastern part of the Susiana (2001-2002 and 2003-2004). Moghaddam adopted a walking survey method for most areas of the plain and complemented the settlement record with local knowledge of archaeological sites. Walking the plain in transects was possible thanks to its rather small size. Given that application of remote sensing and GIS in Iranian surveys lags considerably behind western archaeology, the surveys of the Miyanab and Eastern Gargar did not use satellite imagery and were only assisted by low resolution topographic maps. Maps of historical canals prepared by the KWPA were consulted. These records of the channels represent the last phase of the palimpsest of irrigation on Miyanab, and record only canals that were used until the modernization of irrigation. Later, Moghaddam used CORONA imagery and improved the record of relict canals focusing on the question of the origin and evolution of the Gargar canal.

While the ceramic chronology of Khuzistan in the early periods is relatively well-understood (compared to later periods), test trenches were conducted at the following three sites on the plain and local ceramic chronology was further improved for the prehistoric to the Parthian periods: Tappeh Darouqeh (Achaemenid, Seleucid-Parthian), Tappeh Meshwall III (Late Susiana, Parthian), Tappeh Abu Amud Nejat (Uruk, Late Susiana and Seleucid-Parthian).

More excavations have been conducted on the Miyanab and on the Eastern Gargar since then, and a reliable record of the ceramic sequence on the Miyanab has been compiled for the

periods until the end of the Iron Age.[242] The Hellenistic period is the last phase in the area, known from excavation. Therefore, the ceramic sequence for the later phases (Sasanian and later) is established based only on comparison with excavations and surface collections from outside Khuzistan and Iran and is not very reliable. Even though the transition from Iron Age pottery to the "Parthian" type is recorded on excavated sites, the internal chronology of the latter type or its transition to late antique and medieval types is not determined from local stratigraphic sequences.

Moghaddam has attempted to explain the evolution of the canal systems on the Miyanab based on the association with sites. He has attempted to interpret his data specifically within the discourse of the Sasanian imperial policy of large-scale irrigation schemes. However, the poor chronology of the later periods along with the strong continuity of occupation on most sites undermines his conclusions (see chapters 2, 6). Another important methodological consideration is the small size of the Miyanab plain. It allows for increasing the resolution of the archaeological study; yet, it adds to the limits of the application of the site-canal association method. The density of archaeological sites in close proximity to multiple canals undermines any conclusive statement about the relationship of a certain site to a specific watercourse, based on site and settlement maps only. Similarly, the small size of the plain and its canal levees limits the potential of using a global satellite terrain model like SRTM, which has been efficiently integrated into the regional studies of the Mesopotamian plains.

[242] The results of the excavations on the Miyanab, which are focused on the Achaemenid period, have not been published. The excavation at the site of Tall-e Abu Chizan on the Eastern Gargar has been fully published in Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*.

3.2.2. Non-Archaeological Data

Other sources of information for water history include environmental studies and texts. Until recently, no systematic study of either of these categories had been conducted with the goal of understanding the developments on the Miyanab plain. General information about the geological and geomorphological processes on the fluvial plains of Khuzistan could be obtained from the studies of Lees and Falcon, Kirkby, and from the publications of the Belgo-Iranian research project on the Lower Khuzistan Plains.[243] Only recently, Kevin Woodbridge collected geological information in order to understand the long term water management and river development over the Miyanab plain, as a part of his research on the Karun drainage basin.[244] This study covered the entire flood basin of the Karun with a few OSL and C14 samples. Therefore, the results are more useful in terms of understanding the general regimes of river sedimentation and earth movements than in terms of dating of specific hydraulic features. When dealing with the hydraulic monuments and straight canal segments on the Miyanab, the study has taken the commonly-assumed Sasanian date for the features in order to calculate the rates of surface movements and therefore does not address the questions of the present study.

Archaeological literature on the water history of Miyanab has not so far systematically utilized the insight from Islamic historiography. Prior to Verkinderen's study, the use of textual

[243] E.g., Lees and Falcon, "The Geographical History of the Mesopotamian Plains"; Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers: A Geo-Archaeological Approach: A Joint Belgo-Iranian Project: First Progress Report - Part 1"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 2"; Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 3"; Walstra, Verkinderen, and Heyvaert, "Reconstructing Landscape Evolution in the Lower Khuzestan Plain (SW Iran): Integrating Imagery, Historical and Sedimentary Archives"; Heyvaert et al., "Susa and Elam."

[244] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran."

information for the examination of water history on the Miyanab has been limited to direct references attributing a hydraulic feature (primarily the Masruqan or Shādorwān) to a Sasanian king.[245] Verkindern examined a wide range of Arabic sources for the water history of the Miyanab plain (among other areas in Iraq and in Khuzistan) and has provided a solid base for the integration of archaeological and textual data in the present study. Furthermore, Verkinderen's methodology for investigating the changing river courses in the southern Iraq and in Khuzistan, as well as in the interdisciplinary research of the Belgian project on the lower Khuzistan plain[246] has been a model for my approach to the study of the textual data.

3.3. Research Methodology

This study takes a multidisciplinary approach to study past landscapes in order to shed light on major phases of development in the water history of Miyanab as well as the factors contributing to this trajectory. This goal necessitates working with heterogeneous data that provide uneven coverage for different historical periods, geographical regions and landscape features, as well as being divided across disciplinary boundaries, each concerned with varying issues and time scales. To these problems, one needs to add the limited time and resources of the research project, which required compromising between the range and the scope of the disciplinary analyses.

3.3.1. Archaeological Data

It is common for extensive surveys to lead to more intensive, targeted and question-driven surveys in many parts of the world. The surveys of the Miyanab plain in the 2000s provided the

[245] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period"; Verkinderen, *The Waterways of Iraq and Iran*.
[246] Verkindern was the historian and philologist of that project.

basic pattern of settlements for the entire study area, with a good level of resolution owing to the use of walking transects instead of a vehicular method. The present study needed to adopt a methodology that is useful for targeting specific areas and questions within the previously surveyed archaeological landscape. Scale is a fundamental factor determining the most appropriate research methodology and the adequate resolution of data collection. Following Wilkinson, this research can be categorized as one of "mesoscale," falling between the scale of excavations and Mesopotamian regional surveys.[247] The limited size of the plain (400 sq km) allows for increasing the intensity of archaeological investigation and looking for the types of sites and landscape features that might have been overlooked previously.

One of the goals of this research is to understand the long term patterns and dynamics of habitation and land use across the study area. By identification of features such as relict canals, roads and field systems that bond the habitation sites together, the records of the recovered settlements can be placed within the background of a more subtle "landscape archaeology."[248] Moghaddam's studies begin to address topics of landscape use by mapping and studying of the relict canal systems.[249] However, his focus was more on dating the canals based on the distribution of the sites rather than on understanding the role of the canals as bonding strands across the landscape. When historic satellite imagery was consulted, a single feature, the Gargar Canal, was examined and not the relation between the sites and the landscape features. Nor does he discuss the functional or spatial relations between the sites. Alizadeh et al. on the other hand uses satellite

[247] Wilkinson, *Town and Country in Southeastern Anatolia. Volume I: Settlement and Land Use at Kürban Höyük and Other Sites in the Lower Karababa Basin*, 61.
[248] Ibid., 62–67.
[249] Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyanab, Shūshtar*; Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*.

imagery and intensive survey in order to examine the off-site features around the site of Dar Khazineh. However, that study covers a very small area and does not shed much light on the dynamics of landscape change and land use on the plain.[250]

"Site definition" is a fundamental aspect shaping archaeological survey methods. In much of the Near East, sites are traditionally equated with mounds. Small sites and flat sites that have a short chronological range tend to be underrated and can easily be missed by extensive survey methods. These types of missing evidence, however, characterize much of the settlement pattern of the Iron Age and later periods when population were often dispersed in rural and short term settlements, and when the sites shifted from place to place every few generations or centuries. While the Near Eastern surveys never adopted the kind of intensive methodology that is common in Mediterranean archaeology, more intensive surveys in northern Mesopotamia recently have been successful in achieving a better recovery of the rural countryside, particularly as field surveys are integrated with an increasing range of satellite imagery.[251]

In order to understand the long-term dynamics of land use, the reliability of the recovered settlement record needs to be examined. By increasing the intensity of the survey and by sampling selected areas, patterns of landscape preservation and destruction can be examined. If settlement records are absent for a certain area, it might be that sites are lost due to the processes of erosion or sedimentation, or that sites originally did not occur in the area. Obviously, these two reasons have very different implications for research.

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[250] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations."

[251] Wilkinson, *Town and Country in Southeastern Anatolia. Volume I: Settlement and Land Use at Kürban Höyük and Other Sites in the Lower Karababa Basin*; Wilkinson, "The Disjunction between Mediterranean and Near Eastern Survey: Is It Real?"; Ur et al., "Ancient Cities and Landscapes in the Kurdistan Region of Iraq"; Bonacossi and Iamoni, "Landscape and Settlement in the Eastern Upper Iraqi Tigris and Navkur Plains."

This research utilizes a combination of remote sensing and targeted field examination in order to fill some of the gaps of the previous surveys. The first goal is to move from a settlement map to a landscape map; to examine the inter-site relations, to move from a quantitative approach to collected data to a qualitative one that explores the spatial and functional relations between the "sites"; and to identify landscape features that bond the sites together. The second goal was to investigate the nature of the sites, including their size and patterns of occurrence and absence; to understand the natural and human agents that might have obscured the settlement maps, and to investigate whether the settlement types are inclusive or whether certain kinds of sites might be missing. Given that agricultural land use specifically in later historical periods is the heart of this research, the study aimed to check for the rural landscapes that are characteristic of these periods and that are not easily recovered in conventional surveys. The objectives and results of the remote sensing and field study, which are elaborated in chapters 4 and 5, are summarized below.

Remote Sensing

Following the model of recent northern Mesopotamian surveys, remote sensing is a fundamental aspect of the present research. Given that modern irrigation and agriculture schemes have nearly eradicated the archaeological landscape of the Miyanab, remote sensing is even more important than in the relatively better preserved landscapes of northern Iraq and Syria and southern Turkey. In this research, the remote sensing study is different in two ways. First, it utilizes historical aerial photos alongside the satellite CORONA imagery that are commonly used in Near Eastern surveys. The potential of historical aerial photos has been noted and explored by Adams and others since the 1950s. But, the lack of public access to these datasets turned Near Eastern archaeology toward the historical satellite imagery (see chapter 4 for more details). Since these

photos are archived and available for purchase in Iran, I attempted to integrate this data to explore the potential of utilizing air photos on a large scale. The potential of aerial imagery was examined both on its own and in comparison with the CORONA imagery.

The most essential feature of the air photos is their combination of high resolution (that is often associated with modern imagery) and historicity (that is found in the CORONA). This combination results in excellent preservation of the traces of relict canals on the photos. On the other hand, the present research places the canals at the center of inquiry in order to investigate them as a distinct category of archaeological data. Therefore, careful examination of the two early sets of air photos comprised the first step of the research, providing the means for observing the landscape from the point of view of the irrigation network, independent of and prior to the settlement study. In addition to mapping relict canals, the photos were consulted in order to understand the palimpsest aspect of the irrigation network, i.e., the earlier and later features. This goal was achieved through a relational analysis. The resolution of the air photos allows informed guesses as to which feature crossed over the other, and which ones were probably contemporaneous. This method has been used previously in very limited scale for the examination of limited number of features. [252] I benefited from the relatively small scale of my study area and applied this method systematically across the landscape. The relational analysis examines the relation of each segment to the nearby features both synchronically and diachronically. Despite the difficulty of this task,[253] I attempted to reconstruct the early phases of the evolution of the canal

[252] Often one or two canals in relation to an archaeological sites, see for example, Gasche, "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 2," 29.I thank Dr. Maurits Ertsen, for suggesting to test the potential of applying the relational analysis on a large scale.

[253] Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 27.

systems on the plain as well as their subsequent transformations and configurations. As a result of this study, a model of the evolution of the canal systems was built that is independent of site alignments, and does not necessitate access to geological dating samples.

The research adopts a landscape perspective that revolves around the means of artificial water supply: canals act not only as strands that connect discrete points, i.e. sites, but also as the structural elements of the archaeological landscapes. The patterns of the canals can define the agricultural character of the various parts of the landscape, and can contribute to evaluating the representativeness of the settlement record. This process is similar to predictive modeling, but, it is qualitative and is based on a single factor, i.e. canal patterns. The record of settlements was compared to the varying patterns of canal systems and agricultural capacity across the landscape, and discrepancies between the record and the prediction were noted. These areas were reexamined on the air photos, CORONA and Google imagery (in the case of non-bulldozed areas), for potential missing sites. The remarkable potential of the CORONA imagery in revealing the traces of anthropogenic features through soil coloration was underlined by this study. These areas were mapped and examined in the field.

In addition to the canals, other features, such as historic roads or field patterns, which may show up on the air and satellite imagery, connect and contextualize the sites in the landscape. Field systems were observed on both types of historical data. But, only in very limited areas do they seem to reveal information beyond what was gleaned from the canal patterns. Therefore, this category was not systematically integrated in the study. However, the relict paths were found in abundance in the southern part and immediately southeast of the plain. In these areas, which are essentially outside the irrigated zone, the study of the “hollow way”-like features provided a useful

base for the study of the structure of the landscape and the connection between the settlements. CORONA imagery proved most useful in the identification of relict tracks.

Archaeological Field Survey

Fieldwork must be conducted to test the validity of the remote-sensing findings and reconstructions. As described in chapter 5, the mapped sites and canals were examined during field survey. Despite the damage from development, a selection of the mapped and preserved canals was opportunistically visited and sampled. A handful of larger canals that still promised to be preserved were targeted and visited. The negative impact of development made it nearly impossible to determine with certainty whether the small sites mapped from imagery, which were presumably characteristic of the rural landscape, were archaeological sites. Given the continuous and dense record of human occupation in the fluvial plains of West Asia, differentiating between flat short-term "site" and "background" noise is complicated. Significant soil leveling and removal on the Miyanab plain, which followed the implementation of modern irrigation systems, has eliminated our ability to ascertain the existence of many of the recorded sites. The survey method however attempted to examine the patterns of site occurrence and absence by using a combination of field and remote sensing data, as well as talking to local people about recent topographic transformations. In addition to the remote-sensing guided fieldwork, intensive opportunistic survey was conducted along the areas where landscape degradation is most intensive, i.e. the edge of the Gargar, in order to examine the impact of development and water erosion on the record of settlements. Another task that was pursued in the field and was partially independent of the remote sensing was the investigation of the inter-site relations in targeted areas. Based on the factors such as size, distance, access to water, and topography, the spatial and functional relationship between

a number of the recorded sites was explored, through the examination of the nature of the surface finds, and through walking transects between the targeted sites. The results contributed to a much more integrated picture of the landscape, where sites are connected through presumed functional and spatial relations and through the recovered physical bonds such as tracks and canals.

3.3.2. Toward an Interdisciplinary Approach

The two important categories of information on environmental history, i.e. textual and geohydrological, were examined in combination the archaeological data, albeit in different ways. A systematic survey of the medieval textual sources (Arabic and Persian) was conducted and all possible references to the aspects of irrigation, ancient waterways, and agriculture were compiled (appendix c). The choice of the most reliable and up-to-date editions of every source was made based on information provided by Verkinderen.[254] The testimony of the medieval sources was used under the following conditions. Each of the statements was evaluated based on the category of the text and its distance from the subject. Geographical sources that were contemporaneous with the described subject, followed by the historical sources of the 8th and 10th century that were based on Hadith tradition, were considered most reliable. The rest of the sources, including subsequent geographical compilations and copies as well as encyclopedic texts, were consulted primarily to understand the history of the common stories, and the transmission of original accounts and information. Consistency of information about a certain topic in different parts of the work of the same author served as useful evidence for the author's familiarity with the topic. A priori assumptions about the date of the construction and destruction of hydraulic features were strongly

[254] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period"; Verkinderen, *The Waterways of Iraq and Iran*.

avoided, especially when based on the absence of textual information about a hydraulic feature, or on ambiguous and out-of-context references. Much of the ungrounded theories about the hydraulic features under study have been formed and propagated by the neglect of the latter principle. In addition to the medieval sources, the accounts of the early modern travelers were consulted, primarily for their description of the remains and waterways under study and less so for their judgment about the date and the history of the features. Even in this case, the possibility of mistake in the record, for example about names or distances has been considered. The two reports of the engineers Van Roggen and Najm al-Mulk, which were prepared specifically for the purpose of examination of the water works, provided the most reliable information on the pre-modern state of the hydraulic remains. [255]

The geohydrological information was incorporated in a less systematic way compared to the textual data. Given that specific environmental data corresponding to the questions of this research were not available, information about the major geohydrological features within the study area and the common processes that shape and transform them was collected. This knowledge contributed to the scenarios of landscape formation and evolution that were eventually proposed. Satellite SRTM terrain model of the entire Khuzistan and historic terrain model that was created from historic air photos (chapter 4) were consulted for the identification of the geological and hydrological features. This information was fundamental specifically in the study of the evolution of the Gargar. Topographic information was evaluated independently and in relation to the textual and remote sensing data. Instead of a priori assumptions, each segment of the Gargar was separately examined for potential human and natural features that might have contributed to its

[255] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane"; *Naj*.

formation. On the other hand, the hydrological processes in the whole system that could have shaped and transformed the parts in various ways were noted and taken into consideration.

While integrating various categories of data, the following strategies were adopted. First, highest reliance was placed on the remote sensing data; scenarios that did not correspond with the observations made on the terrain models and historic imagery were dismissed. This strategy was essential in working with textual data. Second, every piece of information about hydraulic remains that is found in the textual sources, even from the early modern period, is not to be necessarily paired with one of the presently known ruins or remains. The rate of landscape transformation, specifically owing to the destructive force of water, is very high; features can be destroyed and ruins can disappear over few decades. One has to be very cautious when matching textual information with features that presently exist on the ground.

3.4. Conclusion

This chapter presented the research methodology. The study of the complex relations between natural systems and human activity requires an interdisciplinary research approach. Archaeological research projects are increasingly planned to integrate textual and geomorphological data. The present study similarly acknowledges the necessity of an interdisciplinary approach and aims at integrating textual and information data, within the constraints of its resources. The archeological aspect of the research is shaped by recent methodological advances in Mesopotamian landscape archaeology, and is assisted by remote sensing of historic air photos, CORONA satellite imagery and digital elevation models. The research also benefits from a systematic and critical survey of the textual sources, Arabic and Persian that cover a wide chronological range from the Islamic conquest to the modern period.

Acquiring geomorphological information for the purpose of this study was not possible at this stage. However, remote sensing evidence and the literature on geohydrological characteristics of the study area was consulted in the process of proposing scenarios of landscape transformation and change.

Chapter 4
Results I: Ancient Irrigation Systems on the Miyanab Plain

4.1. Introduction

Mapping and dating relict canals has become an established archaeological approach for understanding aspects of the socio-economic dynamics of ancient societies. Archaeologists have used various types of data, namely, field survey, historic imagery, and historic maps, to reconstruct ancient canal systems. The Site-Canal Association method is used to estimate what parts of a mapped system were built or used in a certain period. Scientific methods of dating, in particular C-14 and OSL, are increasingly applied to obtain absolute and more accurate dates for relict canals. Despite problems and uncertainties involved in the dating of canal segments by association with archaeological sites, no substitute for this method has been found at the landscape level. The association of canals with sites can very quickly provide large quantities of data, both spatially and temporally, at negligible cost compared to scientific dating methods. Nonetheless, interpretations derived from the alignment of sites with relict canals are not always conclusive. One critical concern is the lack of well-defined ceramic chronologies for the regions under study. As discussed in chapter 2, this problem is particularly relevant to the later historical periods in southwestern Iran. A second, more general problem is that certain categories of archaeological sites may be systematically over-represented or under-represented in the archaeological record.[256] A third problem that will be discussed in depth in this chapter is the complexity of socio-cultural and hydraulic parameters that can affect the association of canals and sites over time. Finally, research

[256] Wilkinson, "Regional Approaches in Mesopotamian Archaeology."

has to take into account the uneven impact of modern development and natural processes on the archaeological record.

The goal of this chapter is to map and reconstruct the ancient canal systems of Miyanab and the dynamics of their development through time. In order to obtain a more thorough understanding of the irrigation history on the Miyanab plain, I aim to utilize the site-canal association method, while alleviating its shortcomings by integrating other categories of data. This study demonstrates that canals as a distinct category of archaeological data have much to offer about past water management strategies. Furthermore, at the heart of the present chapter lies the idea that a comprehensive understanding of water management history can be achieved only if we go beyond the discussion of monumental features and begin to understand irrigation infrastructure in its entirety. In the following pages, the questions and objectives pursued in this chapter are first described. Second, the data that were available and affordable are described. Third, the remote sensing method and results are presented. Fourth, the corrections and revisions made on the remotely-mapped canals based on the survey results are provided. Finally, based on spatial and hydraulic analyses of the ground-truthed data, a long term perspective on the dynamics of settlement and irrigation patterns on the Miyanab plain is presented.

4.2. Questions & Goals

This chapter addresses the following questions:

1. What are the main features of the ancient irrigation system of the Miyanab plain? How did they form and develop? What is the approximate date of various canals and hydraulic features?
2. What human and natural forces may have triggered major transformations (expansion, contraction, reorganization) in the ancient canal system(s)?
3. What is the nature of the relationship between settlement patterns and the dynamics of irrigation on the Miyanab plain? How did the inhabitants of Miyanab organize their settlements in the landscape, in relation to the ancient canal systems and to other available water sources, namely, the Karun, smaller natural water courses, and even rain water?
4. What kind of analysis can be conducted on relict canal systems as a distinct category of archaeological data, independent of their relation to archaeological sites?
5. What are the possible impacts of irrigation developments and natural processes on the relict irrigated landscape of Miyanab and how can we mitigate these effects?

4.3. Data

The research presented in this chapter is primarily based on remote sensing. Before a discussion of the research and the findings, the data used for remote sensing will be discussed below.

4.3.1. Historic Satellite Imagery: CORONA

CORONA is the program name for the United States' reconnaissance satellites that "provided coverage of the Soviet Union, China, and other areas from the Middle East to Southeast Asia" from the late 1950s to 1972.[257] CORONA satellites took high-resolution black-and-white images of the areas chosen for surveillance. In 1995, President Clinton declassified this imagery for historical and environmental research. CORONA images, particularly those from the two latest generations (KH-4A & Kh-4B), [258] quickly proved an invaluable resource for the archaeology of the Near East, both because the focus of CORONA imaging missions covered most of the Middle East, and because CORONA imagery predates the many agricultural and urban development projects that have obscured or obliterated much archaeological evidence (sites, ancient canals and roads). Therefore, these images preserve a record of the landscape that in many places no longer exists, and that, for geopolitical reasons, is often inaccessible. Moreover, CORONA images are high-resolution, although there is increasing spatial distortion toward the edge of each frame. Nevertheless, under ideal conditions, the images can reveal features as small as 2-3 meters wide. Finally, the CORONA imagery covers vast areas on the order of tens of square kilometers.

[257] Ruffner, *Corona America's First Satellite Program*, xiii.
[258] These two missions are the only ones that offer stereo imagery. Casana, Cothren, and Kalayci, "Swords into Ploughshares Archaeological Applications of CORONA Satellite Imagery in the Near East."

Therefore, even when limiting analysis to only the central part of each frame, large land surfaces can be studied efficiently in a single frame.[259]

CORONA imagery is accessible for purchase or free download through the United States Geological Survey (USGS). However, the unique imaging geometry of CORONA cameras produced long narrow strips, and the difficulties of correcting spatial distortion has limited their use by researchers. Two institutions, the Center for Ancient Middle Eastern Landscapes (CAMEL), at the Oriental Institute, and the Center for Advanced Spatial Technology (CAST), at the University of Arkansas through its CORONA Atlas of the Middle East website, provide individual researchers with CORONA imagery obtained from the USGS. They choose the best available imagery for each area, georeference it and correct the spatial distortion.

For my dissertation, I used imagery from the KH4A mission: DS 1045-2182DA, acquired 5 Feb 1968, from three sources, with approximate ground resolution of the images is c. 3 m wide at Nadir (the point on the ground directly below the camera).

1. Negatives purchased from USGS by Nicholas Kouchoukos, scanned at 7 microns (3600 dpi) and orthorectified by him.[260] The rectified imagery is reduced to 96 dpi; the clarity of features is good, and the georeferencing is very accurate. The imagery is particularly helpful for studying relict agricultural landscapes in the hummocky areas of the south, in the vicinity of the sites of Herad and Negini. Unfortunately, the georeferenced imagery did not cover the very southern part of Miyanab.

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[259] In the highest resolution CORONA images, acquired in the KH-4B mission, from 1967–72, the area covered by each strip is approximately 13.8 x 188 km. Ibid.; "About" CORONA Atlas of the Middle East, accessed Feb 8, 2016, http://corona.cast.uark.edu/index.html#bbox=3000000,2200000,5500000,5000000; "Declassified Satellite Imagery - 1" USGS, accessed Feb 8, 2016, https://lta.cr.usgs.gov/declass_1.

[260] The imagery and this information was provided to me by Dr. Abbas Moghaddam.

2. Digitized and Orthorectified Imagery from CAMEL. The negatives obtained from the USGS were scanned at CAMEL at 1600 dpi, then, reduced to 72 dpi for georeferencing.[261] The clarity of the archaeological features is low. However, the imagery covers the entire study area. The major advantage of the CAMEL imagery is the accuracy of georeferencing. Imagery from CAMEL overlaps with Kouchoukos's imagery, with Bing satellite imagery, and with aerial photos I georeferenced with the aid of Google Earth. Therefore, this set was the easiest one to use for comparative study of the features in multiple datasets.

3. Digitized and Orthorectified Imagery from the CORONA Atlas of the Middle East. The tremendous advantage of this dataset is its high resolution and sharp color contrast. The negatives were digitized by USGS at 7 microns (3600) dpi, and the NTF format of the uploaded imagery retains high resolution with smaller file size. Furthermore, the histogram adjustment applied to the imagery further enhances its color contrast and clarity for feature detection. Unfortunately, the accuracy of georeferencing for my study area is less than that of the above two datasets[262]. Therefore, the imagery was not as helpful for mapping and comparative study. I used this data primarily for checking small and ambiguous features and for publication of the results.

4.3.2. Historic Aerial Photos

A myriad of aerial photos of Middle Eastern countries taken since World War II are spread across the globe in various archives. In the 1950s in preparation for the launch of large-scale

[261] E-mail correspondence with the Center, Jan 15, 2015.

[262] The first two categories of imagery are the result of orthorectification of selected segments of the CORONA strips. Casana et al. explain their method for orthorectification of the entire strips of imagery. The accuracy of CORONA Atlas images range from 3–10 meters at nadir to 20–80 meters at the edges. "Swords into Ploughshares Archaeological Applications of CORONA Satellite Imagery in the Near East.". Miyānāb is located on the far right edge of the CORONA strips and my observation of the displacement (60-70 m) confirms this prediction. For my study area, imagery created from orthorectified CORONA segments provides better spatial accuracy.

development projects, some countries ordered systematic aerial photographic surveys. The results were mosaics of vertical stereo photos that could be used to create topographic maps. In the 1960s, Robert McC. Adams and McGuire Gibson systematically used KLM aerial photographs acquired in the 1950s for regional surveys. [263] Despite their tremendous potential, access to these datasets was never guaranteed[264].

In Iran, systematic aerial imaging of the entire county began in 1955, and one year later, the Iran National Cartographic Center (NCC) was established. Fortunately, these photos have been systematically archived and prepared for public purchase. The NCC aerial photo database can be searched by photo metadata (location, scale, acquisition date) or through an interactive map. [265]

The unparalleled advantage of aerial photos is their exceptionally high resolution. Many offer higher spatial resolution than even the best imagery from CORONA and may pre-date CORONA by several decades. Their high quality has enabled me to map and study ancient canal systems with unparalleled detail. A major disadvantage of aerial photos is the limited spatial coverage of photo frames (9x9 inch). For example, each frame of a 1:20,000 aerial photo covers 5x5 km^2 or less. Therefore, georeferencing aerial photos is very time-consuming. Furthermore, photos are relatively expensive ($3 for each contact frame, $20 for a 7-micron scan of each frame). For technical and financial reasons, Iranian archaeological projects have not yet systematically

[263] Adams, *Heartland of Cities*, 28–30; Gasche and Tanret, *Changing Watercourses in Babylonia*, VII.
[264] After his successful experience with high-resolution KLM photos and the failure to secure access to this data, Adams successfully lobbied for public access to declassified high-resolution satellite CORONA imagery Pournelle, "KLM to CORONA: A Bird's Eye View of Culutral Ecology and Early Mesopotamian Urbanization," 30.
[265] http://tsm.ncc.org.ir/HomePage.aspx?TabID=5714&Site=tsm.ncc.org&Lang=fa-IR; http://217.218.133.169/tsm/Pages/AerialCoverbyPoint.aspx?TabID=0&Site=tsm.ncc.org&Lang=fa-IR

utilized aerial photos. Their use by foreign archaeologists is limited because they cannot purchase photos directly from the NCC. [266]

For Shushtar, several datasets of imagery at various scales and coverage exists. To save time and money, I purchased two datasets. [267]

I. Acquired 1956, scale: 1:12500, flight coverage: northern part of the study area (from north of Shushtar to south of the Band-i Mizan). Despite the partial coverage, this dataset was chosen because it offered the chronologically earliest high-resolution coverage of the major water regulating structures in and around Shushtar. The dataset includes 35 frames, all digitized at 600 dpi, with approximate pixel resolution 0.5 m. Seventeen images were georeferenced and used for mapping. [268] All frames were used for 3D modeling.

II. Acquired 1975, scale: 1:20,000, flight coverage: all the plain (flight route: Shushtar-Ahwaz). This dataset was chosen because it provided the oldest high-resolution full coverage of the Miyanab plain. A selection of the dataset which covers the entire frame, 373 frames, was selected, all digitized at 600 dpi, approximate pixel resolution 1 m. 75 images were georeferenced and used for mapping.

[266] The high cost and technical difficulties of using historic aerial photographs for systematic landscape study is not limited to Iran: Casana, Cothren, and Kalayci, "Swords into Ploughshares Archaeological Applications of CORONA Satellite Imagery in the Near East."
[267] In the course of my work as a cultural heritage consultant for the Shushtar Historic Hydraulic System (2005-2008), I was able to work with and assess various sets of imagery available for Shushtar.
[268] The rest of the digitized photos were utilized for photogrammetric modeling.

4.3.3. Modern Google Satellite Imagery

In addition to historic imagery, I have used modern satellite imagery for three major purposes:

I. Georeferencing of aerial photos using Google Earth Imagery (Digital Globe & CNES Astrium) as well as ArcMap Basemap imagery (Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community).

II. Assessment of archaeological features' preservation and destruction using Google Earth Imagery.

III. Navigation and Mapping in Fieldwork using Google Earth Imagery (Google Earth and Google Map App for Android).

4.3.4. Satellite Digital Elevation Models

Owing to the basic hydrological principle that water flows downstream, study of the modern as well as ancient water systems is predicated on understanding topography. Three-dimensional models of a terrain's surface, known as Digital Elevation Models (DEM) or Digital Terrain Models (DTM), are used in spatial analyses for various uses, including hydrological and hydraulic studies. For this project, two free global DEMs from the following sources were used.

SRTM (Shuttle Radar Topography Mission) DEM: A high-resolution digital topographic database of the Earth obtained by means of a specially modified radar system flown aboard the space shuttle *Endeavour*. The result is digital topographic data for 80% of the earth's surface (all land areas between 60° N and 56° S latitude). The horizontal resolution of the collected data is 30

m, but, that is publicly available only for the United States. For the rest of the world, SRTM DEMs at 90 m resolution are available for public use.[269] The elevation data are accurate to 16 meters (at 90% confidence)[270]. Despite the poor horizontal resolution, the accuracy of the SRTM DEM makes it a powerful data source for studies of modern and archaeological landscapes. [271] SRTM data is available for public use at no cost from the USGS EarthExplorer website and from the CGIAR Consortium for Spatial Information.[272] I have used the latter source.

ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) GDEM (Global Digital Elevation Model): ASTER is a Japanese sensor flown onboard the Terra satellite, the first of the NASA's Earth Observatory System (EOS) platforms. The sensor collects high-resolution multispectral (14 bands) as well as black-and-white stereo images of almost the entire earth's surface. The ASTER Global Digital Elevation Model (ASTER GDEM) is a DEM created from the data collected from ASTER. The global spatial resolution of ASTER is 30 m. [273] ASTER GDEM can be downloaded at no cost from the project's website. [274] Despite the higher spatial resolution, ASTER GDEM proved less useful for my study of ancient canal systems.

[269] In 2015 free access was provided to GLOBAL imagery at the resolution of 30 m, which would significantly improve their usability of Near Eastern landscape studies.
[270] http://srtm.usgs.gov/mission.php; https://lta.cr.usgs.gov/SRTM1Arc; http://srtm.csi.cgiar.org/
[271] Casana, Cothren, and Kalayci, "Swords into Ploughshares Archaeological Applications of CORONA Satellite Imagery in the Near East."; Hritz and Wilkinson, "Using Shuttle Radar Topography to Map Ancient Water Channels in Mesopotamia."
[272] http://earthexplorer.usgs.gov; http://srtm.csi.cgiar.org.
[273] http://eospso.gsfc.nasa.gov/missions/terra; https://lpdaac.usgs.gov/products/aster_products_table/aster_overview;
[274] http://gdem.ersdac.jspacesystems.or.jp/index.jsp For a step-by-step guide see http://www.gisblog.com/how-to-download-aster-v2-global-digital-elevation-model/

4.3.5. Land Survey Data

Even the highest resolution, publicly available elevation data is too coarse for anything more detailed than major regional landscape features. Institutions and projects often commission customized high resolution topographic data through land or aerial survey of the terrain's surface. These techniques result in accurate high-resolution DEMs, but are very expensive. Individuals, if lucky, might be able to use high-resolution data that is acquired by institutions or bigger projects. I have also tried to obtain land survey data from the Khuzistan Water and Power Authority (KWPA), which is undertaking a large-scale irrigation project destroying the archaeological landscape of Miyanab. After several attempts, I obtained 1:2000 land survey data generated by the KWPA project for the northern and western parts of the plain, and used this data to create a high-resolution DEM of these areas (Fig. 4.8).[275]

[275] The Miyānāb Irrigation and Drainage Project is organized in seven phases. Phase one, which encompasses most of major headworks of Shushtar was carried out in a far less systematic way than other phases. Unfortunately, total-coverage land survey was not conducted in this zone. The data for zones 6 & 7 (future plans) has not been collected yet.

4.4. Remote Sensing I: Ancient Canal Systems on the Miyanab plain

A major methodological concern of the present dissertation is the relevance of the site-canal association approach for dating ancient canal systems. I attempt to explore whether information about canal function and development can be obtained from relict canal remains, without reliance on settlement pattern maps. Obviously, data availability is key. Similarly important is selecting the appropriate scale to use in the study the dynamics of irrigation, settlement, and flows.

The methodology developed here to pursue these lines of inquiry is to large extent built on access to historic aerial photos of the study area. Remote sensing that utilizes CORONA imagery can successfully map major feeder and distributary canals, but the unparalleled spatial resolution of aerial photos permits a holistic approach to mapping and analyzing the entire canal system of the Miyanab plain. In the pages that follow, I explain my approach and method for mapping systems, the output of the project as well as the results of qualitative analyses of the mapped canal systems.

4.4.1. Creating a GIS database of the historic aerial and satellite imagery

The first step was to build a database of the historic imagery available for the plain. CORONA imagery obtained from the three sources mentioned above came with orthorectification information. [276] However, integrating satellite imagery with historic aerial photos was a time-consuming process. Contact sheets of the two sets (1956, 1975) were digitized in the NYU Digital

[276] CORONA obtained from CAMEL and Dr. Moghaddam (Nick Kouchoukos's data) were in GeoTiff format. CORONA downloaded from CORONA Atlas were in NITF format and were easily georeferenced (on-the-fly) using an SRTM elevation model provided for each CORONA revolution.

Studio using a flatbed Epson Expression 11000XL & 10000XL scanner at 600 dpi resolution, 16 bit depth gray scale.

Selected digitized photos (75 photos) were then imported into ArcMap GIS software and individually georeferenced by the author, using six Ground Control Points (GCPs) taken from Google Earth and first order polynomial transformation. Given the relatively small area covered by each frame and the radical transformation of the landscape, matching old and modern landscape imagery in order to obtain GCPs was extremely difficult (Map 4.1).

4.4.2. Vectorizing relict canals

After the aerial photos were integrated into the GIS database of Miyanab, I began the detailed mapping study. My goals were to step away from the paradigm of "Sasanian monumentality", to be as objective as possible, and to map canal networks as completely as possible. Being objective proved difficult owing to the high amount of information preserved in the aerial imagery. It soon became obvious that the smallest canals needed to be disregarded. After experimenting within an area of approximately 25 km^2, it became obvious that the best compromise between analytical detail and efficiency was to map only canals of 4-5 m or greater width, disregarding the smallest ones. In anticipation of possible hydraulic modeling, canals were mapped as segments defined between two nodes. For each canal segment, the following attributes were recorded (Fig. 4.1).[277]

Width: The width of a canal segment was measured on the aerial photos (Map 4.3). For this purpose, in descending order of preservation, the distance between the two remaining upcast

[277] I am grateful to Dr. Maurits Ertsen, for his invaluable guidance in the process of mapping and studying of canals.

banks, or the width of the levee left from the collapse of the canal, or the width of moist trace left of the canal was measured. Understanding the relationship between the *apparent* width of a canal on the digitized imagery and the *original* width was a challenge. Canals that were short-lived and long abandoned were easier to map and measure. Those used over a long time appeared much smaller on the imagery as a result of sedimentation and erosion processes. In addition to the state of preservation, the resolution of the digitized imagery (c. 1 m/pix) introduced some error. In order to account for the uncertainty of the measurements, both minimum and maximum widths were estimated for each canal segment.

***Length*:** The length of each canal segment was automatically calculated in the geodatabase attribute table.

***Certainty*:** Not all canal segments were mapped with the same level of certainty. Some features were unmistakably relict canals. For some others, the exact path or even the nature of the feature was uncertain. Therefore, a certainty value of 1 to 3 was recorded for every segment, 1 being the most certain (Map 4.2). It was anticipated that the certainty value would become important in the process of proposing and evaluating various scenarios regarding the structure and the evolution of the irrigation systems through time.

***Relative age*:** Given that a primary goal of this research is to understand the phases of the development of the irrigation systems on the Miyanab plain, an age attribute was also recorded while mapping. The concept at this stage was only a relative one based on the qualitative evaluation of the topographic relationships of the features. Four phases were chosen. Not all canals could be assigned to one phase based only on visual analysis. However, various parameters including the morphology of the canal, state of preservation, crossings of canals, or the intersection of the canals

and other features such as roads were used to determine if a canal segment could be assigned to any of these phases.

Having decided on the above parameters, the choice of to-be-mapped canals and their attributes was still not straightforward. In a heuristic trial-and-error method, a plethora of features on the aerial photos were screened for mapping. With the idea of holistic mapping, one critical question was how to deal with *modern* canals, or, rather, how to define *modern*? We have the full coverage of the plain on the aerial imagery for 1975, when an irrigation system incorporating several old channels as well as newly built canals was in place. Eventually, I decided to map only those modern canal segments that clearly related to the older irrigation systems of the plain.

Another question was how to deal with drainage canals. In addition to purposefully built drainage channels, many relict canals were transformed over time and reused as drainage channels. Therefore, I decided that only those drainage channels that seem to be structurally related to the older canals needed to be mapped.

For canals in a very poor state of preservation, or, when it was not clear whether or not a feature was a canal (most relevant in canals with a certainty level of 2 or 3), decisions about the significance and width were made by complementary criteria such as the canals upstream/downstream or the signature of the feature on the CORONA imagery. Given that I started mapping upstream from where the major canals begin to branch off, the unraveling structure of the canal systems became another helpful screening proxy. [278] Many canals marked as least certain

[278] Fortunately the high resolution 1956 imagery (1:12500) covers the upper part of the plain, where important decisions about main branches of the old irrigation systems had to be made in the course of mapping process.

(3) are drawn because of the logic of a closed hydraulic system predicated on their existence, most notably along the Gargar.

Another unfolding reality was that the distribution of canals was much denser in the northern part of the plain compared to the south. In order to save time, I used the logic that the amount of irrigation water that reaches a given area could be determined based on the capacity of the largest canals that carry water through the area. Therefore, I concluded that not all the relict canals in the upper part of the plain needed to be mapped even if their dimensions fall within the parameters of mapping. I made one exception to this rule: any canal that flowed around an archaeological site, whose age could suggest a *terminus post quem* for the canal.

In many places, several parallel canals visible on the imagery seem to have replaced one another as the older ones went out of use. In these cases, only one canal was vectorized and min and max width was estimated for the entire set collectively.

At this level of detailed mapping, differentiating between canals and roads presented a major dilemma. Several modern roads have been built where ancient canals might be expected. In other cases, the feature could plausibly be identified as either a road or a canal. Ground-truthing in the fieldwork helped resolve this problem to a large extent. But, it was not possible to check all features and this ambiguity persists, to a certain degree, in the final canal map.

4.4.3. Assessment and corrections

After the data were vectorized, the results were re-screened and evaluated with two different methods to make sure excessive detail did not affect the coherence of the conclusions:

I. Comparison with the map of historic canals of Miyanab provided by KWPA: Before the launch of The Irrigation and Drainage Network of Miyanab Project, a map of the old canal system of Miyanab was prepared by KWPA and used in negotiations with the ICHHTO to determine what needed to be protected. This map was not complete. It was created by field investigation only and reflected the channels that were used until the very recent past.[279] Nonetheless, this map reflects those arteries of the Dariun system that remained in use until the modern times. I compared the mapped canal system with the KWPA map to make sure that all of these main branches were properly vectorized.

II. Structural approach: Once the mapping was finished, I reclassified the results into several test groups in order to understand the structure of the mapped system and to verify its main arteries.[280] This examination revealed missing links in the mapped arteries that reflected either non-vectorized segments or underestimation of the width of the features (compared to the preceding and following segments), or overestimations that were reflected in stand-alone major canal segments. I then corrected all the errors.

4.4.4. Preliminary Results: Canal Structure and Hierarchy

Maps 4.2 and 4.3 illustrate the results of the mapping over the entire landscape, classified according to the certainty of identification as well as estimated width. Figure 4.1 presents a snapshot of the results, in one of the best preserved areas with the highest density of relict canals.

[279] KWPA did not map any feature that does not function and cannot be restored for reuse.
[280] Reclassification is a function in GIS for regrouping features into more limited categories. For example, one can reclassify all canals based on their maximum width into two groups: wider than 10 m, or as wide as or narrower than 10 m. Reclassification is a useful method for simplifying and making sense of data with wide array of values. This process preserves the original attributes of the features.

When broken down (reclassified) according to size, the distribution of canals over the study area seems to be related to canal width.[281] The larger canals (12-80 m max width) are found in the upstream part of the plain, either in the north or along the Gargar, whereas the smaller canals (4.5-9 m max width) are mostly found in the downstream parts, to the south and further away from the Gargar. The middle sized canals (9-12 m max width) connect the two extremes, as expected in a gravity-based canal system.

Patterning in the spatial distribution of the canals suggests the existence of two or three canal systems in the survey area (Map 4.6):

I. To the north, there is a system of organically shaped canals that stretches out to the middle of the plain. All the known branches of the Dariun canal—prior to modern destruction—are part of this system. I refer to this northern system as the Dariun system.

II. In the center is a concentration of linear canals of similar size that seem to connect to the Gargar Canal/River. The linear canal that appears as the backbone of this canal system ends in a dendritic pattern north of the Kupal anticline. I refer to this as the Gargar System.

III. In the southernmost part of the plain, canal density is generally low.[282] Few potential large canal segments are mapped here that seem to have irrigated areas outside and south of the Miyanab plain.

The possibility of such a division in the canal systems of the Miyanab plain and its possible development over time is an important hydraulic question. If indeed the plain has seen two separate

[281] These size categories were defined so that each included almost one third of the entire mapped canals.
[282] A large part of this zone is coterminous with the tail of the Kupal anticline which blocks the gravity-based canal systems.

water systems, the issue of water distribution within and between those systems needs to be studied. If there was a "third" system downstream, it would have functioned independently of the water originating and flowing in the irrigation system of the Miyanab proper, and is an important hydrological aspect to consider.

Looking at the certainty of the identification (Map 4.2), a critical question that lies at the heart of this research is highlighted: The overall path of "a" Gargar canal from the bifurcation point north of Shushtar to its end in the southern part of the Miyanab plain is very uncertain (Map 4.5). While every source, scholarly or popular, presupposes the existence of a monumental Gargar canal, for the first time Moghaddam provides a detailed discussion of the possible course and evolution of such a water channel (Fig. 4.2-4.3).[283] Two linear features are visible on the CORONA imagery along the Gargar, immediately south of Mahibazan. Moghaddam argues that these features are the upcasts of the linear Sasanian canal. The problem of the connection of this features with the main channel which starts in Shushtar is solved by suggesting that the proposed channel took off upstream of the Mahibazan. As such, the weir of Mahibazan was an essential hydraulic features of the Sasanian irrigation system of the Gargar. The aerial imagery demonstrates, however, that the linear features are not the heaps of a single canal, but are two canals of moderate size (10-15 m wide). It would have been more accurate to talk about the Gargar channels based on the evidence from the imagery (Fig. 4.4). Furthermore, the canals do not reach upstream from the structure known as Band-i Mahibazan (Fig. 2.44-2.48), and could not have been fed by a reservoir behind it. The only east-west link between these canals and the Gargar is located downstream from this structure. The imagery further shows that the linear canals along the Gargar follow the bend

[283] Moghaddam, "A Note on the Gargar Irrigation System."

around the Dastowa outcrop on the west and connect with the Dariun canal system (Fig. 4.4). It cannot be determined with certainty whether this situation reflects the original course of the canals or is a subsequent development.

A second unanticipated aspect that mapping reveals is a group of large canals east of the Dastowa outcrop that spread out westward in a fan-shaped pattern (Fig. 4.5-4.7). Interestingly, these features have never been mentioned in any of the discussions of the water history on the Miyanab plain. Judging from the imagery, these channels are approximately 15-20 m wide (almost as wide as the linear canals along the Gargar). Their capacity does not seem to correspond to the size of the canal that presently passes behind them. Two questions arise: first, what was the source of the water in these canals; second, where did these canals end, as their traces on the imagery disappears after 200-300 m? The canal map draws attention to the hydrological relationship between these canals and the linear Gargar channels.

Modern scholarship has presumed that the Gargar irrigated the Miyanab plain. Medieval texts, on the other hand, report that the Masruqān irrigated the fields as far south as the vicinity of Ahwaz. In view of the remote sensing data, these two functions cannot be easily reconciled. The Gargar irrigation system on the Miyanab, proposed by Moghaddam, does not connect to the main feeder canal of the Masruqān south of the plain.[284]

[284] Moghaddam nevertheless maintains that the Sasanian Gargar irrigated fields up to the vicinity of Ahwaz.

4.5. Remote sensing II: Irrigation and Patterns of Settlement

4.5.1. Spatial distribution of archaeological sites vs. the canal systems

Once the relict canal systems of the Miyanab plain were systematically mapped and their spatial structure understood, settlement data from the survey of Moghaddam (2001-2002) was laid over the mapped canals. In order to better understand the spatial relationship of settlements and canal systems, the focus was placed on the large and medium canals. Three clusters or types of settlements can be defined based on their relationship to irrigation water (Map 4.6).

I. Settlements that are close to and associated with the densest concentration of large and medium canals in the upstream area (north of the plain).

II. Settlements that are close to and associated with the Gargar River (center east of the plain).

III. Settlements located south of the plain, mainly outside the direct reach of major irrigation channels. These canals might have been associated with the third irrigation system (see above) that originated in the south of the Miyanab plain.

What would the different positioning of settlements in relation to canals entail for the ancient inhabitants of the Miyanab plain? First, the canal pattern suggested by the survey of canals is typical for gravity systems. Because the potential area to be served is larger upstream, one might expect to find more and larger canals here. Nonetheless, more upstream canals can also be interpreted as reflecting the greater water rights of those living upstream. If indeed the plain supported more than one water system, the issue of water availability within and distribution between those systems needs to be carefully studied. If this is the case, it is particularly noteworthy

that the elements of the "third" irrigation system (see above) seem to have functioned independently of the irrigation water flowing on the Miyanab proper. Understanding the role of canal systems in determining water availability at the settlement level is grounded in two fundamental aspects of canal chronology and canal function. On one hand, without a basic understanding of the relative chronology of the Miyanab canal systems, it is impossible to determine how the spatial relationship of the canals affected water availability across the landscape. Perhaps upstream canals were older than those downstream and did not function at the same time. Or perhaps several smaller independent contemporaneous water systems on the plain were connected after some time. On the other hand, the advantages or disadvantages of canal proximity for ancient settlements is also determined by hydraulic functions of those canals. For example, one would expect that settlements would not choose the areas near inundation canals. It is impossible to evaluate these possibilities for every relict canal, especially at the scale of my study area. Nonetheless, I have tried to obtain as much information as possible about the canal sequence and function at major hydraulic nodes in order to enhance the reliability of site-canal association.

4.5.2. Re-assessment of the Settlement Data

Access to remote sensing data, intensive survey strategies, and appraisal of non-mounded small sites have resulted in a significant increase in the site recovery rate of landscape surveys in Near East. [285] Given that the 2001 survey of the Miyanab plain was not assisted by imagery, it was conceivable that the site recovery rate would have been higher if imagery-assisted methods had

[285]Ur et al., "Ancient Cities and Landscapes in the Kurdistan Region of Iraq," 111–112; Douglas C. Comer and Michael J Harrower, *Mapping Archaeological Landscapes from Space*, 1–4.

been used. This general consideration became a research concern in the process of remote-sensing mapping of the ancient canal systems. Once the recorded archaeological sites were plotted onto the mapped canal system, several questions about the relationship between settlement patterns and irrigation channels were raised:

I. In the upstream zone of the mapped irrigation systems, where the advantage of good agricultural soil (see chapter 2) is combined with proximity to a dense canal network, very few sites are recorded. The question would be whether settlements were not founded here because the land was agriculturally productive, or because proximity to the Karun would entail a flood threat. Examination of CORONA imagery revealed several small white spots suggesting anthropogenic soil (Map 5.10-5.12). Is it possible that the emptiness in this zone is not real and some small hamlets were overlooked in the survey of the plain?

II. If the Gargar Canal (or the linear feature that runs along it) served as the backbone of an important irrigation system, it is surprising that very few sites are recorded along much of its course. No archaeological site is recorded along approximately 15 km of the length of the Gargar River (Map 5.13-5.15). On the schematic small scale settlement maps, the precise relationship of archaeological sites to the Dariun and the Gargar canal systems might remain unclear.[286] But detailed maps of canals demonstrate that between KS1520 and KS1586, no site is unquestionably related to the Gargar canal. Is the paucity of archaeological sites along the Gargar real, or, has subsequent development blurred the archaeological record in this zone?

[286] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 54: Map 4.8, 4.9.

III. Distribution of settlements in relation to the canal systems of the Miyanab is uneven. Sites are concentrated on the north, south and west of the plain, leaving a large very low-density area in the center of the plain. This relatively empty area overlaps with the zone irrigated by the linear canal system. Again, the question is whether or not this low density could be confirmed on the imagery.

In order to answer these questions, the remote sensing study was expanded to include archaeological sites. For this purpose, I used historic aerial photos, CORONA satellite imagery, as well as modern Bing and Google imagery, and scanned the landscape for missing sites. Several potential archaeological sites were mapped. However, it was not possible to confidently rely on this result without ground-control. Chapter 5 presents the results of the reassessment of the archaeological sites through remote sensing and fieldwork. Besides answering the questions about the distribution of settlements with regard to relict canals, other questions about settlement pattern on the Miyanab plain that were raised and pursued through remote sensing and field work are presented in Chapter 5.

Remote sensing inspection of the archaeological sites on the Miyanab plain demonstrated the unparalleled power of the CORONA imagery for the identification of archaeological sites. Even though the exceptional resolution of aerial photos allows for detailed mapping of canals, archaeological sites are not as clearly visible on air photos.[287] Bigger mounded sites are identifiable

[287] In his first systematic use of aerial imagery for survey, Adams noted that the photographs were far more useful in identifying canals than archaeological sites. Adams, *Heartland of Cities*, 28.

on both sets of imagery. However, small built structures are only visible in the simplified black and white symbology of the CORONA imagery. [288]

The following conclusions were drawn as a result of a reassessment of settlement patterns:

I. The apparently "empty" areas in the northwestern part of the plain where canal density is very high where most likely intensively used for agriculture. Several new small sites, probably all farmsteads and hamlets, were recorded in this zone. Even though landscape destruction has forever precluded our ability to prove that the recorded features were genuine archaeological sites, high density sherd scatters and local farmer s' memories of several now leveled mounds add more credibility to this scenario.

II. The paucity of archaeological sites along the upper course of the Gargar is a result of destructive human and natural processes. Intensive survey of the less developed areas found several unrecorded archaeological sites. Transformation of the archaeological landscape in this zone is happening at such a rapid pace that a far greater number of sites are likely to have been lost. Furthermore, the dating of the newly discovered sites strengthens the argument of this dissertation that the Gargar cannot be dated to the Sasanian period based on the site-canal association because the sites that line up with the Gargar present a wide range of dates.

III. Finally, settlement reassessment highlights the absence of archaeological sites in the central and south-central areas of the plain. Even though locations with much lower likelihood of site-recovery were tested in this zone, survey did not recover more sites. Rather, this zone is

[288] Among the three sets of CORONA imagery that I obtained, those from CORONA Atlas were exceptionally powerful for site identification because of the high resolution and modified histogram that accentuates the black and white contrast. For large-scale landscape features however this contrast was not always helpful. As we will see further in this chapter, details of canals and field systems were only clearly visible in Kouchoukos's dataset.

characterized by a concentration of regularly-spaced linear canals. If the regularity of the canal pattern is suggestive of a planned agricultural expansion project, the site density in this zone seems to have remained unaffected by such developments.

IV. Even though proximity to the river entails higher flood risk, the reassessed settlement map further underscores the high density of sites along the Karun. A comprehensive study of the history of water management on the Miyanab plain must consider the potential advantages of this proximity versus flood risk.

4.6. Hydro-Spatial Analysis

The methodological assumption of this dissertation is that if canal systems are mapped instead of individual canal segments, various hydro-spatial analyses can be undertaken and more lines of evidence about the long term evolution of the systems can be obtained. In the following pages, I will test various aspects of the mapped canal systems in order to understand the hydraulic and spatial attributes of the canal systems of the Miyanab plain. Depending on complexity, prerequisites and data availability, the analyses proceeded differently, and some remain untested at this stage. Nonetheless, I hope to demonstrate the great potential of relict canal systems as distinct lines of archaeological inquiry while obtaining information that could shed light on the irrigation history of the Miyanab plain.

4.6.1. Survey of the Mapped Irrigation System

The Miyanab Archaeological Survey 2014, pursued the two following goals with regard to the ground-truthing of remotely studied relict canals.

First, to better understand the morphology of the mapped canal features on the ground, and improve the validity of the imagery-assisted reconstructions. The primary target was the group classified under certainty level 2, features that can be interpreted as a canal because of their alignment and relation to more certain canals, but which lack clear canal morphology such as flanking heaps or linear depressions. In most cases, there is confusion between identification of the feature as a road or a canal. In several cases, the uncertainty relates to the antiquity of the canal feature: water was running in some canals that were not clearly fed by one of the main branches of the ancient irrigation systems. It was unclear if these features were indeed part of the ancient

canal system and were redirected toward a supplementary water source, or if they are modern features, for example, drainage channels.

Second, to estimate the average dimensions of the mapped canals more accurately. A small sample of canals of varying dimensions was measured, and observations across the entire landscape were recorded. The resolution of the 1975 imagery used as the primary data source for mapping is approximately 1.5 m/pix. Therefore, a slight error in manual measurement can result in several meters variance from the actual width on the ground. Furthermore, canal erosion has in most cases blurred section morphology, thereby making photo-based measurement far less reliable. More importantly, canal depth cannot be measured on the imagery at all.

All the locations where relict canals were measured are shown on Map 4.3. Map 4.4 presents the revised canal map. Comparison with the pre-survey canal map demonstrates that several features have been omitted. In addition, the certainty level for some canal features has been modified. The purging of the canal map is based on the following criteria:

I. If a mapped feature proved unlikely to have ever been a canal.

These omitted features were generally re-classified either as roads or run-off drains. In some cases, however, field observations strengthened the interpretation that several local roads are built over former canals. In addition to the pattern of features on the historic imagery- which was the reason why they were mapped in the first place - this transformation could be discerned by the unnecessary meanders of these roads as well as their height above the plain, compared to other local roads.

II. If a canal feature was re-classified as too small to fit the mapping criteria.

Photo-based measurements of sampled canals proved to be overestimates, especially for the smaller ones. Canal dimension is most variable in the category of very large canals. Beside the few monumental relict canal segments with varying dimensions in excess of 20 m, the average width of the biggest canals on the plain ranges between 7 to 14 m (between the heap centers); canal depth often varies from 3 to 5 m. In the category of average-sized canals, width ranges from 5 to 8 m, and depth is approximately 2 m. The smaller canals are usually 3 to 5 meters wide. Their depth ranges between less than 1 m and 2 m. Field canals that are excluded from mapping (either before or after ground control) are approximately 2 m wide and less than 1 m deep. These measurements reflect the present preserved condition of the relict canals and it is possible that original widths might have been somewhat larger. Nonetheless, this study suggests that for schematic hydraulic modeling, the estimated minimum canal ranges are more reliable.

III. If a canal feature proved to be a more recent extension for access to pumped water.

Pumping from wells and rivers (the Karun and the Gargar) is used as a complementary source of irrigation water across the plain. This practice caused some confusion in differentiating between the ancient and modern canal segments in the course of remote sensing. Several abandoned relict canals are now connected to rivers and wells and reused to direct the pumped water. This practice was confirmed in the field and was most common in the south-central parts of the plain[289]. The revised map excludes all canal segments that could have functioned only using pumped water or were added only so that a relict canal could reach a pumping station and thus be reused. In sum, I removed some linear features from the canal map of Miyanab in the expectation

[289] The MIDP has not reached these lower areas yet, and will not be integrating the whole plain in a single gravity system. Based on my correspondence with authorities at KWPA, in these lower areas of the plain the idea is to rely mostly on pumping river water.

that a purged map would better represent the structure of the ancient gravity canal systems of the plain.

While the canals that may have been fed only by pumped water were disregarded in this research, it is important to note that the supplementary use of water lifting devices has a long history in the region. Mechanical lifting devices were used when the water level in the main channel dropped below the off-branching canal. Remains of a few of these structures are preserved on the plain. Unfortunately, we will not be able to reliably estimate the significance of lifting devices in the irrigation history of the plain and we have to continue under the flawed assumption that the system under study functioned only on the basis of gravity.

The survey highlighted the disparity between agricultural productivity in the upper and lower parts of the plain. In the north, upstream of both the ancient and modern Dariun canal system, irrigation water is abundant, soil is well-drained, and wheat and barley are cultivated along with vegetables. In the south, except for some areas where large-scale agricultural projects are being implemented, dry farming of barley predominates. Field observations and interviews with local farmers indicate that farming in these areas is undertaken despite a high risk of crop failure and very poor productivity. In the absence of better options, farmers continue to cultivate their land and try to complement their income by herding and other activities. Very often, the crop is so meager that they graze their animals on the land. Interestingly, well water is widely used in the north to supplement the water delivered through the canal system, whereas in the south, the river water is pumped very frugally, usually not more than once in a season; the cost of the fuel compared with the negligible agricultural income makes pumped water an expensive supplement.

The MIDP is not the only cause of the destruction of the archaeological landscape on the plain. Even though it altered much of the landscape, a second, follow-up project for leveling and re-plotting of farmlands is erasing any remaining traces of the ancient landscape (Fig. 4.7).[290] The unregulated explosion of private fish-farming along the edge of the Gargar River is further eradicating the historical landscape at an unprecedented rate (see chapter 5, survey along the edge of the Gargar). In addition to site destruction, the environmental impact of many square kilometers of stagnant water in the fish farms as well as large modern drainage canals in the semi-arid climate of Miyanab should not be underestimated.

4.6.2. Topographic Data: Data Acquisition

Topography plays a crucial role in the distribution and flux of water within the landscape. The design of a new canal system, as well as the analysis of an old one, is predicated on the availability and accuracy of topographic data. Free DEMs have low resolution and cannot reliably be used for topographic study of low-relief landscapes. The best commercially available topographic maps for Khuzistan are similarly low-resolution, 1:25000 at best. On the other hand, the cost of high-resolution topographic data, whether obtained through air-borne technologies (e.g., LiDAR) or traditional manual surveys, is high. In addition to the problem of scale, modern topographic data relate to the modern conditions of places and therefore are not as useful for the study of ancient landscape features destroyed by development processes. In this section, I will present the results of my attempt to obtain high-resolution and historic topographic data within the financial and temporal constraints of this dissertation. The data could potentially be used for

[290] Ministry of Agriculture, Contractor: Jihad-e Nasr Agricultural Company.

different lines of analysis, at varying degrees of complexity. Some of these research lines that I followed and the results that contribute to my final discussion will be presented below.

- Traditional Land Survey Data

I utilized the Land Survey Data collected for the MIDP.[291] The data, however, did not provide full coverage of the plain. In order to obtain a DEM, AutoCAD files of the surveyed areas were cleaned and prepared in AutoCAD Software, contour lines were exported to ArcGIS, and used to create a Digital Terrain Model (Fig. 4.8).

- Automated Generation of a Digital Terrain Model of the Miyanab plain

Since the second half of the twentieth century, air and space-borne stereo imaging has been systematically used to create the topographic maps. The mechanism for inferring topography from overlapping stereo photos is analogous to the way human eyes perceive three dimensional space. The overlapping areas of the terrain are photographed from two different angles. When the adjacent photos are viewed through a stereoscope, the difference in perspective allows the specialized viewer to see the image in three dimensions and draw contour lines. Originally, stereo images were processed by people who manually drafted/drew/created maps. Nowadays, modern photogrammetric software imitates this process and creates high resolution 3D models of the terrain.

Photogrammetric software may also be used to create 3D models from historic stereo images. The result is called a historic DEM, meaning that the terrain model corresponds to the landscape at the time of the imaging. Historic imagery is particularly useful because it preserves

[291] The data seem to have been collected at a scale of 1:5000 and then triangulated to create 1:2000 maps.

evidence of a landscape that, in most cases, is destroyed or dramatically altered. A historic DEM, adds one more dimension to the analytical and representational power of the unprocessed historic imagery by presenting a 3D model of the landscape prior to modern destruction. It was conceivable that a historic DEM corresponding to the topography of the mapped irrigated landscape would significantly enhance my ability to generate and test hypotheses about the function of several hydraulic features, as well as the evolution of the canal systems on the plain. Below, I have summarized the process and result of my attempt at creating historic DEM of the Miyanab plain from aerial photos.

Casana and Cothren explored the use of CORONA satellite imagery to create historic DEMs.[292] Despite promising results, the resolution of historic DEMs is still low. The true value of this innovative technique may become clear after more studies employ this method in different regions and with different datasets. These scholars have demonstrated that the use of CORONA images for DEM generation is most relevant for sub-images where the distortion of the imagery is minimal. For the three following reasons, I decided to test historic aerial photos for DEM generation. First, It was possible that higher resolution historic air photos, compared to CORONA images, would yield better results. Second, since aerial photos cover significantly smaller areas of the Earth, I expected there to be image distortion. Third, given the lack of systematic access to air photo datasets almost anywhere in Middle East, the potential of these datasets in Near Eastern archaeology could not be easily tested; carefully curated and digitized datasets of historic imagery from the United States have been utilized to create historic DEMs of astonishing resolution and

[292] Casana and Cothren, "Stereo Analysis, DEM Extraction and Orthorectification of CORONA Satellite Imagery: Archaeological Applications from the Near East."

accuracy. As will be explained below, it became clear that a lack of corresponding metadata is the major disadvantage of my dataset of air photographs. Another problem for my project was the lack of accurate Ground Control Points (GCP).

Through a SPARC Data and Analytics Award, I was able to assess the possibility of creating historic DEMs from aerial imagery at the Center for Advanced Spatial Technology (CAST) of the University of Arkansas. Both sets of historic imagery, 1956 and 1975 aerial photos, were tested. The small dataset of 1956 resulted in a historic DEM of great accuracy (Figs. 4.9, 4.11), while the larger 1975 dataset failed to yield any result despite many attempts. The following section provides a technical summary of the project.

4.6.3. Photogrammetric modeling of the historical landscape of Miyanab

For the photogrammetric project, additional images had to be purchased. Aerial photos are usually taken in such a way so that there is approximately 60% fore/aft overlap between photos in each path of the airplane and 30% lateral overlap between paths. The NCC by default sells every other photo in each path so that photo overlap is 30% in all directions. This is enough for visual analysis. But, for a DEM, the 60% overlap is needed. The SPARC Award included funding to obtain photo coverage to fill the gaps in the imagery purchased earlier. As a result, I used the imagery that was digitized with regular flatbed scanners at high resolution (600 dpi), but at different times (2010 and 2014) and with two different specifications.[293]

[293] Studies have shown that using photos digitized with photogrammetric scanners yields betters results compared to those scanned with regular flatbed scanner (even at very high resolution). Personal Communication with Rachel Opiz and Jack Cothern. This has to do with the higher rate of distortion of the image across the x & y axis when digitized with flatbed scanners. Nonetheless, photogrammetric scanners have become very rare and most projects including mine had to go with regular scanners.

Photogrammetric modeling was undertaken at CAST using Agisoft PhotoScan 1.1.0. Unlike the aerial photos that are provided by the USGS in digitized format, the metadata of aerial photos of Miyanab are not completely available. Only the focal length of the camera was visible in the contact photo. For 1956, the fiducial marks[294] were visible which helped with relatively accurate cropping and transformation of the digitized imagery. Unfortunately, most photos in the 1975 dataset are missing some or all of the fiducial marks.

Photos were loaded in PhotoScan software. For camera calibration, ground resolution (pix/m) and focal length were added manually.[295] Other cameral parameters were calculated by the software. Testing with several parameters in the course of the process yielded the best results under the following conditions. Any other combination either increased the noise in the model or decreased the ground resolution and details in the final DEM.[296]

1. Photo Alignment: High Accuracy; Generic Pairing; 100k Point Limit
No GCPs added at this point.
2. Build Dense Cloud: Ultra High Quality; Depth Filtering Aggressive
3. Build Mesh: High Face Count; Arbitrary Face Type
4. Built Texture: 8196 pnts, Count 1
5. Add GCPs: 12 GCPs. Coordinate System: WGS_1984_UTM_Zone_39N
6. Optimize Camera Alignment: XYZ extracted from Google Earth, Marker Accuracy 1m
In addition to DEM, an Orthophoto[297] was also exported. See Appendix B.

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[294] Fiducial marks show the exact corners of the original film on the developed contact. The films used to take photos were 9 by 9 inches. The digitized copy of the contact transforms all pixels across this film to grid of known number of pixels. Contact photos come with a black margin of varying size and are not ideal squares. Since, photogrammetric modeling is based on the complicated mathematical calculation of millions of matching points, it is important to accurately crop the digitized copy to the actual dimension and proportion of the original film. Therefore, knowing the fiducial marks is crucial.

[295] I am grateful to Adam Wiewel at the University of Arkansas for providing me with the worksheet for calculation of spatial resolution.

[296] See Appendix B.

[297] Orthophoto is a seamless georeferenced aerial photo that covers the entire model area. Orthophoto is created from the individual photos after the model is created. Thus, it doesn't have the problem of overlapping imagery, seams across the image boundaries, or spatial distortion when hard copy or digitized versions of individual images are laid next to each other. Compare Orthophoto in Appendix B and GIS database of Aerial Imagery (Map &).

4.6.4. Canal Evolution on Miyanab: Topographic Study

DEMs provide another efficient way to identify canals. In an elevation model of a fluvial landscape, the main water channels (natural or manmade) can be identified by their levees, against the flat background of the plain. Levees are formed as sediments are continuously deposited along a water course during flood events. Canal maintenance activities further enhance levee patterns through the periodic digging of sediments and deposition of them on the banks of the water ways. Despite their low spatial resolution, SRTM DEM have exceptional potential for highlighting major canal features, in a way that is complementary to historic photos.[298] While historic photos provide much detail on canals of all sizes, DEMs demonstrate the largest and most long-lived features.

The alignment of archaeological sites along the mapped irrigation system on the Miyanab suggests that some canals are larger and more long-lived than others. However, this distinction cannot be confirmed based only on the information preserved in the historic photographs owing to uneven patterns of canal preservation and destruction. The palimpsest visible on the imagery preserves only segments of very old canals at best; the abandoned channels are more likely to reveal their original dimensions while attributes of those that stay in use for hundreds of years are obscured.

Levee size on Digital Terrain Models is a reliable proxy for the longevity of water courses, on the condition that DEMs of appropriate resolution to the research question are available. Given the relatively small size and low topographic variation of the study area compared to the spatial resolution of SRTM DEM (90m), the elevation model does not provide the ultimate clue to the

[298] Gasche and Tanret, *Changing Watercourses in Babylonia*; Hritz and Wilkinson, "Using Shuttle Radar Topography to Map Ancient Water Channels in Mesopotamia."

topography of the canal systems of Miyanab. Nonetheless, even at this resolution some major topographic features begin to emerge (Fig. 4.12). The DEM demonstrates that the northernmost part of the plain, between Shushtar and Dastowa, is in fact a continuation of the mountain ridges, and the only area where topographic variation across the landscape is noticeable. The town of Shushtar is built on the major outcrop to the north while the site of Dastowa occupies the smaller and less distinct southern outcrop. Beside this northern zone, some topographical variation is observed at the very southern part of the plain where the western end of the Kupal anticline has protruded through the plain. Much of the rest of the plain is technically a flat land, with no more than 3 m of elevation variation over the southern half of the plain, (ca. 20 km).

With regard to canal analysis, the DEM begins to illuminate certain major water channels below Dastowa. At least one of them is clearly highlighted by site association as well, and a few more segments seem to stand out. However, the generally higher elevation of the northern part of plain fuses with levee topography and blurs the structure of the irrigation system. It is important to note that the area of possible levee features overlaps with the organically shaped canal system, whereas the linear canal features spread over the flat area of the plain, where no levee feature is identifiable. Also noteworthy is that the less distinct western extension of the Dastowa outcrop defines an area of slightly higher elevation along the course of the Dariun canal system. Just below this natural barrier is the fan shaped group of monumental canals.

The DEM generated from the land survey data clearly illuminates the levees and the structure of the canal system across large areas of the plain (Fig. 4.8). Since this elevation model presents the topography of the landscape prior to the implementation of the large scale canal building project, it can be argued that the alignments highlighted on the land survey DEM represent

the major and most long-lived water channels on the plain. As discussed earlier, this conclusion can be supported on the basis of canal morphology, site alignments and SRTM data. Despite the incomplete coverage, the high resolution DEM again underlines the distinction between the northern part of the plain where distinct levee patterns are observed and the flat southern area of the plain with little elevation variation.

The land survey DEM further stresses the need for a better topographic understanding of the strategic area west of Dastowa. For this area, the high resolution historic DEM (ca. 0.8 m) highlights all the major relict canals around Shushtar, even the soil upcasts of the fan-shaped canals (Fig. 4.11)

4.7. Discussion

At this point, it is possible to theorize about the evolution of the canal systems on the Miyanab plain. Given the complex environmental and social factors involved in shaping the hydraulic history of the fluvial plain, and given the dearth of reliable data, the aim is to put forward the most likely scenario for the evolution of the irrigation system on the plain. At present, evidence that supports this model mainly comes from remote sensing data; a comprehensive program of geoarchaeological research is required before any scenario can be proved.

4.7.1. Previous models: summary and critique

Before presenting a model of canal evolution on the Miyanab, it will be useful to provide a brief summary and critique of previous scholarship on the topic. [299] Alizadeh et al. published the first scientific research that focused on the question of canal evolution on Miyanab. Their study

[299] For maps and detailed discussion, see chapter 2.

provides a scholarly explanation of the narrative presented by the texts. The Gargar, which is more or less the same watercourse as the Masruqān canal, began at Shushtar and ended at Ahwaz or further south in the marshes. It was built by a Sasanian king, Ardashir I or Shapur I. They hypothesized that the plain was watered by natural wadis that flowed from the east and channeled the run-off of the Zagros piedmont toward the Karun. The linear monumental Gargar canal was built in order to irrigate the agricultural fields on Miyanab, and was transformed into a meandering river through subsequent geomorphological processes (Fig 2.7). The Masruqān canal continued to support a prosperous agricultural economy in the Early Islamic period, as described in tenth-century geographical texts. In the course of the sociopolitical disturbances of the Middle Islamic period, the system collapsed, sometime before the 14th century. The collapse could have been related to the destruction of the hitherto unlocated weir of The Band-i Qir. They hypothesize that the avulsion of the Karun to a previous segment of the Masruqān canal, between The Band-i Qir and Weis, created a sudden change in the hydraulic base of the Masruqān which expedited the downcutting of the Gargar as eastern wadis pour into it.[300]

Several problems are associated with this model. First, these scholars have not presented any evidence, on the ground or on the imagery, for the monumental linear canal that was once dug between Shushtar and The Band-i Qir.[301] While it can be argued that erosion processes have eradicated all traces of the linear canal, one has to be way of the lack of material evidence for the hypothetical feature, south of Shushtar. Nor is any evidence for the east-west wadis, which according to this model irrigated the plain for millennia before the Gargar was dug, found on the

[300] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 80–82.
[301] The linear course of the Karun between The Band-i Qir and Ahwaz remains no doubt that it was originally a segment of the Masruqān.

terrain models (Figs. 4.8, 4.12). Secondly, the significance of the present Gargar or its hypothetical linear course for the irrigation of the fields on Miyanab is not supported by remote sensing evidence. Based on my mapping of relict canals (Map 4.4), it is impossible to prove that any canal irrigating the Miyanab took off from the Gargar. Thirdly, this model does not take into account the evolution, history, or even the existence of the Dariun canal system and its relationship with the history of the Gargar. Fourthly, a Sasanian date for the Gargar (or its linear predecessor) is unproven. Besides textual sources, the only supporting evidence provided by the authors is that "field scatters of late historic pottery" were found along the river. Aside from the fact that the ceramic chronology of "late historic pottery" on Miyanab does not provide the resolution required for this conclusion, fieldwork conducted by Moghaddam and supplemented by me proves that sites of all periods are found along the course of the Gargar south of Shushtar. Fifthly, the authors do not explain the socio-political conditions that presumably caused the breakdown of the system—which survived the post-conquest turmoil, by the 14th century. Despite these problems, this scenario attempts to understand the landscape dynamics, taking into account local environmental processes and geoarchaeological data. Furthermore, the observation that an avulsion along the lower segments of the Gargar should have resulted in significant erosion upstream from The Band-i Qir is a significant contribution. In addition, this model recognizes that the agricultural wealth of the region in the Islamic period implies that the irrigation infrastructure of Shushtar lasted for centuries after the Muslim conquest.

Moghaddam's hypothesis, to the contrary, is built on evidence from remote-sensing and settlement data (Fig. 4.3). He uses CORONA imagery and canal maps provided by KWPA and attempts to present a holistic picture of the ancient canal network of Miyanab. He suggests that

two different irrigation systems existed on Miyanab. The Dariun canal system predated the Sasanian period. Given the increase in the number of sites datable to the Parthian period on the northern part of the Miyanab plain, Moghaddam suggests that this system was mainly built during the Parthian period. The monumental Gargar canal, he argues, was built in the Sasanian period, in order to extend irrigation to fields in the southern areas of the plain. [302] Moghaddam identifies a linear feature on the CORONA imagery, which he argues is the trace of the linear monumental canal of the Gargar. He dates the canal to the Sasanian period on the basis of archaeological sites along the canal. In order to explain the transformation of the linear canal into the present meandering Gargar river, he argues that lack of maintenance caused the collapse of the system almost immediately after the Muslim conquest; the linear canal left its course and became a natural channel after an avulsion event at Mahibazan. The reason this transformation has to be dated to the 7th century is that when the Islamic town of 'Askar Mukram was founded, in the 7th or 8th century, the Gargar River certainly followed its present course, passing through the city (now in ruins).[303] This scenario, while providing important insight, faces certain problems. First, what Moghaddam identifies as a monumental linear canal is in fact two parallel canals of average size, nothing more substantial than the upstream segments of the Dariun canal system (Figs. 4.4-4.5). He is correct, however, that these canals irrigated southern areas of the Miyanab plain. Second, the area near Mahibazan is not a natural place for avulsion events. Sudden channel shifts happen in relatively flat plains where water courses leave one channel for another easy course. At the proposed location, the piedmont flanks the linear canal on the west. Suggesting an avulsion event

[302] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 28–29, 53–54.
[303] Moghaddam, "A Note on the Gargar Irrigation System."

here in an eastern direction implies an unlikely situation whereby a canal left its course on the flat plain in order to dig a new path, c. 20 km long, into the steep side of the piedmont. Third, the topographic situation and remains at Mahibazan undermine the hypothesis that the structure originally served as a weir; even more questionable is that a weir at this location could have fed the linear canals under discussion. Fourth, based on Moghaddam's own maps, all but one of the settlements located along the linear canals were founded prior to the Sasanian period.[304] Thus, their alignment cannot per se suggest a Sasanian date for the canals.

4.7.2. Evolution of the Canal Systems on Miyanab: Toward a New Model

Main arteries of irrigation that were used over a long time are visible as a dendritic network of levees in the northern half of the plain. On the aerial photos, several large canals are traced in the northernmost area of the plain, in the vicinity of Shushtar and Dastowa (Map 4.4, Fig. 4.13). These canals are distinct from the rest of the mapped network, not only for their size, but, also for the level of preservation. It seems that most of these canal segments were abandoned at some point and have escaped the frequent modifications which happen through reuse of canals over a long time. Within this zone, a group of relatively large canals, c. 15-20 m wide, southwest of the Dastowa outcrop merit particular attention (Figs. 4.5-4.6). These canals which spread out in the direction of the Karun in a fan-shaped way have two peculiarities: on one hand, the capacity of these canals does not correspond to the size of the channel they connect to at present (Fig. 4.11). The source of water that was flowing in these canals and the canals' function need to be

[304] One of the main problems involved in the dating of sites on Miyānāb is that not a single ceramic type can be securely dated to the Sasanian period only. Most types in Moghaddam's catalogue for this period are datable to the Sasanian-Early Islamic; if they are dated to the Sasanian period, the comparison is not with any reliably excavated site in the region. As a result, I doubt what has been the base for dating of this one site to the Sasanian period only.

understood. On the other hand, none of these canals can be traced very far on the historic imagery. It also needs to be understood where these canals drained. A comparison of the canal map with SRTM DEM demonstrates an important aspect: the fan-shaped canals are all located south of the extension of the Dastowa outcrop, i.e., the last major topographic barrier/feature on the plain. It is noteworthy that these canals are located in the vicinity of the settlement of Dastowa, which seems to have been more ancient than Shushtar. In contrast to the fan-shaped canal system, large canals that are located north of this ridge can be all connected—on the imagery—to the main arteries of irrigation on the plain. However, in this zone, numerous intersections of canals of similar width seem to succeed each other (Fig. 4.13), and no archaeological sites have been recorded, either by Moghaddam or by the author. The clue for understanding the source of the fan-shaped canals came from the historic terrain model created from the 1956 aerial photographs; this group of canals also flowed toward the main arteries of irrigation on the plain, highlighted by levee systems (Fig. 4.10). The extensions of the northern canals of this fan are obliterated by other large canals that flow from the west of Shushtar, but, the connection is still very clear for the feeders that are located further south. In addition, it was noted earlier that the linear canals along the Gargar also divert around the southwestern side of Dastowa toward this area.

A clue to the interpretation of the successive overlay of large canals in the north can be found in Van Roggen's observation that the inhabitants of Shushtar struggled to protect the Dariun feeder canal from flood damage. They had even built a wall along its western side to protect it from high waters. Despite their efforts, the canal gradually became useless as floods filled it with rubble and sediments.[305] Prior to modern damming projects, which have resulted in significant

[305] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 179, Fig. 471.

decrease of the river flow and seasonal fluctuation, the area west of Shushtar and north of the Dastowa outcrop was frequently flooded and headworks had to be repaired (Fig. 4.16, Fig. 6.11).[306] While previous models of canal evolution on Miyanab have depended only on the assumption of the need to increase the overall water quantity available in the system, I argue that the management of irrigation and dynamics of canal evolution on Miyanab should be understood as an attempt to satisfy two needs. First, the need to situate canal heads at a location where supply is guaranteed during the low-water season (autumn), when it is needed for cultivation. Second, the need to maintain sufficient capacity in the system so that the radical increase in the Karun's flow during high-water season (spring) could be discharged and the fields could be protected. Furthermore, I argue that all the canals that irrigate the fields on the Miyanab plain are ultimately tapping the same source, and are part of the same canal system: the Dariun. The canals that run parallel to the present course of the Gargar and irrigate the fields south of the plain are simply an extension of the older Dariun system. With these assumptions, it will be possible to propose four general phases of the evolution of the canal systems of Miyanab, from the later historical periods until pre-modern times.

1. The first significant investment in large-scale irrigation aimed at tapping the Karun, somewhere near the present intake of the Dariun and distributing it south of the Dastowa outcrop (Fig. 4.14 top). An important advantage of this strategy appears to be that below this ridge, no topographic feature would pose an obstacle to flow in the canal system. The question of the feeder

[306] The challenge that spring floods pose to cultivation and irrigation is a widely known problem in the region. The historican Kasrawi, while describing the mission of Najm al-Mulk in Khuzistan, expresses surprise about the naiveté of Nasir al-Din Shah in assuming that repairing the dam of Ahwaz could bring prosperity to the region. He adds that no hydraulic structure, no matter how impressive, can stand the floods of the Karun; therefore, the Upper Khuzistan needs a comprehensive program of irrigation whereby the flow of the Karun is controlled through distributed into different numerous canals, checked by several dams and weirs. Kasrawi, *Tārīẖ-i Pānṣad sāli-yi Ḫuzistān*, 93–95.

of these canals is more difficult to answer: From canal remains on the imagery and the historic DEM, it seems that one or two large canals, more or less along the northern segment of the Dariun canal west of Shushtar, provided water for the fan-shaped canals systems. However, this segment of the Dariun canal seems to be one of the most ancient parts of the system. It is difficult to make a final statement about the role of this exceptionally long-lived segment in the earliest phase of the canals systems on Miyanab. At this phase, the Gargar did not exist, at least as it does today. All the canals drained toward the Karun. The larger canals located immediately west of Dastowa must have functioned as quick by-passes against flooding as suggested by their size and density compared to the irrigable land they serve. Large canals located further south formed the backbone of the irrigation system of the plan and distributed water as far south as Arab Hasan. This canal has continued to define the lowest limit of gravity irrigation on the plain until the present. That this strategic hydraulic node is adjacent to Dastowa suggests that this configuration of the irrigation system was in place prior to the Sasanian period. The upstream segments of some of the canals that were later integrated into the Gargar canal system might have existed as branches of the Dariun in this phase. The map presents a snapshot of this phase at its maximum extent. It is likely that during this phase more canals were gradually added in the distribution zone near Dastowa in order to cope with the spring high waters.

2. The major change in the configuration of the canal systems on Miyanab happened at this stage (Fig. 4.14 bottom); by digging the Gargar canal, or at least the northern segment of it which flanks Shushtar, a major drainage channel was created and a workable solution for flood control was pursued. This hypothesis is supported by the radical change in the configuration of upstream canals that are traceable north of the outcrop of Dastowa and are disconnected to the network of

fan-shaped canals. At this point, it is possible to emphasize a fundamental finding and claim of this research, i.e., that the primary purpose of the Gargar project was to serve as the main drainage canal for the Karun. In this way, previously available agricultural lands north of Miyanab were provided with better flood protection; furthermore, more agricultural land was made available south of Miyanab. Main canals that diverted floodwater to both the Karun and the Gargar were now situated immediately south of Shushtar. Particularly noteworthy are the canals that are immediately east of the Karun and farthest from Shushtar: their size, compared to their short length and the small area of the fields available near them, strongly suggests that they served primarily as by-passes for the excess water in the Dariun canal head. The possibility of changes in the Dariun canal head will be addressed in the next chapter, as will the construction of the Shadorwan weir, which seems to be related to this major hydraulic project.

It seems reasonable to argue that the foundation of Shushtar as a major city was related to this shift in water management strategy. From available textual and archaeological evidence, it appears that Shushtar emerged as the urban center of the plain and one of the most important cities in Khuzistan in the Sasanian period and gradually overshadowed the more ancient Dastowa. It seems reasonable to argue that the shift in irrigation strategy described here happened sometime in the early Sasanian period; as a result, the population center of the plain moved further north to Shushtar. How much of the course of the Gargar was built at this stage will be discussed in next chapter.

The newly cultivable lands on the Miyanab were irrigated by means of a major canal expansion project. Additional canals were added to the Dariun system that ran parallel to the Gargar and formed the network of linear canals which watered the new fields south of the plain.

At this point, it is possible to refine Moghaddam's scenario and reconstruction of canals adjacent to the Gargar: it is likely that this canal system, or at least major parts of it, was indeed established in the Sasanian period: its distinct linear configuration compared to the rest of the system as well as the regularly spaced outlets along the Gargar suggest that it was created in one phase, when suddenly additional fields had become available. However, they were simply an expansion of the Dariun canal system and not the former course of the Gargar River. The resolution of our data is not enough to establish for how long these canals were used, or how much of the new system was built in the Sasanian period. It is possible that these canals continued to serve the fields or were even expanded after the Conquest. The southern end of this canal system, which spread out to the plain east of Arab Hasan in a fan-shaped way, suggests that new canals were added during a later expansion phase. Nevertheless, it seems that the impact of this canal system in general was relatively short-lived: new canals left little topographic impact on the landscape, and settlements (at least permanent ones) never expanded into this zone. [307]

3. Despite the construction of the Gargar as a major drainage channel, it seems that large canals near the Karun constantly fell victim to floods. Following the hydraulic shift toward the north, canal heads had to be built in a very vulnerable zone in the flood plain. The relative sequence of intersecting canals north of the Dastowa outcrop suggests that feeder canals had to be moved further away from the Karun and toward the city. The map (Fig. 4.15 top) presents a snapshot of this long process, which resulted in the gradual retreat of large canals toward the present northern segment of the Dariun canal which flanks Shushtar (Fig. 4.13, a-c). This phase marks the end of a

[307] Najm al-Mulk states that these canals were in use until a while ago. Mirza abdulif, makes similar claim, a century before him. These statements, therefore, seem to reflect simply a notion of antiquity. *Naj*, 119; *Tuḥ*, 65.

phase of expansion after which irrigation agriculture on the Miyanab plain gradually contracted. It has yet to be determined how much the reduction of irrigation agriculture was due to natural wear and tear of the system and how much was due to the reconfiguration of the canal heads. Similar problems existed on the eastern side of the canal systems: rapid erosion along the banks of the Gargar constantly washed away the upper segments of the feeder canals that ran parallel to it (Fig. 5.19-5.21). Dramatic erosion in the area between Mahibazan and Shalili-i Kouchak demonstrates that canal heads of the linear canal network were placed in a poor location. It is conceivable that upstream canal segments quickly fell apart; therefore, the lower canal segments had to be rearranged to be fed through the branches of the old network, farther from the Gargar.

4. The current situation, whereby a single canal of the Dariun feeds all the canals on Miyanab is the very last phase of canal dynamics. In this phase, the Dariun feeder also served as the only channel that diverted excess water to the Gargar during flood season (Fig. 4.15 bottom); irrigation agriculture was practiced at minimal level. Modern travel accounts and data collected for the MIDP show that flood sedimentation and lack of dredging continued to reduce the capacity of the irrigation network. [308] The only major addition to the water available in the system prior to the modern irrigation schemes happened when water pumps began to be widely used; several of the old and abandoned canal segments near the Karun and the Gargar where reused to direct the pumped water to the fields.

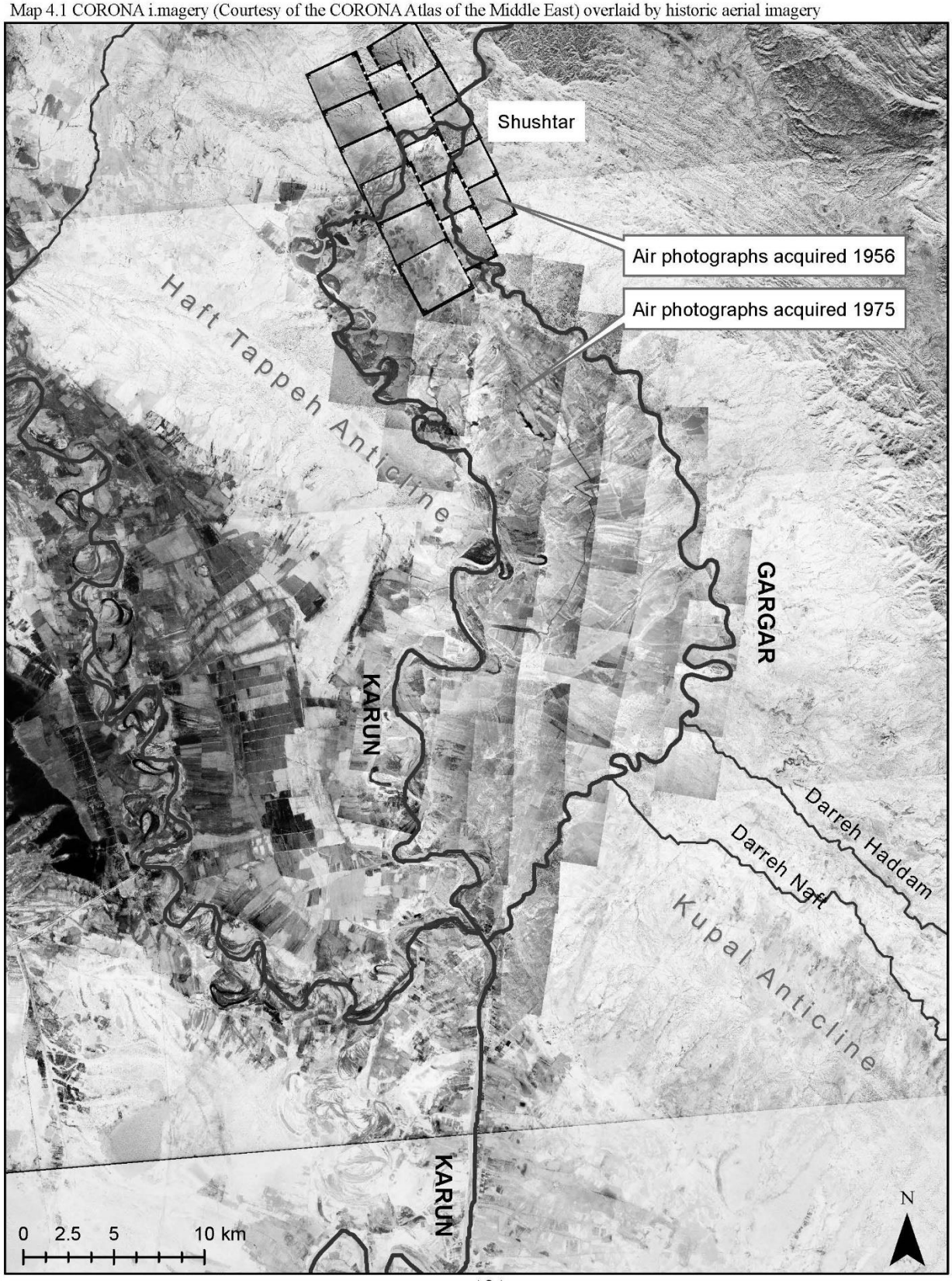
4.8. Conclusion

Although the Gargar canal has overshadowed the Dariun in all the narratives of irrigation history on Miyanab, this study highlights the role of the Dariun canal system for the irrigation of

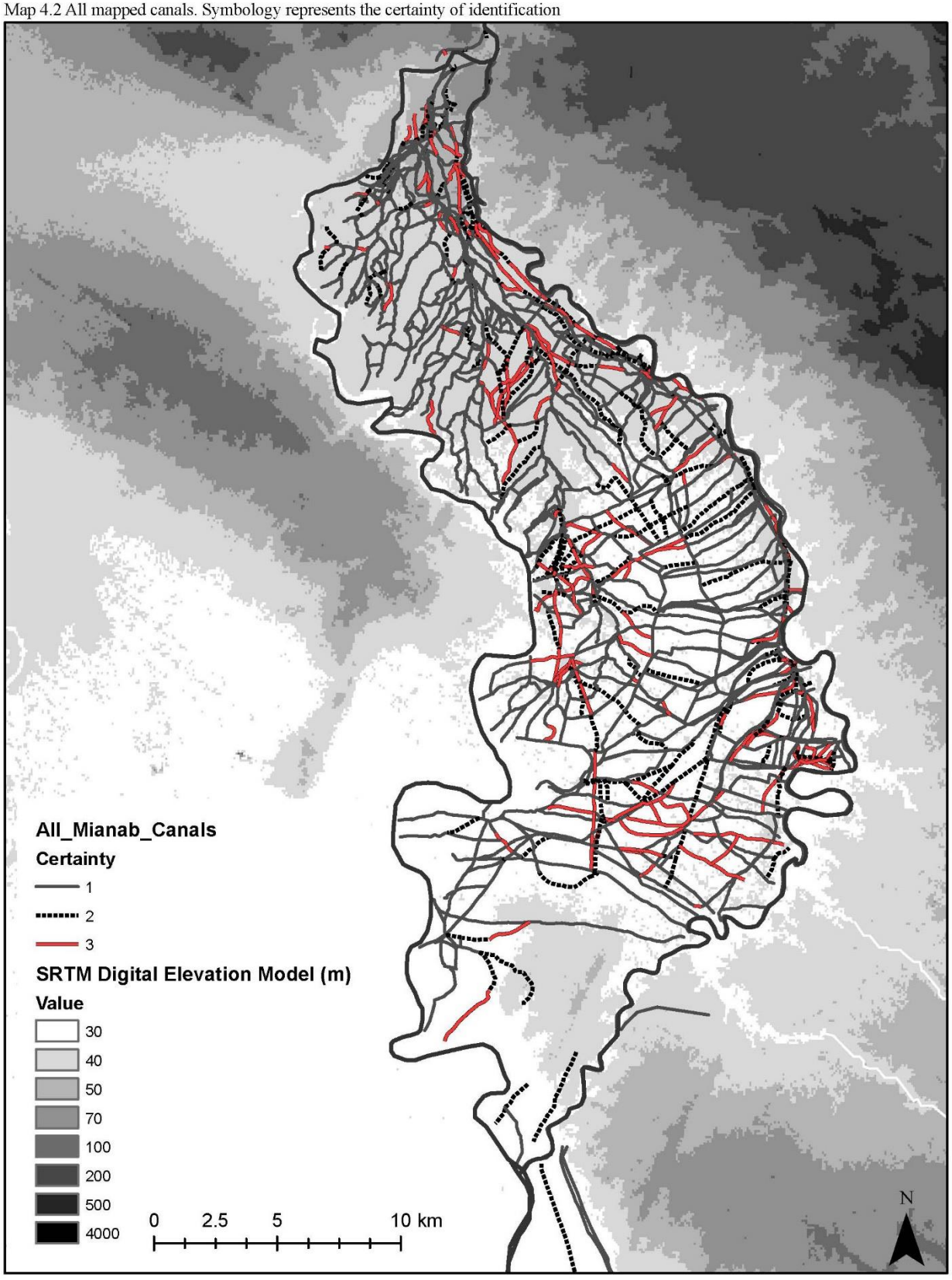
[308] See the description of Dariun, in chapter 2.

the plain. The pre-modern and modern canal system of Miyanab almost exclusively relied on the water running in the Dariun feeder canal. As Moghaddam argued, the canal system fed by the Dariun feeder canal seems to have existed at least since the Parthian period. The main purpose of the Gargar project was to control floods and to reclaim additional fields to be cultivated. The northernmost segment of the canal, which flanks Shushtar, must have been built in the Sasanian period. It remains to be investigated how much of the rest of the course of the Gargar was built during this large-scale project. What Moghaddam identifies as the trace of the monumental Gargar canal is in fact an extension of the Dariun system through several parallel feeder canals. According to the present study, it seems reasonable to assume that this expansion was part of investment initiated in the Sasanian period. The emergence of Shushtar as the urban center of the plain appears to be related to a shift in the strategy of water distribution in the Sasanian period.

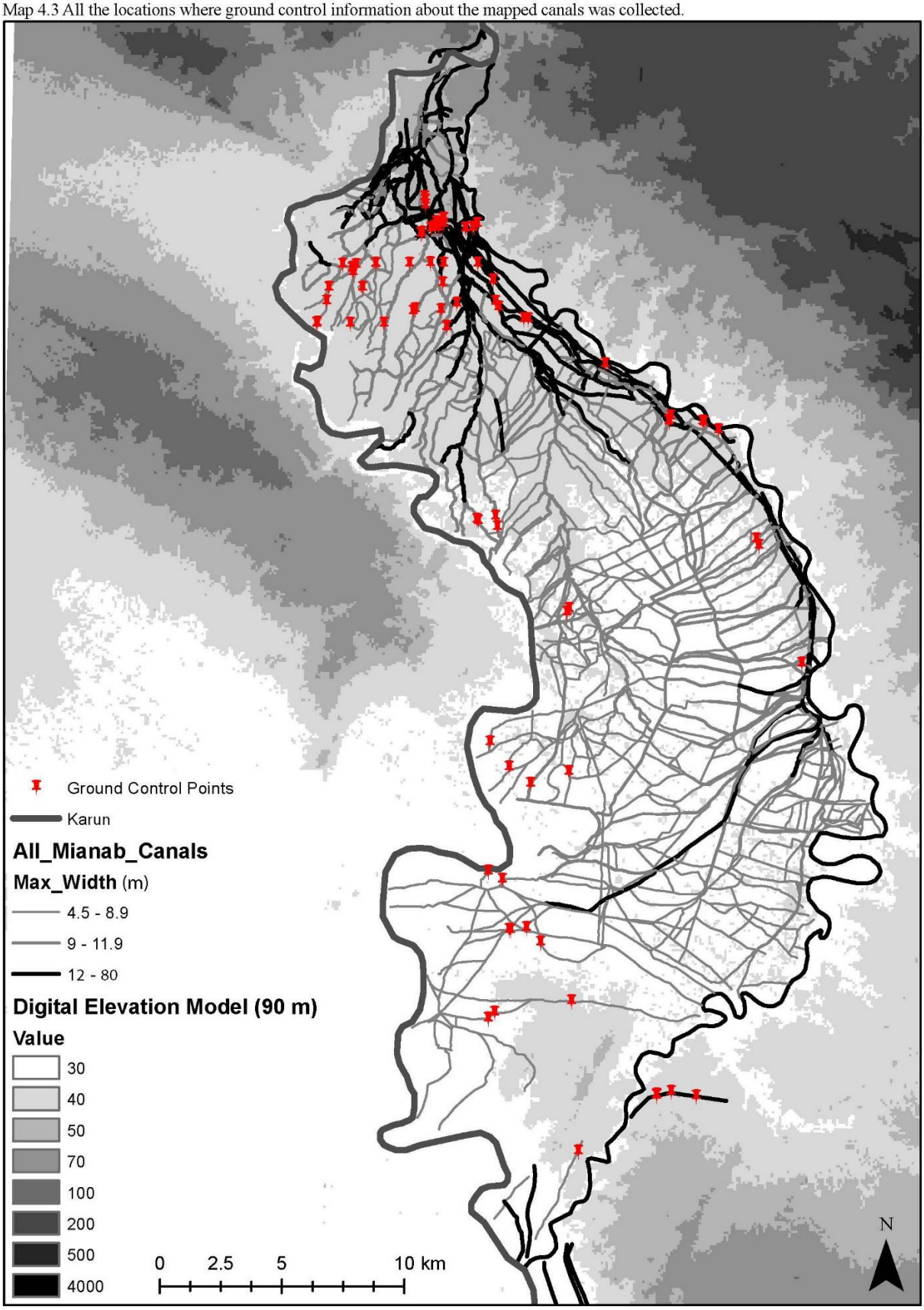
Map 4.1 CORONA i.magery (Courtesy of the CORONA Atlas of the Middle East) overlaid by historic aerial imagery



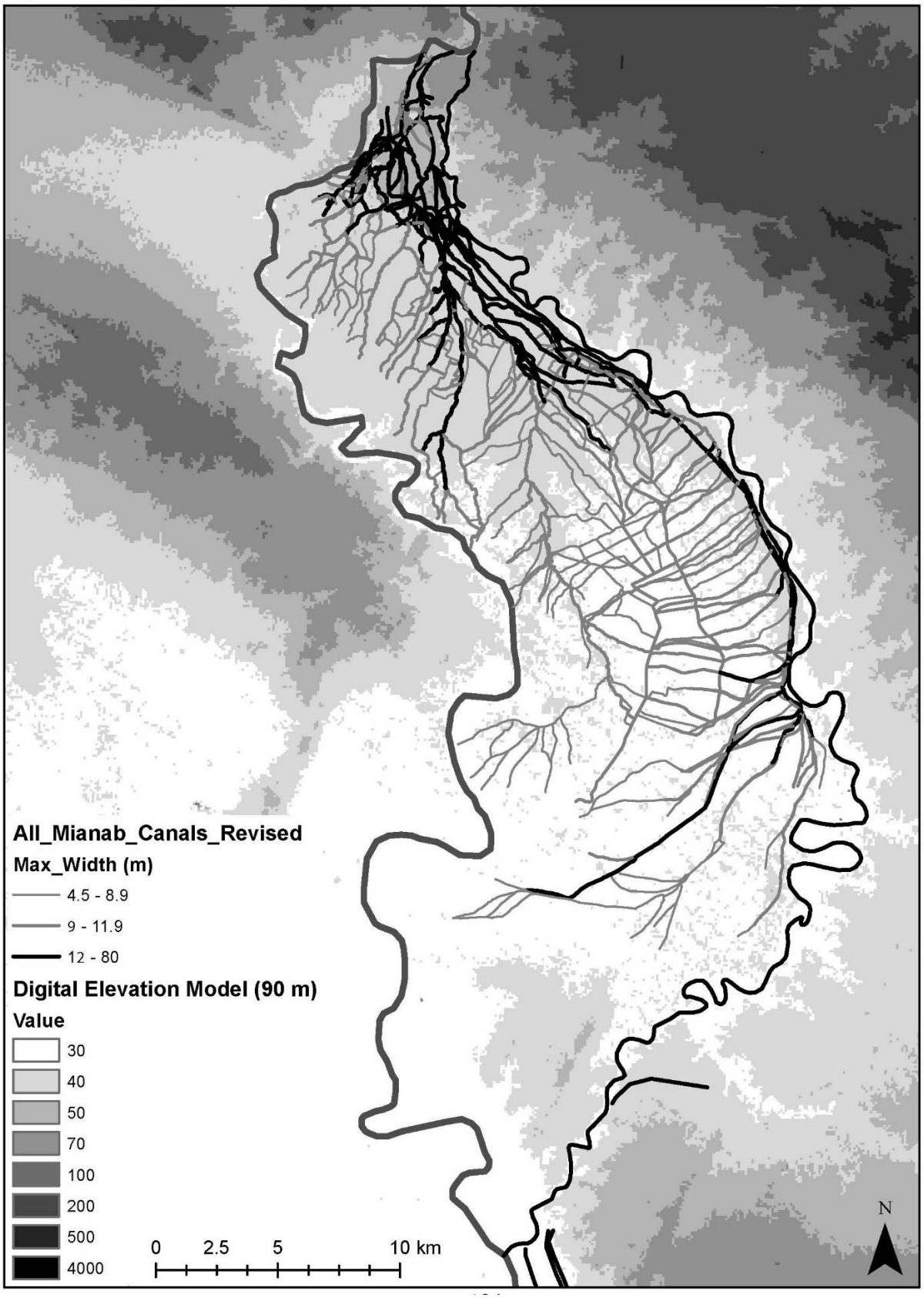
Map 4.2 All mapped canals. Symbology represents the certainty of identification



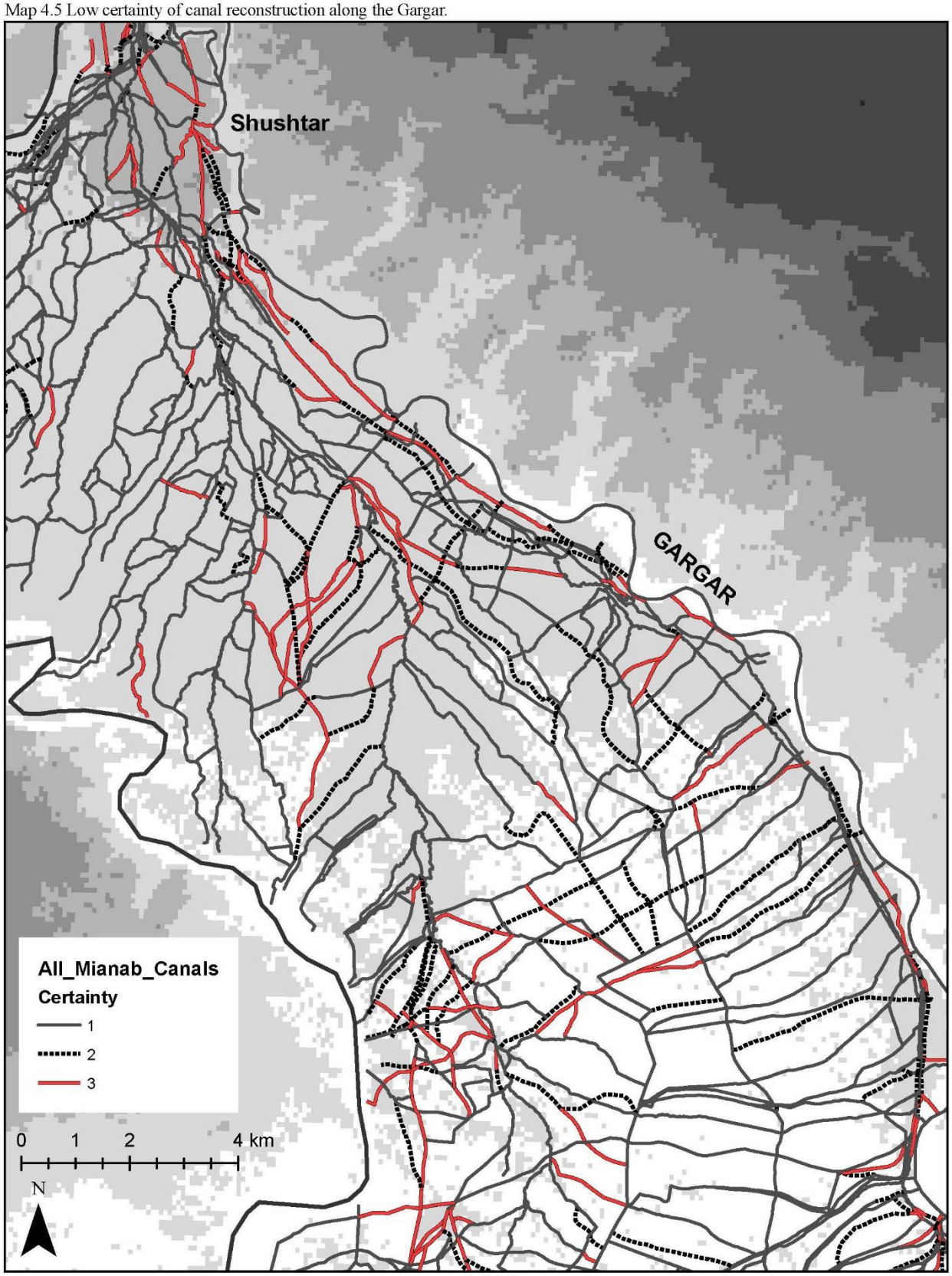
Map 4.3 All the locations where ground control information about the mapped canals was collected.



Map 4.4 The revised map of ancient canals after survey observations.



Map 4.5 Low certainty of canal reconstruction along the Gargar.



Map 4.6 Distribution of settlements in relation to the patterns of canals.

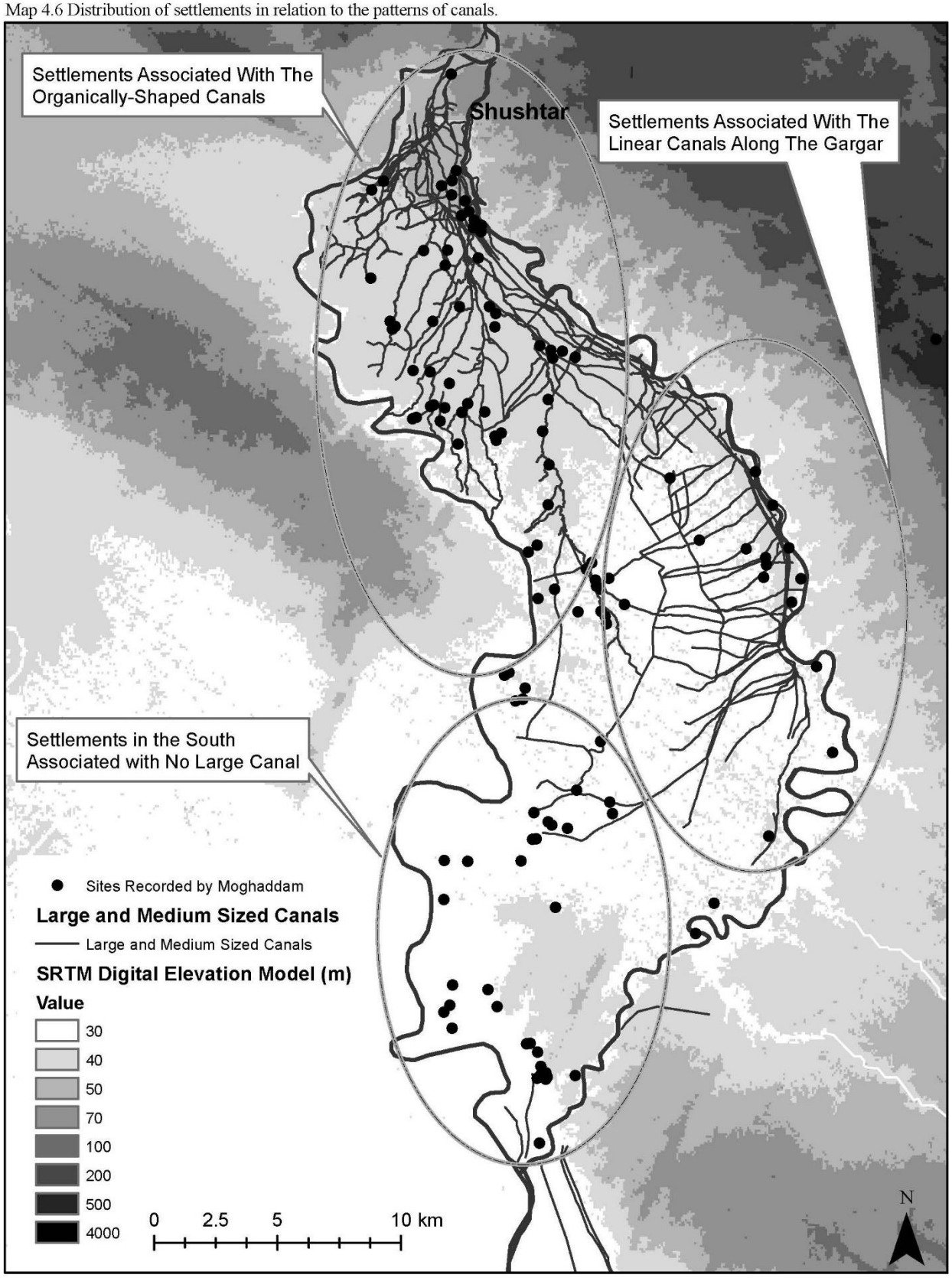


Figure 4.1 Snapshot of the mapped canal system-Symbology represents the certainty of identification.

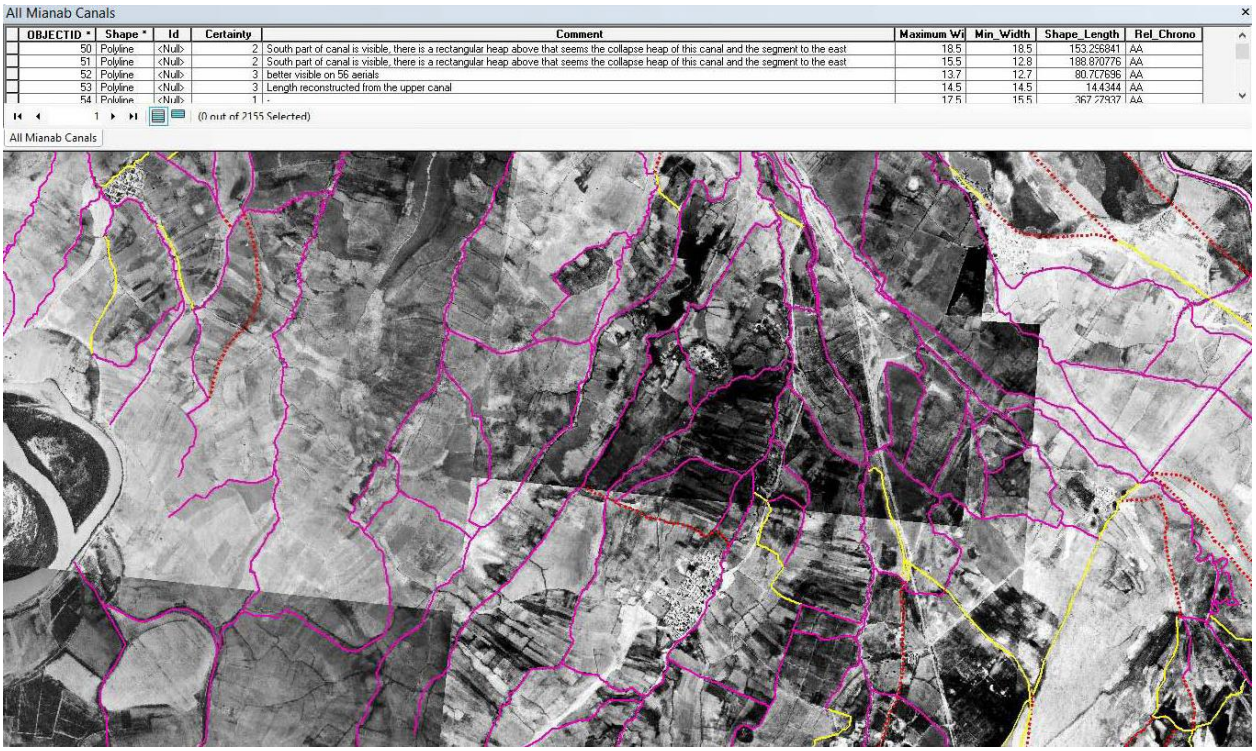


Figure 4.2 Features identified and interpreted by Moghaddam in the vicinity of Mahibazan (1) The Mahibazan weir (2) The Sasanian Gargar canal (3) Waste collector channels.

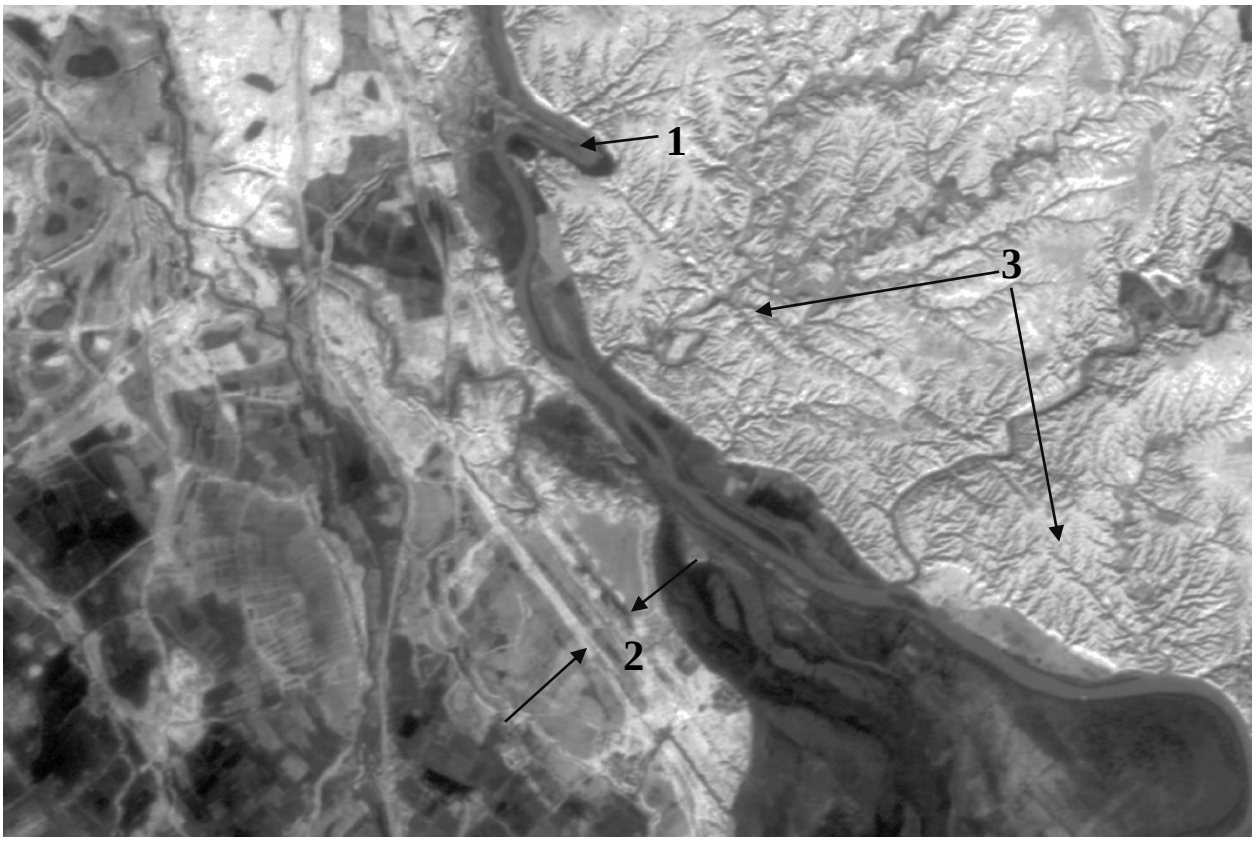


Figure 4.3 Moghaddam's reconstruction of a monumental Sasanian canal (After Moghaddam 2012b).

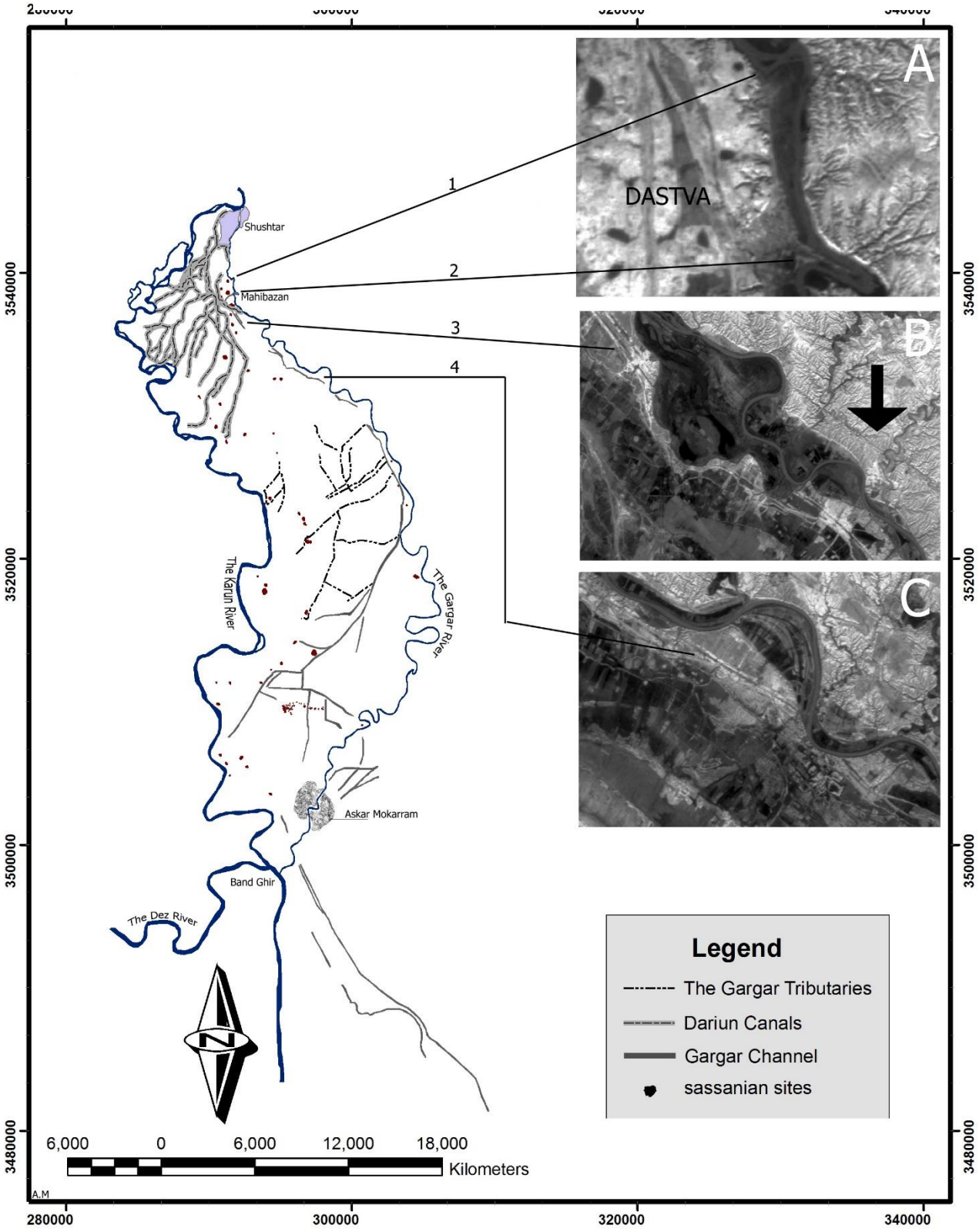


Figure 4.4 Reconstruction of the relict canals in the vicinity of Mahibazan. (1) The two linear features represent two Small canals. (2) The small canals turn NE around the outcrop of Dastowa. (3) The only canal segment approaching Mahibazan drains to the Gargar downstream from the feature.

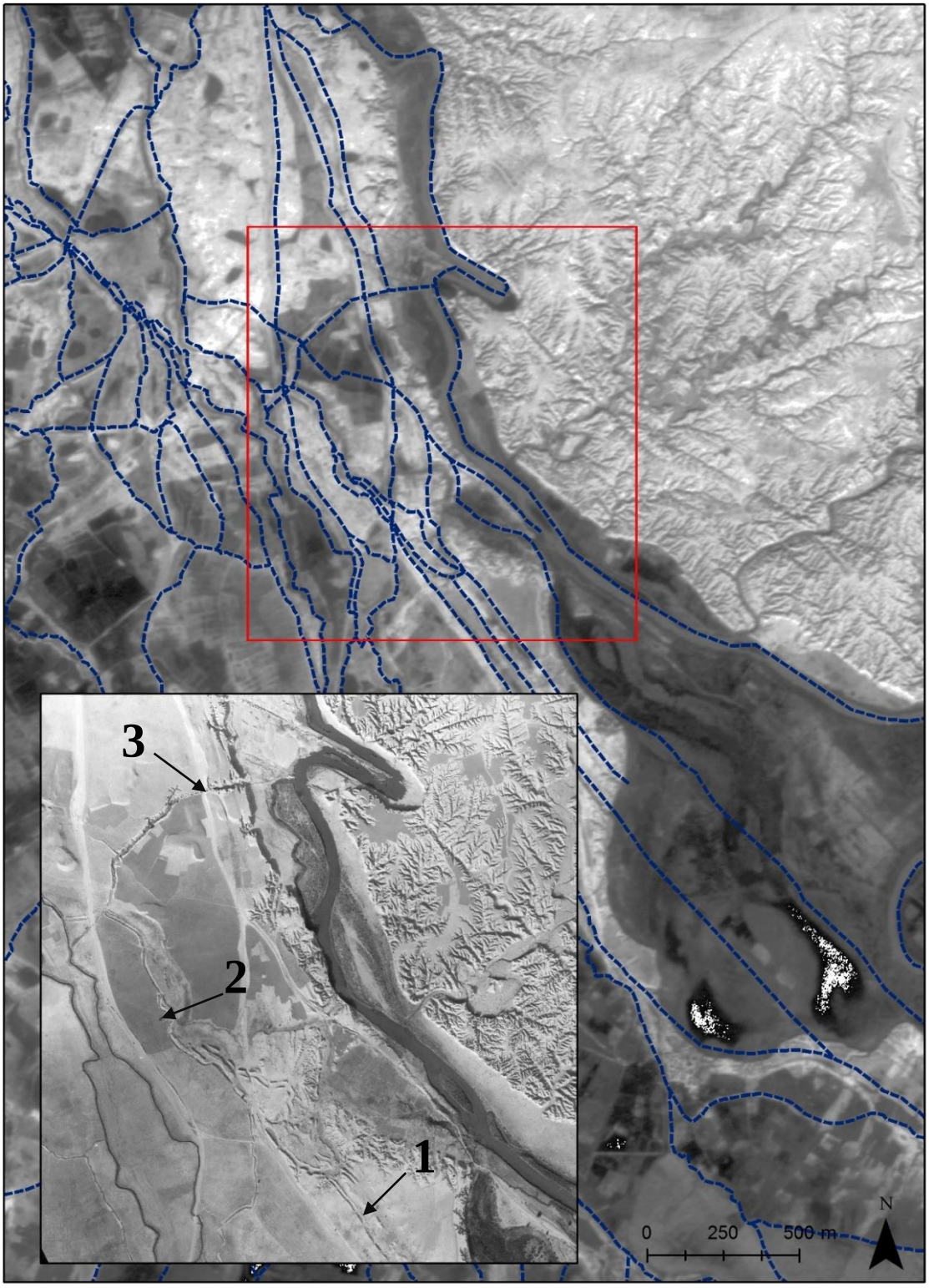


Figure 4.5 Fan-shaped canals southwest of Dastowa. Imagery aerial photos acquired in 1975. Close-up imagery, aerial photo acquired 1956.

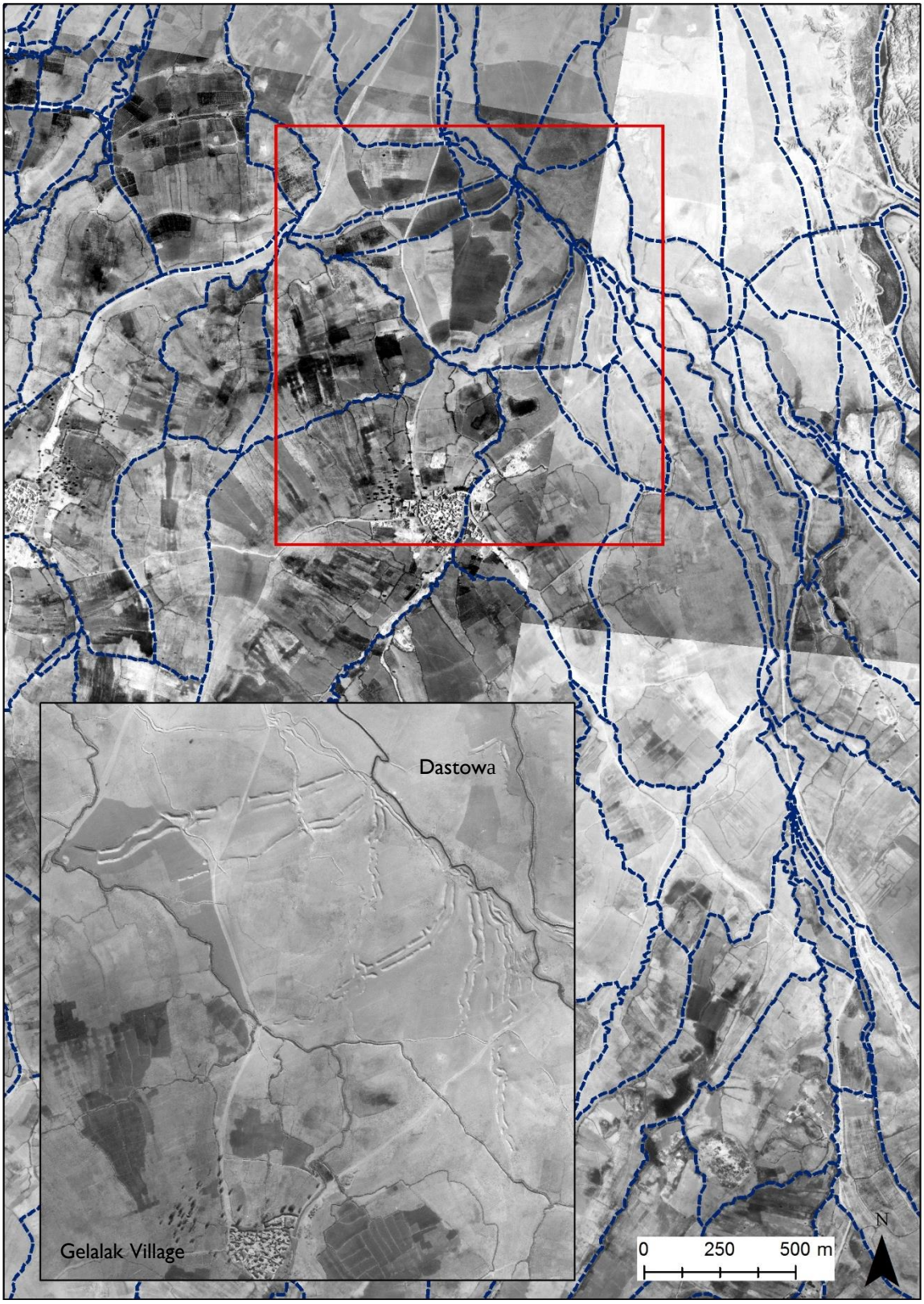


Figure 4.6 The only survived segment of the fan-shaped canals, surveyed in 2014.

Figure 4.7 Land-leveling has gradually destroyed the ancient irrigation system and is progressing toward the remaining segment, documented in 2014.

Figure 4.8 DEM created from land survey data underlain by SRTM DEM

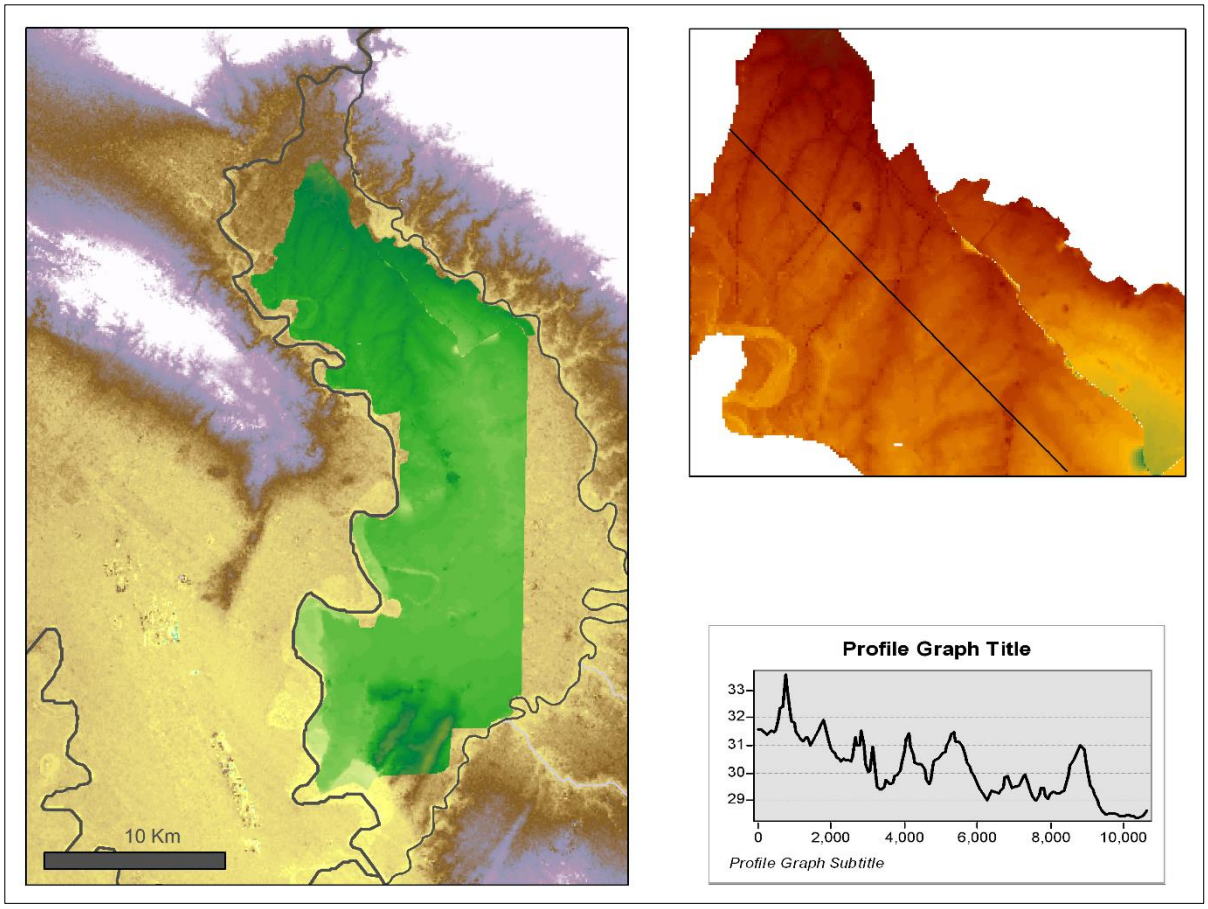


Figure 4.9 Historic DEM of Shushtar and its environs.

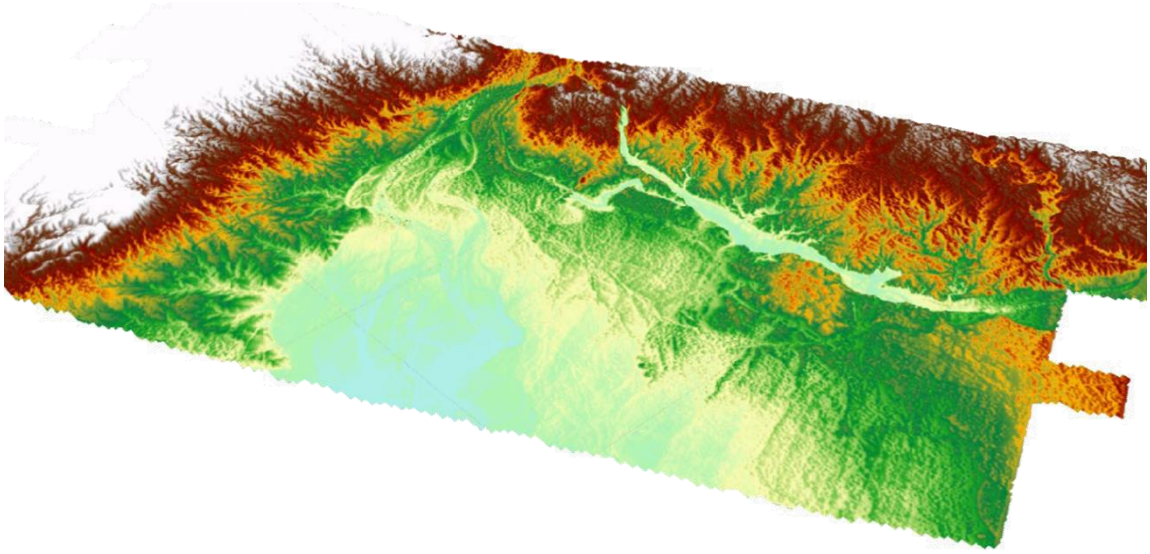


Figure 4.10 Overlay of land survey DEM on historic DEM demonstrates that the fan-shaped canals join the lower segments of the Dariun canal system which have remained in use until the present. The underlain historic DEM in the marked area is illustrated in Figure 11.

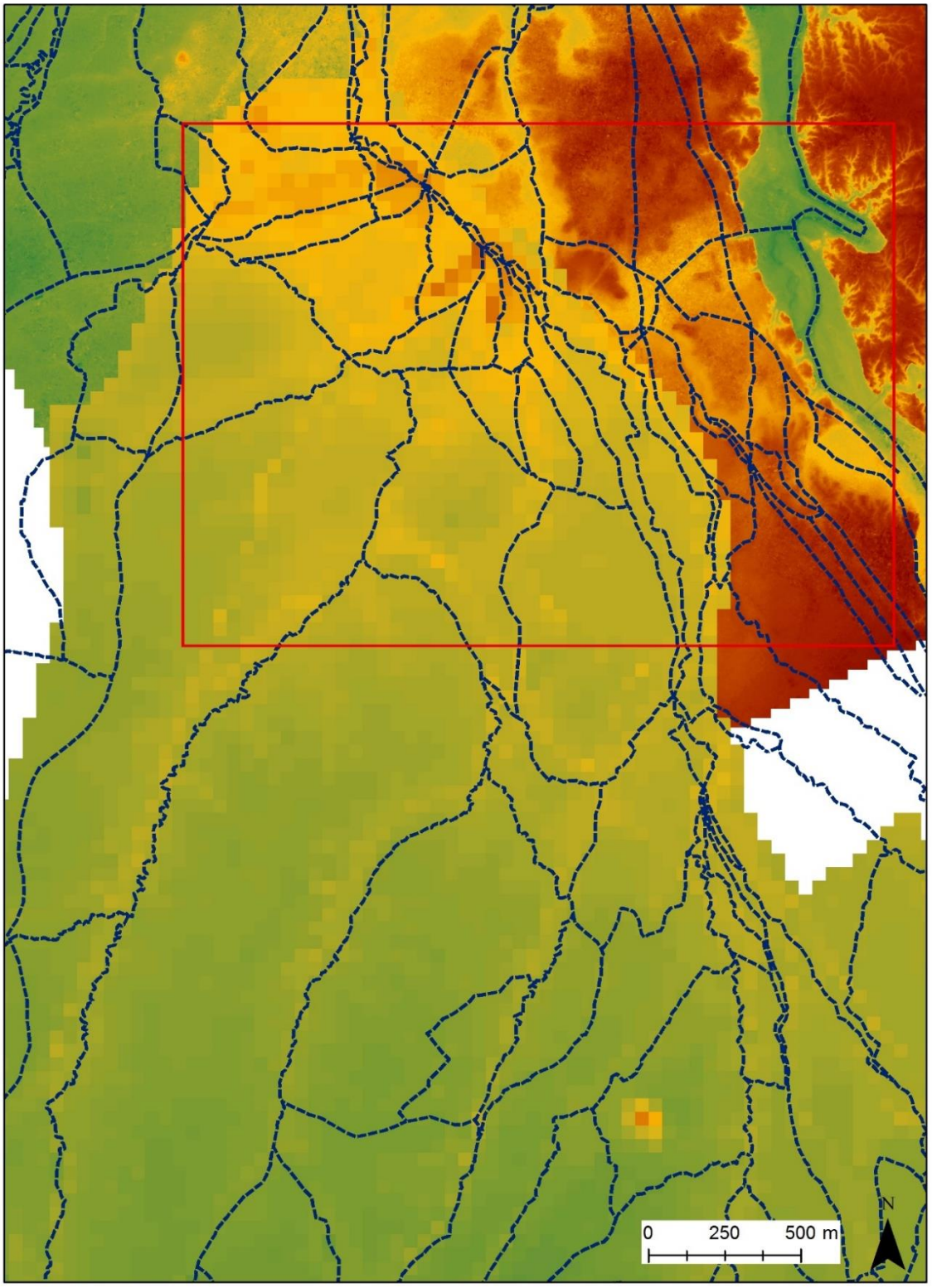


Figure 4.11 Historic terrain model southwest of Dastowa. The linear canals along Gargar (1) make a sinuous path in the direction of northeast and join the feeder of the fan-shaped system (2).

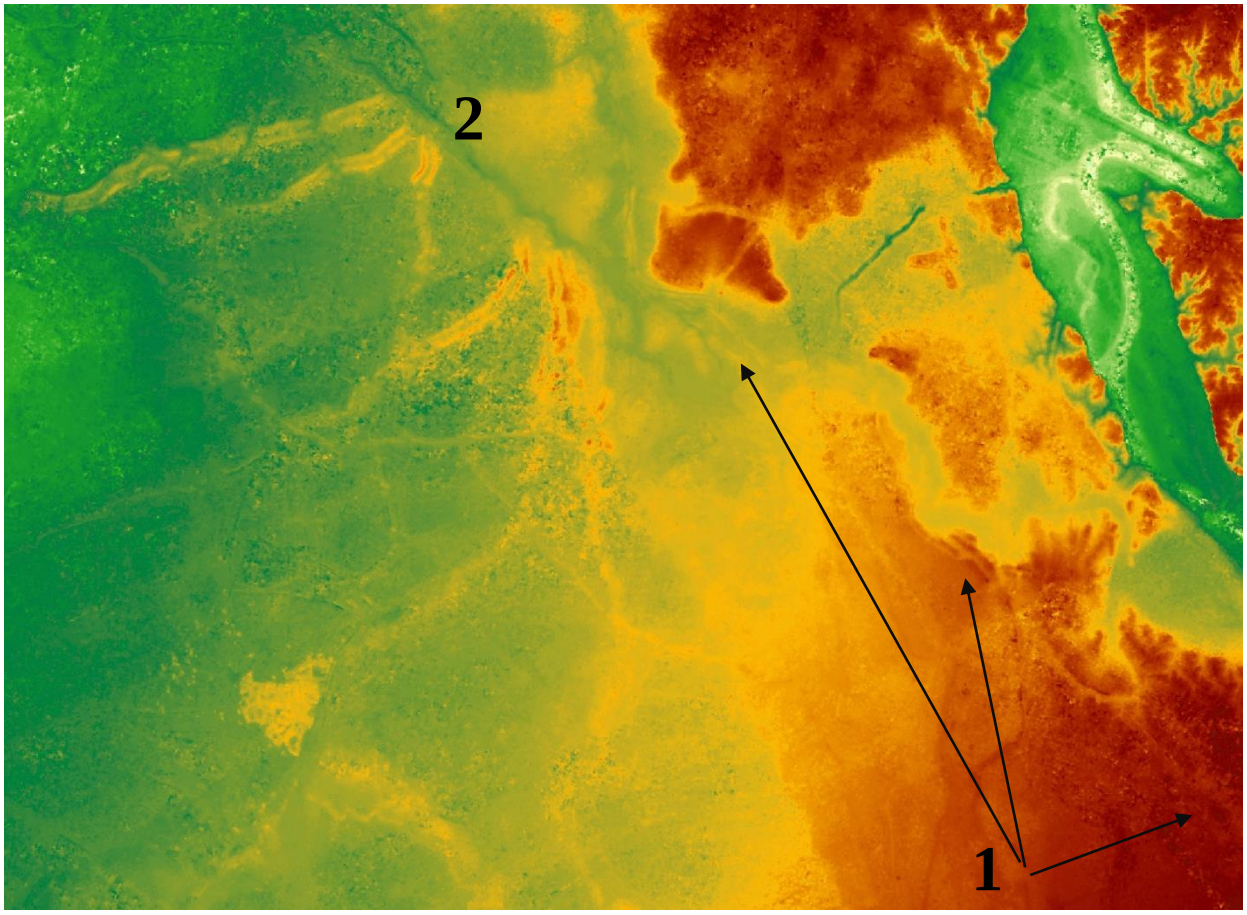


Figure 4.12 Main canals on the Miyānāb, which have been used for millennia, are visible on the SRTM DEM, in the central part of the plain, as well as on the site-canal map. Their configuration is, however, less clear at the source in the north where the concentration of large canals is high.

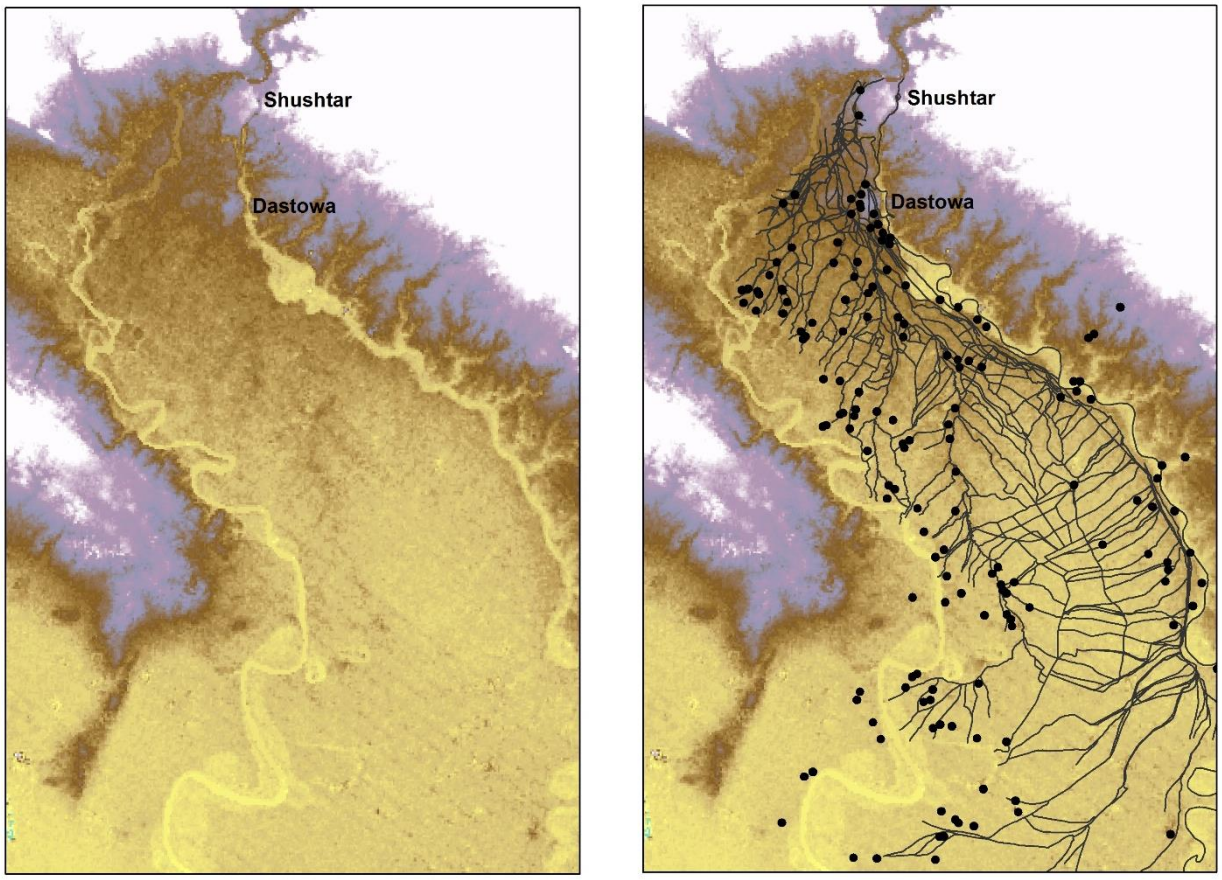


Figure 4.13 (a)-(c) Concentration of relict large canals north of the plain. d) Subterranean channels may have supplied mills downstream from the Mahibazan.

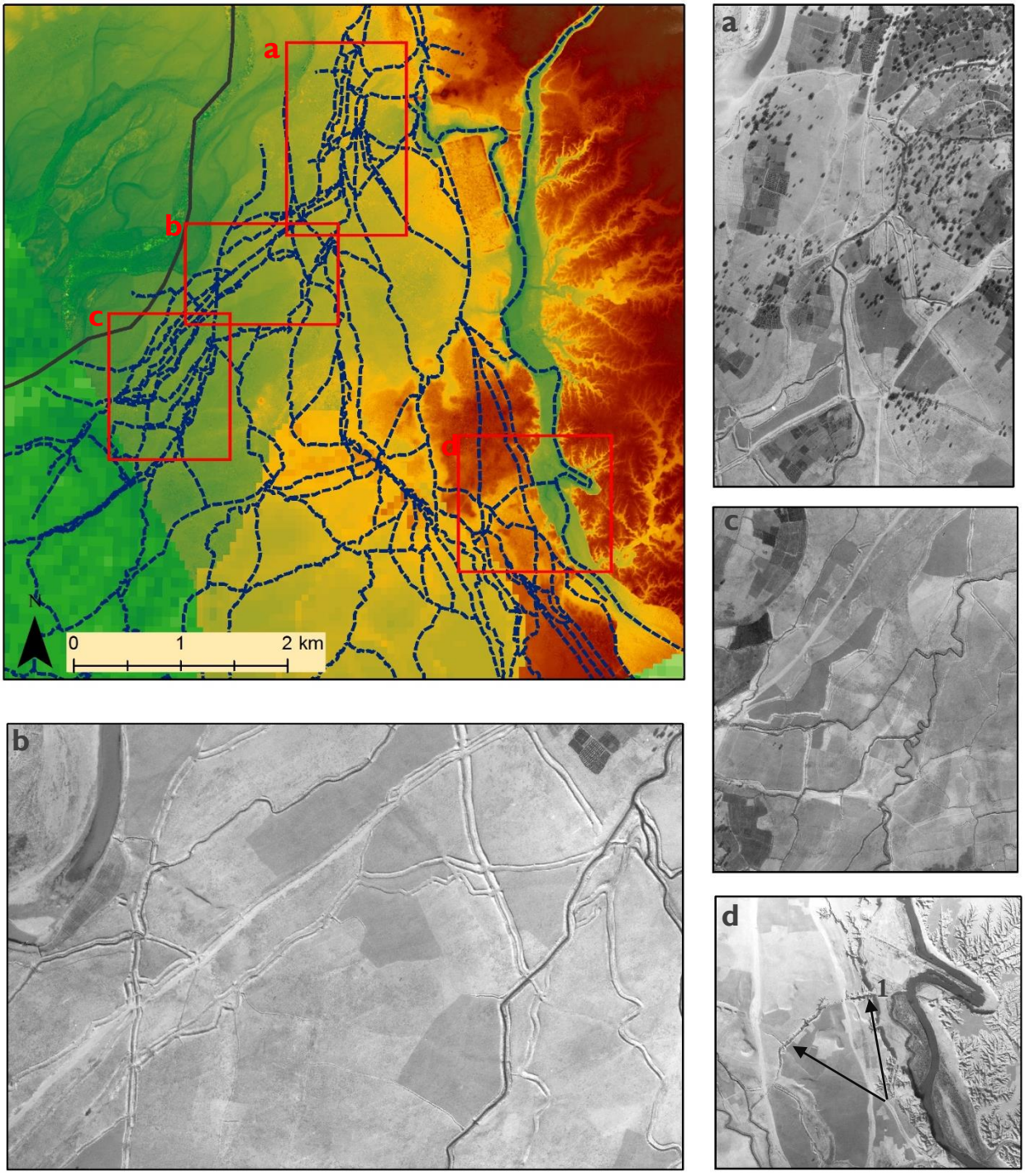


Figure 4.14 Evolution of canal systems on the Miyanab; first phase (top); second phase (bottom).

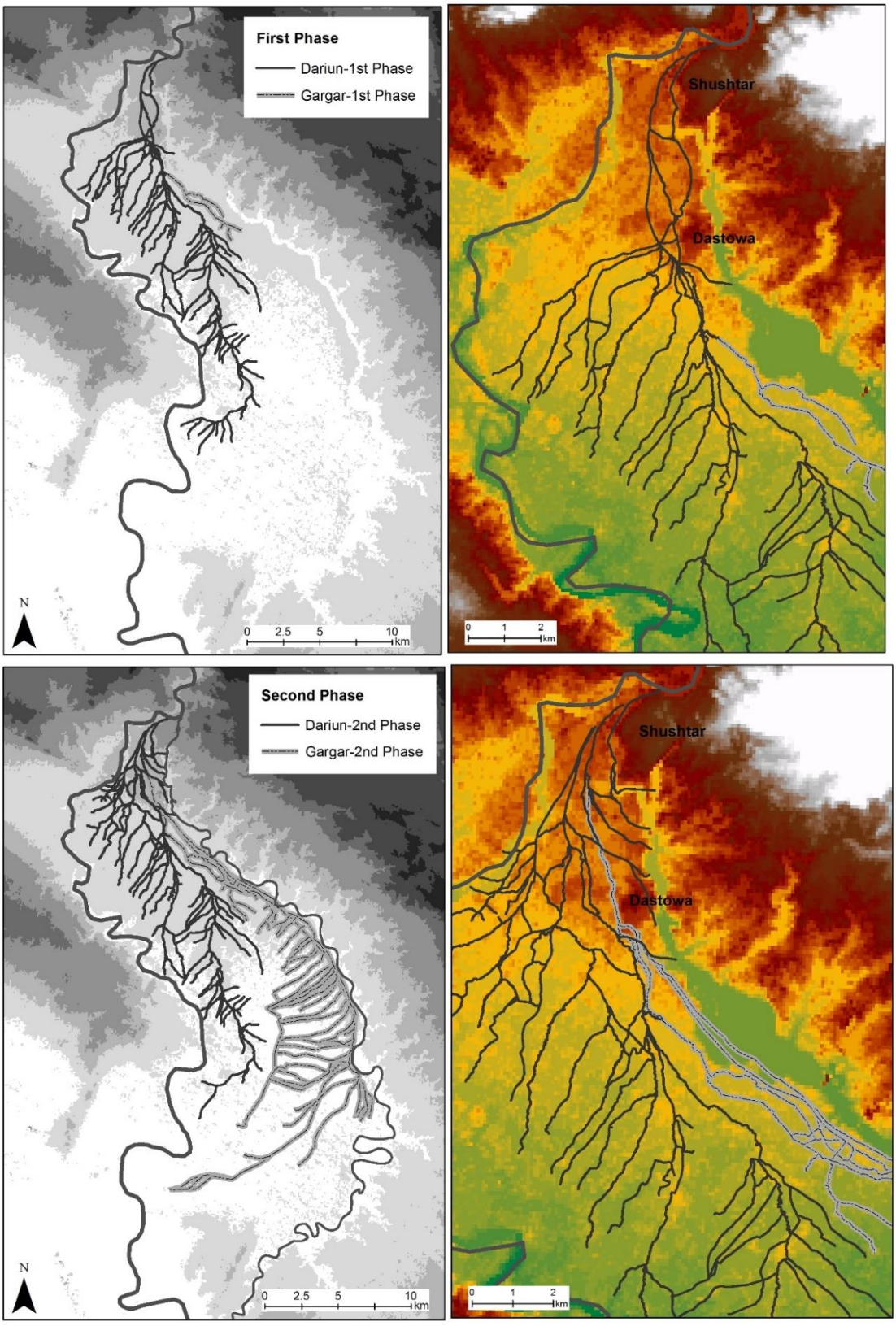


Figure 4.15 Evolution of canal systems on the Miyanab; third phase (top); fourth phase (bottom).

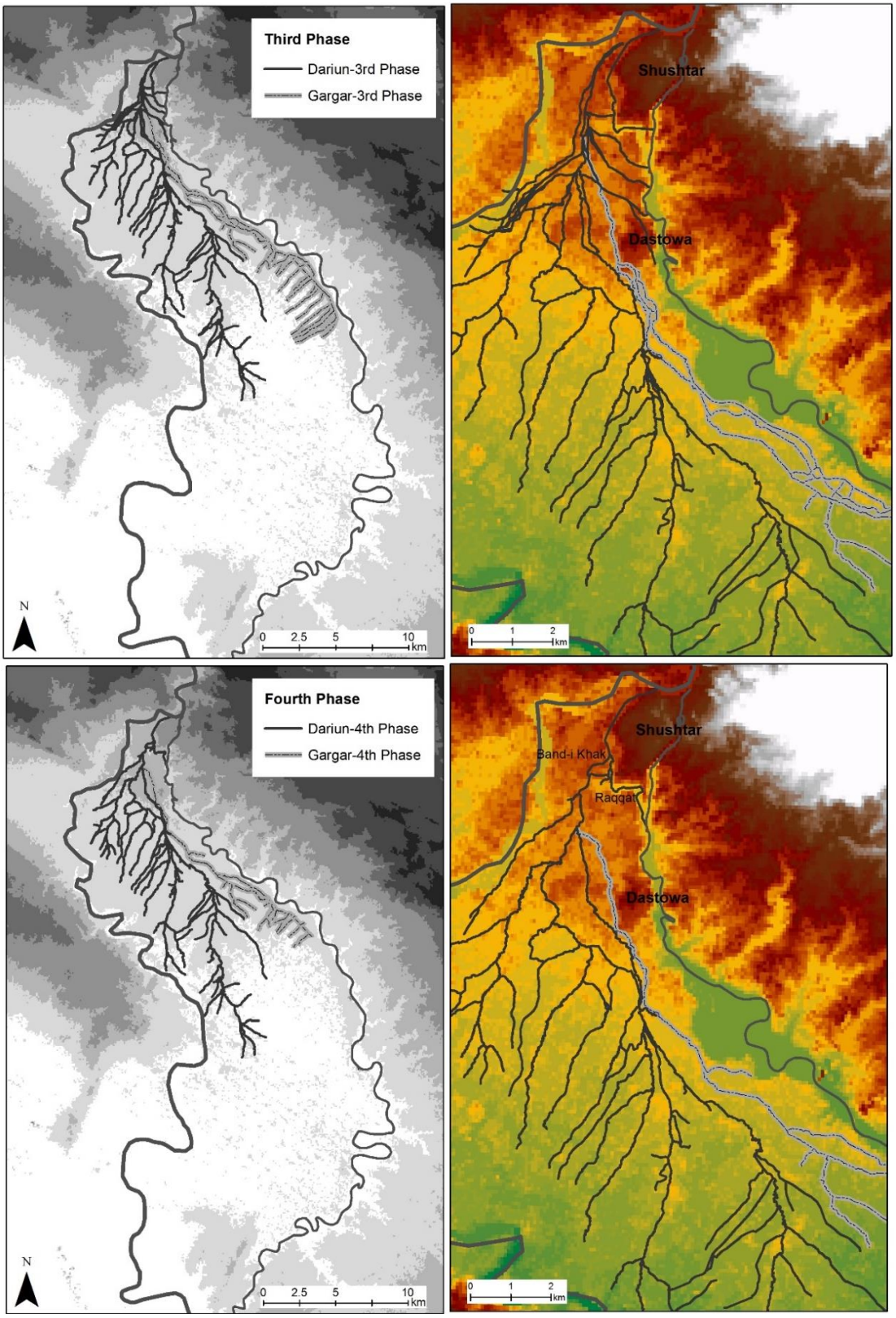
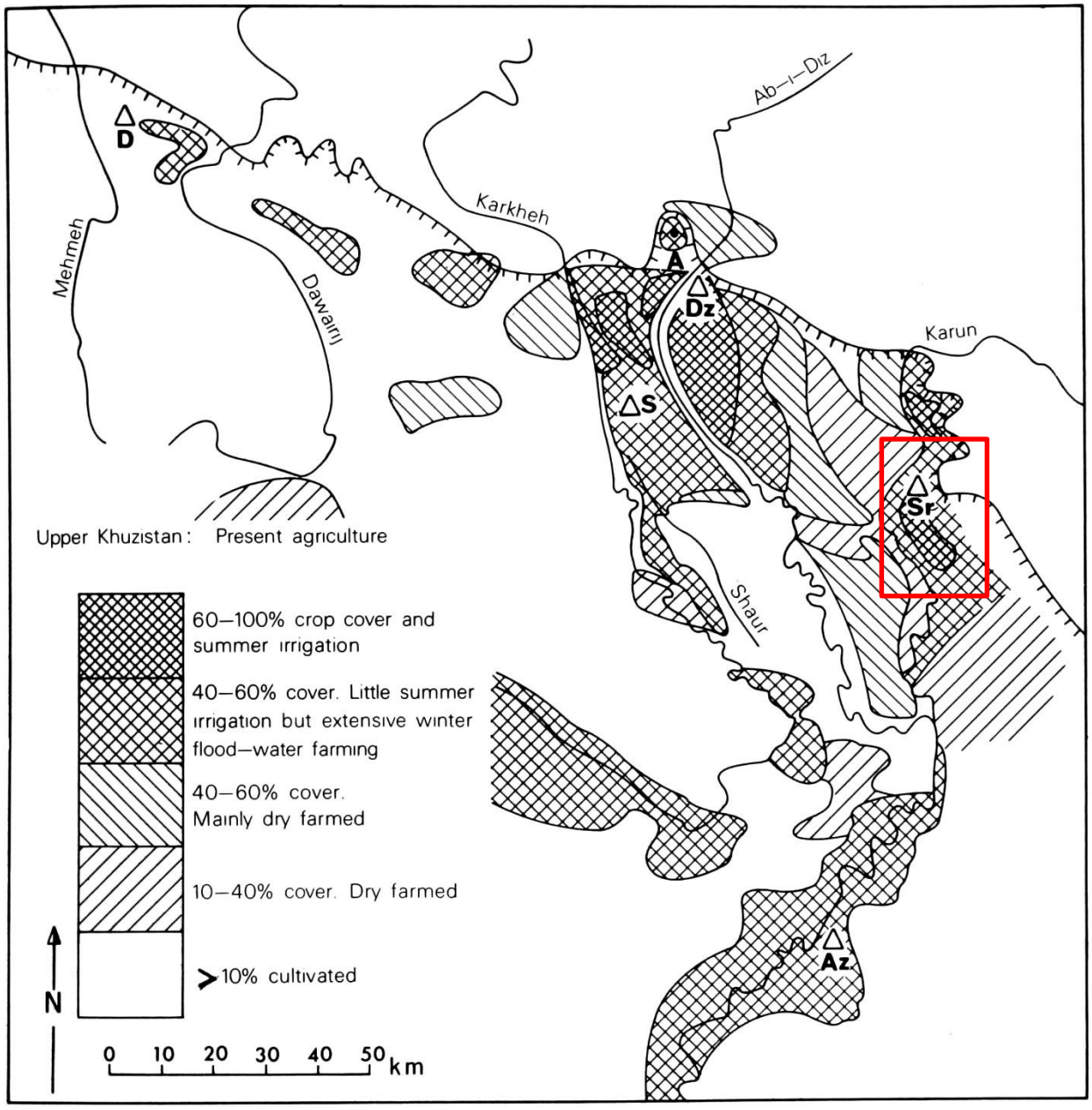


Figure 4.16 Modern agricultural land use and water supply in Khuzistan (After Kirkby 1977, Fig. 102). The map demonstrates that the north of the Miyanab is primarily marked as an area of average productivity and extensive winter floods.



Chapter 5
Results II: Miyanab Archaeological Projects (MAP), 2014

5.1. Survey Goals & Methodology

Before a thorough analysis of settlement and irrigation could be carried out on the Miyanab plain (Map 5.1), fieldwork was required to test the validity of the data that is being used for settlement pattern and canal study and to collect complementary data needed for analysis. I directed an archaeological survey in February and March 2014 on the Miyanab plain (MAP), which was funded by the Institute for the Study of the Ancient World of New York University. The general questions that this field season assessed are listed below:

1. The representativeness of settlement data previously collected on the plain.
2. The nature of land use on the plain, as mirrored in the typology, distribution and density of archaeological remains on the plain.
3. The validity of the remote-sensing reconstructions of ancient canal systems and the approximate hydraulic capacity of preserved canal segments
4. The relevance of low-cost remote-sensing for cultural resource management.

Depending on the nature of the task, two survey methodologies were chosen: Systematic purposive survey and intensive opportunistic survey. The first method is used primarily for site survey on the plain, where satellite and aerial imagery are used to identify potential unrecorded sites, as well as for survey of selected canal features. The second method is used along the edges of the Gargar River and large natural outcrops where remote-sensing data is of little or no use given the similarity of the signature of natural and anthropogenic soil heaps.

5.2. Survey Objectives & Findings

5.2.1. Study of settlements on the plain

The study of historic aerial and satellite imagery via remote sensing suggested that the density of archaeological sites in certain hydraulically and agriculturally advantageous locations might actually be higher than previously suggested (Map 5.1). To test this hypothesis, several of the densest concentrations of such potentially missing sites were ground-truthed by visiting the locations identified through the imagery. . The goal was not a full coverage survey in order to map all potentially missing sites; rather, the survey aimed to test the representativeness of existing settlement data, particularly in the locations which were unusually low-density despite the advantage of good soil and sufficient irrigation water. A major challenge for the survey was that these agriculturally advantageous areas were among the first on the plain to be entirely levelled and reorganized for agricultural activity, often at an industrial scale (Maps 5.9-5.19).

For this task, our systematic targeted survey method involved importing GIS coordinates of potential sites identified from the imagery into a handheld Garmin 62S, driving to the desired location and, if possible, [309] walking between several nearby test spots. In this way, time efficiency was combined with a good degree of certainty that ceramics found in a location recorded as a new site were not part of a larger field scatter and were more or less confined within that boundaries that correspond to the imagery-based mapped feature. Sites KS1802-KS1824, KS1836-KS1843 (see the site catalog) were recorded in this way. Majority of confirmed sites are small habitations,

[309] Large cement canals that have crisscrossed the landscape and are often full of water dramatically hinder and slow-down vehicle and pedestrian movements across the survey area. Driving distance, that involves long detours to the local canal crossings, has been a major criteria in deciding on visiting or dismissing locations identified from the imagery.

approximately one hectare or less. Unfortunately, landscape destruction has been so severe that the only indication of the presence of these sites was pottery sherds and the occasional attestation of local farmers about one or several small, levelled mounds (Fig 5.7-5.10, 5.17-5.18). Satellite imagery and the extent of the remaining field scatters were used together to estimate the boundary and area of the sites. The height frequently could not be determined. Sites KS1802-KS1824, KS1836-KS1843 were recorded with this method (Maps 5.7, 5.9-5.10, 5.14-5.18, 5.20). The results of this investigation supported the hypothesis that the apparently "empty" areas of the upper Miyanab plain could have been intensively exploited. However, these small habitations, which are likely to represent farms and agricultural activities cannot be easily captured in a tell-based and non-imagery assisted archeological survey.

5.2.2. Study of the ceramic distribution and periodization across the site of Dastowa

Analysis of the satellite imagery along with the archaeological data collected by 'Abbas Moghaddam and Mehdi Rahbar suggested that the area identified as Dastowa may need to be expanded to the entire large outcrop located to the west of the Band-i Mahibazan (Map 5.7).[310] In such case, several individual sites that have been recorded on this outcrop, KS1503-KS1510, KS1518-KS1520, might need to be incorporated as areas of a single mega-site in order to better understand the nature of human occupation and settlement distribution at this geographically and hydraulically strategic location. Sites recorded by Moghaddam in this area were often identified as multi-period, datable to the Parthian, Sasanian, and Islamic periods. Given the hydraulic

[310] Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*; Rahbar, "Kāwuš-I Bāstānšināsī Dar Gilālak-I Šūštar."

significance of this location, it was necessary to obtain information about the extent of the occupation of the site for each of these periods.

To address these issues, twelve test areas on and adjacent to the Dastowa outcrop were selected for pedestrian survey. The majority of the test areas were selected opportunistically so at least one sample area was collected between each of the previously recorded sites. Some areas adjacent to the outcrop that suggested anthropogenic features were also tested. The results confirmed the assumption that the Dastowa outcrop represents a spatially continuous record of human activity and occupation. Thus, a new site number, KS1801 was given to the larger site of Dastowa. Formerly recorded sites within this area, and newly collected areas were defined as collection sub-areas of KS1801. Refer to the site catalog for KS1801 and KS1520.

Another finding of the survey was that by Seleuco-Parthian period, most areas on the Dastowa outcrop, specifically the highest grounds to the north, seems to have been inhabited (Map 5.8). Occupation seems to have continued into the Sasanian and Early Islamic period, as known from historical sources. As such, the significance of Dastowa as a major Parthian site (more than 100 ha) seems to have been until now underrepresented. It is not unlikely that Dastowa represents a case similar to Susa where Parthian period cemeteries, namely Gelalak, located on the eastern side of the Dastowa outcrop, were situated on the fringe of important Parthian settlements.

5.2.3. Study of the settlements along the Gargar

The study of settlement patterns in relation to ancient canal systems raised the question as to why no sites have been recorded along much of the upstream of the Gargar, below the site of Dastowa. The survey aimed to test whether the lack of archaeological sites along this segment of the river is real or an outcome of destruction caused by rapid development and natural processes.

Remotely-sensed data was unable to provide an adequate answer to this question; given that the signature of canal soil heaps is almost identical to anthropogenic soil, study of imagery by itself cannot be reliably used to identify sites along river banks. Therefore, intensive opportunistic survey was carried out along the western edge of the Gargar, wherever foot or car access was possible within the time constraints. Satellite imagery was used for identification of sites that were located in this zone, near the river in but not at its bank. Along the banKSof the Gargar, natural and human factors, primarily surface water erosion and construction of villages and numerous fish farms, have largely obliterated the archaeological landscape (Fig. 5.5-5.6, 5.20, 5.22-5.25). Nevertheless, the survey recorded several new archaeological sites; see the site catalogue for reference to KS1825-KS1835 (Map 5.12-5.14). In light of the extent of site destruction in this area, satellite imagery along with the surviving field scatters have been used to estimate the boundary of the remaining area of these sites. It is not unlikely that these sites were originally much larger than what was left for us to record.

5.2.4. Landscape study of the site of ‘Askar Mukram

One of the goals of 2014 survey was to achieve a more comprehensive understanding of the largest archaeological site on the plain, ‘Askar Mukram (Map 5.1, 5.21), and its landscape. Despite textual resources and archaeological evidence demonstrating that the town expanded on both sides of the river Gargar, only the remains on the western bank have been systematically surveyed. Furthermore, it was reported that pottery scatters had been observed north of the area of ‘Askar Mukram[311]. The area is characterized by a topography that consists of natural mounds,

[311] I am grateful to Mr. Loghman Ahmadzadeh who shared with me the above observation.

meaning historic imagery was less useful for identifying anthropogenic remains in this zone. Therefore, the identification of a potential site, which may also be related to ‘Askar Mukram, could only be tested on the ground. Furthermore, certain prominent relict landscape features, including a monumental canal segment as well as several hollow ways were mapped during remote sensing study, which had to be examined in the field. Finally, the survey aimed at investigating whether several small Islamic sites that were recorded in close proximity to each other and to ‘Askar Mukram might in fact have been part of the urban landscape of the town (Map 5.23).

Given the huge size of the site and time constraints on fieldwork, possible preserved landscape features and potential boundaries of archaeological remains were mapped and visited during a vehicle survey. Walking survey was carried out only within areas where archaeological remains were attested.

In general, it was confirmed that the area of ‘Askar Mukram and associated urban and industrial activities extends beyond the main area on the western bank of the Gargar, which has been previously surveyed.[312] The survey results suggest that ‘Askar Mukram was built on both sides of the Gargar (Fig. 5.41-5.44). The remains of at least one bridge connecting the two parts of the settlement are preserved (Fig. 5.45-5.46). It seems that two industrial zones were built to the north and west of the town, with the former specializing in metal production and the latter dedicated to the production of construction materials (Fig. 5.39-5.40, 5.55-5.60). In order to be consistent with the numbering system used by Moghaddam for ‘Askar Mukram, KS1622, the surveyed area was designated as KS1622A. The newly defined or redefined areas were registered

[312] In addition to information recorded by Moghaddam in his 2001 survey, an archaeological mission was carried out in 2011, directed by Mr. Mir-Eskandari, in order to delineate the boundaries of the site of Askar Mukram, still only on the western bank of the Gargar.

as KS1622B-D. Detailed description of survey methodology and results in each of these areas is provided in the site catalog under KS1622 (Map 5.22-5.24).

5.2.5. Study of the settlements outside Miyanab, southwestern of the plain

Several features with the signature of archaeological sites appear to exist in close proximity to the Karun and to be threatened by a new wave of development. This drove the survey to expand beyond the boundaries of the Miyanab plain. Like several nearby sites on the eastern bank of the river, these potential sites were located within the flood zone; thus, it was important to visit these locations and understand the date of the sites if they proved to be archaeological. Although site destruction was less severe than it was on the Miyanab, satellite imagery was critical for defining site boundaries. See site catalog for KS1844-KS1851 (Map 5.16, 5.18-5.19).[313]

5.2.6. Revisiting the site of Negini, its boundary and date

Moghaddam suggests that the mound clusters of the extensive site of Negini (Map 5.1, 5.21) were occupied primarily in the Parthian and particularly Sasanian period. Given that the figures presenting the areas of the site and the extent of occupation in different periods in the 2005 report were problematic, that this location was not easily irrigable, and that the site is very close to the concentration of Islamic sites to the south of the plain, I decided to revisit the site, in order to define its boundaries more precisely and test the proposed dating. The results suggested that the main period of occupation of the Negini area was later than suggested, falling in the Late Sasanian,

[313] After the survey, I was provided with the most recent site register which included some of the sites I had mapped. The information about these sites, however, is provided because they have not been mapped and because no record of their ceramic assemblage has been published.

Early Islamic and early Middle Islamic periods.[314] This conclusion seems to better fit the bigger regional picture, namely, the expansion of Islamic sites in the lower part of the plain, which was not easily irrigable. The 2014 survey suggests a smaller site, ca. 145 ha instead of ca. 400 ha. [315]

5.2.7. Study of Relict Canals and Water Use on the plain

One of the objectives of the 2014 survey was to test the accuracy of the canal system mapped through satellite imagery, in particular for the features that were grouped as uncertain. In addition, the estimated capacity of the mapped canal systems needed to be checked on the ground. From the very large dataset of mapped relict canal segments, a sample of canals of varying dimensions, functions, and antiquity was surveyed and measured. Monumental canals were intentionally visited (Map 4.3, Fig. 5.11-5.12, 5.14, 5.19-5.21).

For this purpose, the shapefile of mapped canals was uploaded on the handheld GPS device. The features were checked as they intersected survey routes. This study was very informative in understanding and documenting transformations of old canals in the modern landscape. In addition to the study of old canals, modern water sources and modes of water extraction were observed during the survey. Local farmers were occasionally interviewed, in order to collect information on the state of agriculture and irrigation on various parts of the modern landscape as well as the significance of various water resources in each area.

The data collected from the irrigation system is incorporated in the hydraulic analysis in chapter 4. Nonetheless, some general observations made during this survey are outlined here.

[314] Same observation, though less formally, was made about another large site, Herad, similarly located in a cluster mound topography. Herad is about 1 km NW of Negini (See Map 5.20).
[315] Originally recorded by Moghaddam as 1567E&1567 W. Area not provided in English publication (2003), total area provided in 2005 Persian report (397 ha).

During the 2014 survey, information was collected about the modes of preservation, destruction, and transformation of ancient canals in the modern landscape. Obviously, it was impossible to test all 2300 mapped canal segments. This sample did, however, provided a better understanding of the signature of different features that were observed during mapping, as well as information regarding the accuracy of reconstructions that were made in different geographical locations. For example, it was observed that when canals are completely abandoned, they are often very well preserved. Sometimes, they have been integrated into the modern landscape; in such cases, their antiquity and original morphology and dimensions become very difficult to estimate. For example, they may be deepened and transformed into drainage canals as part of a modern irrigation system, or they might be levelled to be used as local access roads.

Furthermore, survey observation and interviews with local farmers provided an understanding of the significance of various water sources on different parts of the plain. The water that runs in the old and reconstructed parts of the Dariun canal system is in fact the primary source of irrigated water for the upper parts of the plain, which are also most productive agriculturally. In the middle regions of the plain, deep wells and water pumped from the river is a main source of irrigation water, while in the south, dry-farming is dominant, even though the yields are insignificant and unreliable. As the MIDP increasingly proceeds to the areas farther south, the variation between different locations becomes less marked. However, some areas are too peripheral to be covered by the new canals, and some areas have remained outside of the network as a result of design errors in the modern system. In these localities, people still rely on pumping water from the river or wells, especially if they are far from either the Karun or the Gargar.

5.3. Settlement Data

In this section, all the sites that were visited, sampled, and dated in the 2014 field season will be presented (Map 5.4-5.6). The general site catalogue will be followed by a brief account of the survey of 'Askar Mukram and its landscape, as well as the results of the sampling survey of the site of Negini. The traditional numbering method for the sites surveyed in Khuzistan has been used, starting with KS, followed by a four-digit number.[316] Moghaddam KS1500-1700 in his surveys of the Miyanab and the plains east of the Gargar River. In this Survey, KS1800-KS1851 were assigned to the newly recorded sites.

A catalogue of ceramic wares and types was created as a guide for dating survey types, which is presented in the Appendix A. Similar to the Miyanab 2005 catalogue, individual assemblages have not been published for every site. Since the former catalogue does not provide an overview of the assemblages, reassessment of dating of the sites based on revision of the ceramic catalog is not possible. To avoid this problem, this site catalog provides an account of ware/types recorded in each assemblage.

Summary of Results:

Total number of sites recorded: 51
Sites with Late Susiana material: 4
Sites with Old Elamite material: 3
Sites with Middle Elamite material: 5
Sites with Neo Elamite material: 8
Sites with Achaemenid material: 16
Sites with Seleuco-Parthian material: 13
Sites with Sasanian material: 19
Sites with Early Islamic material: 48

[316] Initiated by Henry Wright

Sites with Middle Islamic material: 13
Sites with Late Islamic material: 3

5.4. General Site catalog

5.4.1. KS1801

KS1801 (39R 296279 m E 3542981 m N; 47 m asl; surveyed Feb 5, 8, 9) has been identified as the extensive and complex site of Dastowa (Fig. 5.1-5.4). Total area ca. 130 ha. It includes several sites recorded in the 2001 survey (KS1503-KS1510) as well as areas collected in the 2014 survey. Most of the newly collected areas on the Dastowa outcrop were selected opportunistically, but CORONA imagery was used for selection and recording of the areas on the western edge of the site. The fact that human habitation across this area is continuous is indirectly recognized in the 2001 survey report by the fact that sites located on this outcrop are all called Dastowa, and some of them have been given Dastowa numbers (1504, 1506-10 as Dastowa 1-5 respectively). Nonetheless, for the purpose of understanding land use and concentration of human habitation and activity across the Miyanab plain, it was deemed necessary to systematically check the continuity of occupation and if demonstrated, register all collections under one site number. Occupation of the mound started in the Achaemenid period, at the latest. Parthian (or Seleuco-Parthian) pottery was retrieved from most subareas of the site. Occupation seems to have not been interrupted during the Sasanian and Middle Islamic periods (Map 5.8, 5.9).

Date: Achaemenid, Seleuco-Parthian, Sasanian, Early Islamic, Middle Islamic, Late Islamic

- KS1801-01

Ca. 0.5 ha. Selected based on the imagery. Aerial and satellite imagery suggest a building with a central courtyard, similar to that of a Khan. No architectural remains were found on the

surface. Area entirely levelled for agriculture, half plowed, half planted (wheat and vegetables). Moderate visibility.

Date: Parthian, Early and Middle Islamic.

Parthian: PCW.T2(2) ; PCW.T13(1); PBW.T1(1)
Parthian-Sasanian: PCW.T3(1)
Early Islamic: DBG(1)
Middle Islamic: ICW.T6(1); UGP(1)
UI (2)

- KS1801-02

Ca. 0.4 ha. Selected based on imagery, located between the Gelalak burials and the irrigation canal, which passes through KS1801. In the northeastern part of the area a brick kiln was found. BricKSdimensions: 31x31x7 cm. Under wheat cultivation. Moderate to poor visibility (Fig 5.1).

Date: Achaemenid, Sasanian-Early Islamic.

Achaemenid: ACW.T1(1)
Sasanian-Early Islamic: CGW.T1(2); GCW.T2(1)

- KS1801-03

Ca. 5 ha. Selected based on imagery, west of the Gelalak burials. Dense cultivation of wheat and vegetables. Poor visibility.

Date: Early and (early) Middle Islamic. (Sasanian not unlikely)

Sasanian?: MYG.T1(1)
Early Islamic: ICW.T2(1); GCW.T2(1)
Early and Middle Islamic: ICW.T3(1)
Middle Islamic: MGG2.YU(1)

- KS1801-04

Ca. 1.8 ha. Identified and collected in the field, while surveying between areas 3 and 5. It is possible to match this area with an anthropogenic-looking feature on the imagery, which was

left unnoticed in the remote sensing study. The area is entirely levelled, plowed and cultivated. Moderate visibility (Fig. 5.1).

Date: Parthian, Late Sasanian-Early Islamic, Middle Islamic (Achaemenid not unlikely)

Achaemenid: BGW.T2(1)?
Parthian: BGW.T1(1)
Sasanian-Early Islamic: GCW.T1(2); GCW.T3(1)
Early Islamic:GCW.T2(1)
Middle Islamic: MGG1(1)
Islamic:ICW.T4(1)

- KS1801-05

Ca. 7 ha. Identified in the field. Following the survey of area 1, it was discerned that the pottery scatter continues to the west of the canal that defines the western boundary of the area (Fig. 5.1). A new collection area was thus defined with the aid of imagery. Some parts of the area were impossible to investigate due to dense cultivation. Poor visibility.

Date: Parthian, Sasanian, (mainly) Early Islamic and Middle Islamic

Parthian: PCW.T15(1)
Parthian-Sasanian: PCW.T13(2)
Sasanian: MGG.T1(1)
Early Islamic: MGB.T1(1)
Middle Islamic: IRW.T2(1)
Islamic: ICW.T5(1); IRW.T1(1); MGB.UI(1)

- KS1801-06

Collection area ca. 4.6 ha. Based on imagery, two neighboring mounded areas, approximately 1 and 2 ha, were selected for field visits. The area was heavily disturbed; therefore, a smaller collection area was defined based on the modern field boundaries and topography. Sherd density was high on the surface, and in the sections created by human activity and running surface water. Moderate visibility.

Date: (Primarily) Parthian, Sasanian, and Early Islamic

Achaemenid: AFW.T1(1)
Seleucid: ASW.T11(1)
Parthian: PCW.UI(1); BGW.T1(1); PCW.T10 (1) PCW.T11; PCW.T15a (1); MBG1.T6
Parthian-Early Sasanian: PCW. T1 (1); PCW.T15(4); PCW.T13(2); PCW.T11(1); PCW.T10(1); MBG1(3); BGW.T1(1).
Sasanian-Early Islamic: DBG(2); ICW.T5(1)

- KS1801-07

Collection area ca. 2 ha. Based on imagery, a mounded area of ca. 2 ha was selected for field visit. The area was heavily disturbed; therefore, a smaller collection area was defined based on the modern field boundaries and topography. Sherd density was high on the surface, and in the sections created by human activity and running surface water. A large, deep pit flanKSthe western edge of the selected areas where a good section of the mound becomes visible (Fig. 5.2). From visual investigation, up to 2 m below the surface of the mound, evidence of human occupation, including brick walls, soil and floor layers, and pits are visible in the stratigraphy. Moderate visibility.

Date: (Primarily) Early Islamic, Late Islamic, (Middle Islamic not unlikely)

Early Islamic: MGB.T4(2); SPW(3); MBG.TU(3); DBG(2)
Early or Middle Islamic: MGG.T1(2)
Late Islamic: LIG.T1(2)
Islamic: ICW.T4(1); ICW.TU(2); VMG.T2(1)

- KS1801-08

Collection area ca. 4 ha. Based on imagery, a mounded area to the east of the Shushtar-Ahwaz road was selected in order to check if the surface scatter that defines the site of Dastowa continues on both sides of the road. The area was levelled and under wheat cultivation. But, a few diagnostics were collected. Poor visibility.

Date: Parthian, Early Islamic

Parthian: PCW.TU(1); PCW.T2(1); BGW.T1(1)

(Early?) Islamic: GCW.T2(1)

- KS1801-09

Collection area ca. 7.4 ha. Based on the imagery, two small mounded areas of about 1 ha each were selected, in order to test the western extent of the Dastowa mound complex. The surface was invisible given the dense cultivation. The clear mounded topography and surface pottery on the edges of the mounds suggested that the area is part of KS1801 (Fig. 5.3).

Date: Parthian, Early Islamic

Parthian: PCW.T2(1); MYG1.T8(1)
Early Islamic: MBG2.T2(1)
Early or Middle Islamic: GCW2(3); MBG2.TU(1)

- KS1801-10

A large mounded area of ca. 7 ha was selected for investigation, based on imagery and field investigation in adjacent areas. Google Earth imagery shows that a gas station has been built on top of the mound. Upon field visit it was discerned that the whole area had been bulldozed and levelled for various new constructions; hence, collection was impossible. Nevertheless, a considerable amount of pottery was visible on the edges of the mound, however, mixed with construction waste, where a complete cup, datable to the Parthian period, was found (Fig. 5.4).[317]

Date: (possibly) Sasanian, (primarily) Early Islamic

Sasanian-Early Islamic: GCW1.T2(1); MBG2.T7(1); MBG1.TU(1)
Early Islamic: GCW1.T1(1); GCW2.T1(1); GCW1.T5(1); MBG2.TU(1)

[317] See Appendix A, sherd photos, PCW.T1, sherd number 1801-18-1.

• KS1801-11

A large mounded area of ca. 5.3 ha was selected for investigation, based on the imagery and field investigations of the adjacent areas. A large ancient canal separates this area from area 10. The area is plowed and cultivated. Low density pottery scatter. Poor visibility

Date: Sasanian-Early Islamic

Sasanian-Early Islamic: GCW1.T1(3); GCW1.T2(2); MBG.TU(1)
Early Islamic: ICW.T5(1); ICW.T9(1)

• KS1801-12 (Moghaddam 2005: KS1503)

For the purpose of investigating the extent of occupation of the site complex of Dastowa in various periods, sample assemblages were collected from two of the sites recorded by Moghaddam, which are now included as areas of the site KS1801. Area ca. 2.4 ha.

Date: Seleucid, Parthian

Achaemenid or Seleucid or Parthian: ASW.T2(1)
Seleucid: ASW.T1(1)
Seleucid-Parthian: SPE.T1(1); PCW.T8(1); PCW.T14(1)
Parthian: BGW.T1(1); PCW.T13(1)

• KS1801-13 (Moghaddam 2005: KS1510)

Description same as KS1801-12. Area ca. 4.9 ha.

Date: (Primarily) Achaemenid and Seleucid, (possibly) Parthian

Achaemenid: ASW1.T11; ASW1.T16(1); ASW1.UI (1)
Achaemenid or Seleucid: ASW.T11(1)
Seleucid: ASC.T3(1); ASW2.T6(1); ASW2.T3(1)
Parthian: PCW.T10(1); BGW.T2? (1)

5.4.2. KS1520

As explained above, KS1520 (39 R 297510.5 m E 3541312.9 m N; 33 m asl; surveyed 2001), recorded by Moghaddam, was revisited to check if this site too could be considered part of

the mound complex of Dastowa (Map 5.5). Unfortunately, large-scale levelling of land for agricultural production combined with destruction caused by running surface water, have totally obliterated the topography of the site. Given the extent of site destruction and disturbance, it was impossible to define the original boundary of the site, as recorded by Moghaddam, or to check its relationship to KS1801. Because the site was completely destroyed and the sherd density was very high, surface ceramics were collected. The southern and eastern part of the site that were still preserved were separately collected as Areas 2 and 3. Area 1 (not described here) stands for Moghaddam's collected assemblage. The long occupation history of the site was visible by judging the depth of stratigraphy on the inaccessible edges of the Gargar valley. Moghaddam's recorded area is approximately 2 ha.

Date: Old Elamite, Middle Elamite, Neo-Elamite, Achaemenid, Sasanian, Early Islamic

- KS1520-2

Collected area ca. 1.7 ha. Moderate to poor surface visibility.

Date: (primarily) Late Early Islamic (10th-11th), Old to Neo-Elamite

(Old to New) Elamite: GEW3.T5(1); GEW.T3; GEW2.T3(1)
Early Islamic: MGG2.T2 (1); MGG2.T6(1); ICW.T1(2); ICW.T2(1); SPW.T2(1); SGW1(1)

- KS1520-3

Collected area ca. 1.5 ha. Except for a small disturbed area, the site is entirely washed away by water erosion. Deep stratigraphy visible on the washed edges of the Gargar river bed, but impossible to collect given the height of the gorge. Moderate to poor surface visibility.

Date: (Primarily) Old and Middle Elamite, Neo-Elamite

Old Elamite: GEW1.T1(2); GEW1.T6(7)
Middle Elamite: GEW2.T2(1); GEW2.T4(2); GEW2.T5(1); GEW2.T6(1)
Neo Elamite:GEW3.T1(2); GEW3.T3(2); GEW3.T4(1)

5.4.3. KS1802

KS1802 (39R 295936 m E 3542570 m N; 41 m asl; surveyed Feb 9) consists of pottery scatter in an area ca. 0.8 ha. Identified during the re-examination of the western boundaries of the Dastowa (KS1801). On an outcrop approximately 1.5 m above the plain level. Under vegetable cultivation. Given the site's disturbance, it was not possible to securely define the extent and area of the site. It is possible that the mound (and possibly the site) was originally larger, and has been reduced in size over time by subsequent levelling and bulldozer activity on the northern edge of the site (Map 5.7). Poor surface visibility

Date: Early Islamic

Early Islamic: DBG.TU(3); ALW1.TU(1); OWG.TU(1); WIG.TU(2); MBG2.TU (2); ICW.T8(1); ICW.T9(1)?

5.4.4. KS1803

KS1803 (39R 293443 m E 3541163 m N; 41 m asl; surveyed Feb 10) is a mounded area, identified from the CORONA imagery. The modern village of Qal'eh Now, is built on top of the site, obliterating much of the archaeological remains. The ruins of several historic buildings are still visible on the edges of the site. Pottery is visible around these ruins and in the stratigraphy of a large well cut in the middle of the site. Estimated area ca. of ca. 4.5 ha. Remaining height 1.5 m. Poor visibility.

Date: Late Islamic

Late Islamic: MBG3.T2(1); MBG3.T5(2); MBG3.T9(1); MBG3.T10(1); MGG3.T2(1); MGG3.T6(1); MGG3.T9(1)
Islamic: MBG2.T10(1); ICW.T2(1); ICW.T9(1)

5.4.5. KS1804

KS1804 (39R 292029 m E 3539358 m E; 36 m asl; surveyed Feb 10) is one of several small closely located mounded areas, visible on CORONA imagery, that suggest human habitation. The area has been entirely levelled and is integrated into the farmlands that belong to the agricultural company Hamzeh (Fig. 5.7-5.8). Sherd scatter attested within the imagery-based estimated area, ca. 0.6 ha. Workers of the company confirmed that a group of small mounds that correspond to the features on the imagery were levelled in approximately 2010 (Map 5.9). Poor visibility because of levelling, plowing and flood irrigation.

Given the small size of the mounds and their proximity within a circumscribed area, it appears that they might have been contemporary sites. All the assemblages suggest an Early Islamic occupation.

Date: (Most likely) Early Islamic

(Early or Middle) Islamic: GCW2.TU (11)

5.4.6. KS1805

KS1805 (39R 292100 m E 3539215 m N; 35 m asl; surveyed Feb 10) is one of several small, clustered, mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). Collection area ca. 0.5 ha. The area is entirely levelled, partly to be integrated in the fields that belong to the Hamzeh Company, and partly for canal construction (Fig. 5.7-5.8). Poor visibility.

Date: Sasanian-Early Islamic

Parthian or Sasanian: PCW.T3 (1); PCWT13(1)
Sasanian-Early Islamic: GCW2 (3)

5.4.7. KS1806

KS1806 (39R 291447 m E 3538861 m N; 34 m asl; surveyed Feb 10) is one of several small closely located mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). The area is entirely levelled for agriculture. Few sherds visible from the walkway through the field (Fig. 5.9-5.10). Poor visibility given the heavy cultivation.

Date: Early Islamic

Early Islamic: GCW2.T3(1); ICW.T2(1); DBG.TU(1)
Early Islamic-Middle Islamic: GCW2.T2(2)

5.4.8. KS1807

KS1807 (39R 291960 m E 3538536 m N; 34 m asl; surveyed Feb 10) is one of several small mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). The area is entirely levelled for agriculture. Sherd scatter visible within the mounded area, and around it with lower density, apparently the result of levelling and moving the soil for agricultural purpose. Poor visibility given the plowing and site levelling.

Date: Sasanian-Early Islamic

Achaemenid?: ASW1.T13(1)
Sasanian-Early Islamic: GCW1.TU(8)

5.4.9. KS1808

KS1808 (39R 291646 m E 3539455 m N; 38 m asl; Feb 10) is one of several small mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). The area is entirely levelled for agriculture. Sherd scatter visible within the estimated location of the mounded area. Poor visibility given the plowing and site levelling.

Date: (most likely Early) Islamic

(Early?) Islamic: GCW2.T1(2)?; GCW1.T1(1); GCW1(1)

5.4.10. KS1809

KS1809 (39R 291370 m E 3539403 m N; 35 m asl; surveyed Feb 10) is one of several small mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). The area is entirely levelled for agriculture. Sherd scatter visible within the estimated location of the mounded area. Poor visibility given the plowing and site levelling.

Date: (most likely) Early Islamic

(Early?) Islamic: GCW2.T3(1); GCW2.TU(8)?

5.4.11. KS1513

CORONA imagery suggests archaeological remains at this location. Upon field investigation it was noted that archaeological features, including the remains of a building on top of a small mound, were in fact recorded by Wright and Moghaddam, with the numbers KS224 and KS1513 respectively. However, the GPS location recorded by Moghaddam for this site, known as Toll-i Gačī (*Per.* the gypsum mound), correspond to the village of Qal'eh Seyyed, 500 m to the east of the site (archaeological remains at the village of Qal'eh Seyyed were later recorded as site KS1824, see below). The mound was originally much larger and has been gradually destroyed and the soil moved to nearby fields. What remains of the building includes three rooms roofed with a barrel vaults. Almost 2 m of building ruins are preserved over approximately 2 m of archaeological strata (Map 5.9).

Sherds suggested a Parthian and Islamic occupation (possibly early, middle and late). Moghaddam had also suggested a Parthian date and a Middle Islamic occupation.

Date: (Primarily) Parthian, also early Islamic and late Islamic

5.4.12. KS1810

Estimated area of KS1810 (39R 295357 m E 3541381 m N; 39 m asl; surveyed Feb 12) is ca. 0.5 ha. Poor visibility.

Date: Achaemenid, (most likely Early) Islamic

Achaemenid: ASC2.T3(1); ASC2. TU(1); ASW1.T2(1); ASW1.T11?(1)
Early Islamic?: ICW.T6(2); ICW.T3(3); ICW.T9(2)

5.4.13. KS1811

KS1811 (39R 292518 m E 3540017 m N; 37 m asl; surveyed Feb 10) is one of several small mounded areas, visible on CORONA imagery, that suggest human habitation (Map 5.9). The area has been entirely levelled for agriculture. Sherd scatter on the mounded area, ca. 0.5 ha. Poor visibility given the plowing and site levelling.

Date: (Possibly) Sasanian, Early Islamic

Early Islamic: GCW1.T1; GCW.T4(1)
Late Sasanian-Early Islamic: BGW.T2(2); GCW1(5)

5.4.14. KS1812

KS1812 (39R 292839 m E 3540553 m N; 37 m asl; Feb 10) corresponds to two small mounds with anthropogenic characteristic, identified on the imagery. The southern mound was completely levelled and densely cultivated. The northern mound is also disturbed by a canal that has cut into the eastern side, as well as by a deep well that has been dug at the center of the mound (Fig. 5.13-5.14). Islamic pottery was found in the debris from the cut and inside the well (Map 5.9). Area 0.3 ha.**Date:** (possibly) Early Islamic, Middle Islamic

5.4.15. KS1813

KS1813 (39R 295684 m E 3538990 m N; 35 m asl; surveyed Feb 12) is a large area consisting of several mounds, identified Based on the CORONA imagery. Google imagery and survey showed that development has completely obliterated the morphology of the area. Three large irrigation canals and a drainage canal have been constructed in the northern, eastern and southern parts of the area that was defined on the historic imagery (Fig. 5.15-5.16). The area that is left between the canals has been levelled and plowed. Low to high density sherd scatters cover the area. A local farmer confirmed that several mounds with material remains were levelled in 2003 or 2004. According to him, one of the larger mounds was known to locals as *Tall-i Šīšeh-ʻī* (*Per.* the glass mound) because of the glass slag that was found on and around it. Several pieces of glass slag were found at the location where the glass mound stood (Fig. 5.17-5.18). Given the disturbed nature of the area, it was not possible to record individual sites. Seven areas corresponding to the identifiable concentration of material remains were marked and collected within the general area of KS1813 (Map 5.10). The demarcated area is ca. 6.25 ha, but it seems that not the entire area was actually occupied.

- KS1813-1

CORONA imagery shows a small mound. At present completely levelled for canal construction. Material remains scattered along the canal. Recorded area ca. 0.4 ha.

Date: Achaemenid, Early Islamic, (Parthian occupation not unlikely)

Achaemenid: ASW1.T5(1); ASC2(1)
Parthian?: MYG1.TU?(2)
Early Islamic: ICW.T3(2); GCW1.T1(2); MBG2(1)
Islamic: ICW.TU(1)

• KS1813-2

CORONA imagery shows a small mound along an old canal. Mound has been levelled and old canal is filled. Recorded area ca. 0.85 ha.

Date: Early Islamic

Late Sasanian-Early Islamic: MYG1(1); MBG2(1)
Early Islamic: MBG2 (3); MIW.T1(1); MYG2(1)

• KS1813-3

A large irrigation canal crosses through the center of the mounded area. Dense concentration of material remains, including pottery, glass, and slag as well as anthropogenic soil flanKSthe southern edge of the canal. Recorded area ca. 1.4 ha.

Date: Neo Elamite, Achaemenid, Early Islamic (possible Parthian and Middle Elamite habitation)

Neo Elamite: GEW3.T2 (4); GEW3.T3(3); GEW3.T5(2); MBG2.T10(1)
Middle Elamite: GEW2.T1(1)
Elamite (Middle or Neo): GEW. T5; GEW.TU(1)
Achaemenid:ASC2. T1(1); ASC1.T4(1); ASC1.T13(2); ASW1.T11(1)
Early Islamic: GCW1.T1(1); SPN(2); GCW1.TU(1); DBG(1)
Parthian (possibly): PCW.T14(1)?

• KS1813-4

A large irrigation canal crosses the center of the mounded area. Dense concentration of material remains, including pottery, glass, and slag as well as anthropogenic soil flanking the southern edge of the canal. Recorded area ca. 1 ha.

Date: (primarily) Neo-Elamite and Early Islamic, (possibly) Achaemenid, Seleucid, Late Sasanian

Neo-Elamite:GEW3.T3(2); GEW3.TU(4)
Achaemenid:ASW1.T13(1)
Neo Elamite or Achaemenid: GEW3.TU/ASC2.YU(4)
Seleucid: ASW2.T4(1); BGW.T4?(1); ASW2.TU(1)?
Late Sasanian-Early Islamic: GCW1.T1(1); GCW1.TU(4); MBG2.TU(1)
Early Islamic: ICW.T8(1); ICW.TU(1); MBG2.T2(1)

• KS1813-5

A small mounded area, visible on imagery, has been completely levelled. Low density sherd scatter covered the site. Recorded area ca. 0.3 ha.

Date: Early Islamic

Late Sasanian-Early Islamic: MBG2.TU(1)
Early Islamic: WIG? (1); DBG.TU (3)
(Early?) Islamic: ICW.T3(1); MGG2.TU(2)

• KS1813-6

A large mound of ca. 2 ha and a small mound of less than half a hectare next to it are visible on CORONA imagery. Both have been completely levelled for agriculture. Large pieces of glass slag were scattered here. Recorded area ca. 1.9 ha.

Date: Elamite, Achaemenid, Parthian, Early Islamic

(Neo?) Elamite: GEW.T6(1)
Middle Elamite: GEW2.T6(1)
Achaemenid: ASW1.T11(1)
Parthian-Sasanian: BGW.T2(2)
Sasanian-Early Islamic: MBG2.T8(1)
Early Islamic: IGP?(1); DBG(1)

• KS1813-7

A small mounded area, visible on imagery, has been completely levelled. Pottery collected within the estimated boundaries of the mounded feature. Recorded area ca. 0.4 ha.

Date: Neo Elamite, Seleucid, Parthian, Early Islamic, Middle Islamic

Neo Elamite: GEW3.T3(3)
Achaemenid: ASW1.T16(1)
Seleucid: ASW2.T12/T16?(1); ASW2.T8(1)
Parthian: PCW.TU(1)
Seleucid-Parthian: MYG.T1(1); MYG1.TU(3)
Early Islamic: GCW1.T1(1)
Late Early Islamic-Middle Islamic: MIW.T1(1); MGG2.T3(2)
Islamic: ICW.T5(1); MBG2.TU(2)

5.4.16. KS1814

KS1814 (39R 296626 m E 3539266 m N; 37 m asl; surveyed Feb 12) was identified based on CORONA imagery. Area reserved for beekeeping, and not accessible for collection. Pottery visible at the edges of the mound. Area ca. 0.9 ha (Map 5.10).

Date: Early Islamic

Early Islamic: OWG(1); MBG2(1); GCW2(1)

5.4.17. KS1515-2

CORONA imagery suggests that KS1515 (39 R 296583 m E 3538278 m N; 36 m asl; re-surveyed Feb 12) might extend beyond the large mound and its immediate periphery, as recorded previously.[318] All areas around the site were heavily cultivated and impossible to investigate. Pottery and archaeological strata were visible, however, inside a drainage canal that was cut through the larger area visible on the imagery. Pottery retrieved from the canal cut places the beginning of the occupation in the Achaemenid period. Also suggested is an increase in the area of the site from ca. 5.4 ha to 7 ha (Map 5.10).

Date: Achaemenid, (possibly) Parthian, Sasanian

Achaemenid: ASW1.T8(1); ASW1.T11(1); ASW1.T13(1)
Parthian or Early Sasanian: PCW.T2(1); PCW.T13(1); MBG1(1)

5.4.18. KS1815

KS1815 (39R 294312 m E 3538037 m N; 35 m asl; surveyed Feb 12) is a small mounded area, visible on the imagery, completely levelled. Pottery collected within the estimated boundaries of the mounded feature, ca. 0.4 ha. Poor visibility due to dense cultivation.

[318] A short stop was made by this site as it was on the survey route.

Date: Neo Elamite, (possibly) Achaemenid

Neo Elamite: GEW.T2(3); GEW3.T7(1)
Achaemenid: ASW3.TU(3)

5.4.19. KS1816

KS1816 (39R 293079 m E 3538418 m N; 34 m asl; surveyed Feb 12) is a small mounded area, visible on the imagery, completely levelled. Area estimated based on imagery and extent of sherd scatter, ca. 1 ha. Poor visibility due to plowing and dense cultivation.

Date: Early Islamic (Sasanian and Middle Islamic habitation not unlikely)

Sasanian-Early Islamic: GCW1.T2(1); GCW1.TU(1)
Early Islamic: ICW.T3(1); DBG.T10(1) ; SPW(1); IGP(2)
(Early?) Islamic: GCW1.T5(1); YMG2(2); MBG2.TU(4); ICW.T9(1)

5.4.20. KS1817

KS1817 (39R 293247 m E 3538899 m N; 35 m asl; surveyed Feb 12) is a small mounded area, visible on the imagery, entirely levelled. Area estimated based on the imagery and extent of sherd scatter, ca. 0.6 ha (Map 5.9). Poor visibility due to plowing and greenhouse cultivation.

Date: Sasanian-Early Islamic

Sasanian-Early Islamic: ICW1.T1(2); ICW.TU(2); MBG2.T9(1); MBG2.TU(1); GCW1.TU(1)

5.4.21. KS1818

KS1818 (39R 297466 m E 3531292 m N; 29 m asl; surveyed Feb 13) corresponds to two small neighboring mounds, selected based on imagery. The area was heavily disturbed following canal construction and field levelling. Therefore, only part of the eastern mound was marked as site KS1818, where lower vegetation density made it possible to see a low density field scatter on the surface. Area ca. 0.5 ha (Map 5.11). Visibility was poor due to dense cultivation.

Date: Sasanian-Early Islamic

Sasanian-Early Islamic: GCW1.TU(11)
Early Islamic: OWG(1); MYG2(1)

5.4.22. KS1819

KS1819 (39R 297406 m E 3530734 m N; 31 m asl; surveyed Feb 13) corresponds to several small adjacent mounds with anthropogenic characteristics, on CORONA imagery. The area has been levelled and transformed into agricultural land. Evaluation of the field scatters did, however, suggest human habitation. The areas of pottery collection correspond with the mound boundaries on the imagery. Sherd density suggests that the largest mound, located west of the demarcated area, could be identified as the center of the site. Site area ca. 8.7 ha (Map 5.11).

Date: Seleuco-Parthian, Sasanian-Early Islamic

- KS1819-1

High density cultivation. Poor surface visibility.

Date: Sasanian-Early Islamic

Sasanian-Early Islamic: GCW1.TU(10)

- KS1819-2

Low density field scatter over an area larger than the mounded feature on the imagery, most likely the result of levelling activities.

Date: Sasanian, (more likely) Early Islamic

Sasanian-Early Islamic: GCW1.T3(1); GCW.TU(1)
(Early?) Islamic: ICW.T2(2)

- KS1819-3

A small mound on the edge of the river. Heavily disturbed, particularly, because of several abandoned water pumps that flank or are on top of the area.

Date: Parthian, (Early Islamic not unlikely)

Parthian: MBG1.T5(1); MBG1.T6(1); MBG1.TU(3) I think it should be corroded Islamic blue glaze, check photos, I think they should all be Islamic?
Early Islamic?: ICW.T6

- KS1819-4

The largest mound, most likely the center of the site. Completely levelled for agriculture. Ceramic density within and immediately around this area higher than in other areas.

Date: Early Islamic

Seleucid-Parthian?: TJS.T2(1)
Early Islamic: OWG (2); GCW.T1(3); DBG(3); MBG2(2)?
(Early?) Islamic: GCW2.T1(1); MGG2.T9(1); ICW.T9(1); ICW.T9(3)?

5.4.23. KS1820

KS1820 (39R 297749 m E 3531123 m N; 3 m asl; surveyed Feb 13) corresponds to a small mound, identified from imagery. The area is completely levelled for agriculture. Pottery collected at the edges of the fields, within the imagery-based demarcated area, ca. 0.4 ha (Map 5.11). Poor visibility because of flood irrigation.

Date: (Middle?) Islamic

Middle Islamic: SGW2.TU(1)
Islamic: GCW2.TU(7)

5.4.24. KS1821

KS1821 (39R 298679 m E 3530328 m N; 30 m asl; surveyed Feb 13) corresponds to two small adjacent mounds of anthropogenic signature on imagery. Completely levelled for agriculture. Pottery collected from the few visible areas within the estimated boundary, ca. 3.1 ha (Map 5.11). Poor visibility because of plowing and cultivation.

Date: (possibly) Sasanian, (primarily) Early Islamic, Middle Islamic

Sasanian-Early Islamic: GCW1.T1(1); GCW1.T2(1); MBG1.TU(1)
Early Islamic: DBG(4); MBG2.T10(1)
(Early?) Islamic: ICW.T5(1); MBG2.TU(1)
Middle Islamic: USP.T1(1); YMG2.TU(1)?

5.4.25. KS1822

KS1822 (39R 298942 m E 3529353 m N; 30 m asl; surveyed Feb 13) consists of few very small adjacent mounds of anthropogenic signature on imagery. Area completely levelled for agriculture. Area ca. 1.4 ha (Map 5.11). Poor visibility because of plowing and cultivation.

Date: Seleucid-Parthian, Early Islamic

Sasanian-Early Islamic : GCW2.T1(2); MGG2(1); MBG.TU(2)
Seleucid-Parthian: MYG1.T4(2); MYG1.T15(1)?
Parthian: BGW.T1(1); PCW.TU(1)

5.4.26. KS1823

KS1823 (39R 299896 m E 3527511 m N; 30 m asl; surveyed Feb 13) consists of three small mounds identified from imagery. Area has been entirely levelled for agriculture and the original morphology is blurred. Pottery visible on the surface of two of the mounds. Collections were made in two zones, given the different nature of the pottery and surface features. Total area ca. 3 ha (Map 5.16).

Date: Achaemenid, Seleuco-Parthian, Early Islamic, Middle Islamic

- KS1823-1

Area adjacent to the road. A modern drainage canal has cut through this area, revealing pottery and ash layers beneath the surface of the site.

Date: (primarily) Parthian, (possible) Middle Islamic, (possible) Achaemenid

Achaemenid: ASW1.TU(3)
Parthian: PCW.T2(1); PCW.TU(3); YMG1(1)

(Middle?) Islamic: ICW.T13

- KS1823-2

Completely levelled for agriculture. Surface visibility poor due to plowing, cultivation, and salinization.

Date: Early Islamic (late Sasanian, and Middle Islamic not unlikely)

Early Islamic: GCW2.T1(1)?; GCW2.T2(1)?; MBG2.T8(2); MBG2.TU(1)
Early? Islamic: ICW.T2(1); MGG2(2)

6.1.27. KS1824

A visit to the village of Qal'eh Seyyed, which corresponds to GPS point of KS1513 (see above) showed that the modern village is located on an archaeological site, recorded as KS1824 (39R 293069 m E 3539387 m N; 37 m asl; Feb 12). Surface is heavily disturbed and covered with new buildings and construction debris. Estimated area ca. 2.8 ha. Remaining height ca. 1.5 m (Map 5.9). Poor surface visibility.

Date: Early Islamic, Late Islamic, (possibly) Middle Islamic

Early Islamic: GCW2.T1(2); GCW2.T2(1); DBG(1)
Middle? Islamic: MGG2(2); MYG2.TU(1)
Late Islamic: MGG2(2); MBG3.TU(5)

5.4.27. KS1825

KS1825 (39R 298190 m E 3539584 m N; 35 m asl; Feb 14) is completely levelled for agricultural purposes. However, pottery on the soil heaps on the edge of the river as well as inside the water wash cuts on the river bank demonstrates the existence of a site at this location. Remaining area ca. 0.5 ha (Map 5.12). Poor visibility.

Date: Early Islamic

Early Islamic: ICW.T2(1); MBG2.T5(1); MBG2.T6(1); GCW2.T1(1); GCW2.TU(1); MGG2.T2(1)?; MBG2.TU(1)?
Islamic: MGG2.TU(2)

5.4.28. KS1826

KS1826 (39R 299606 m E 3538994 m N; 36 m; surveyed Feb 14) is heavily disturbed: A chicken farm has been built on top of it. Also, a large pit has been dug within the area outside the farm (Fig. 5.23). And, part of the site seems to have been levelled and integrated into the farm. Remaining area ca. 0.4 ha (Map 5.12). Moderate visibility.

Date: (possibly) Achaemenid, Parthian, Early Islamic

Achaemenid: ASW1.T13(1); ASW1.TU(6)?
Parthian: PCW.T2(4)?; PCW.T3(2); PCW.T8(1); PCW.T13(5)?; PCW.T15(1); BGW.T1(1); BGW.T2(2); MBG1.T7(1); MBG1.T8(1); MYG1.T8(1)
Early Islamic: GCW1.T1(1); ICW.T3(1)
Islamic: MGG2.TU(1)

5.4.29. KS1827

KS1827 (39R 300370 m E 3538698 m N; 32 m asl; surveyed Feb 14) is heavily disturbed, and original boundaries are unclear. The area immediately next to the river was destroyed during the construction of several fish farms (Fig. 5.22). The rest has been levelled and transformed into agricultural land. As at other sites along the Gargar, surface water erosion has also significantly contributed to the site's destruction. Remaining area ca. 0.3 ha. Poor visibility.

Date: Parthian

Parthian: PCW.TU(4); PCW.T15(2)

5.4.30. KS1828

KS1828 (39R 301160 m E 3538161 m N; 36 m asl; surveyed Feb 14) is located at the eastern fringes of the Shalili village. Extent of the site impossible to identify. Surface is obscured

by construction debris, domestic and animal waste. The site was identified inside one of the fish farms that flank the village. The fish farm was being filled the same day, and pottery was visible in the cut of the pool and under the water (Fig. 5.25-5.26). Remaining area ca. 0.3 ha (Map 5.12).

Date: Neo Elamite

Neo Elamite: GEW3.T3(1); GEW3.T5(8); GEW3.T6(3); GEW3.TU(1)

5.4.31. KS1829

KS1829 (39R 301527 m E 3537870 m N; 35 m asl; surveyed Feb 14) is located south of the village of Shalili-yi Koochak. Existence of site is confirmed by pottery scatter (Fig. 5.24). However, fish farms and marshes have altered the archaeological landscape and have blurred site boundaries. Remaining area ca. 0.3 ha (Map 5.12).

Date: Early Islamic

Early Islamic: MBG2.T2(1); MBG2.T7(2); MBG2.T9(1); MBG2.TU(5); ICW.T5(2)
Islamic: ICW.TU(3)

5.4.32. KS1830

KS1830 (39R 305276 m E 3535197 m N; 35 m asl; surveyed Feb 14) corresponds to a large mound of anthropogenic signature on CORONA imagery, located between the river and the Shalili road. The tomb of Nabi Shu'ayb is located on the mound. Recent development of the tomb and the adjacent cemetery has completely altered all accessible parts of the mound. Pottery is, however, found in the cuts and pits in the less developed areas around the tomb complex. It is not possible to define the boundary of the site. Estimated area 1.9 ha (Map 5.13), but, the site may have been larger.

Date: Seleucid-Parthian, (possibly) Sasanian-Early Islamic

Seleucid:ASW2.T2(1); ASW2.TU(2)

Parthian: PCW.T15(2); PCW.T1(1); MYG1.TU(2)?
Parthian-Sasanian: PCW.T12(1); PCW.T2(2); BGW.T2(1)
Sasanian-Early Islamic: GCW.T2(2)

5.4.33. KS1831

KS1831 (39R 304618 m E 3534943 m N; 35 m asl; surveyed Feb 14) consists of several features that resemble Islamic period buildings on CORONA imagery. The area has been completely levelled for use as agricultural land. Additionally, the large canals that cross the area do not permit access to all parts of the site. The farm owner did, however, confirm that several historic buildings once stood in this area and have since been demolished. Although the pottery collected suggests an Early Islamic date, later occupation is also possible given the well preserved state of buildings on CORONA imagery. Area ca. 9.7 ha (Map 5.13). Surface visibility is poor due to cultivation and trash deposits.

Date: Early Islamic, (Middle or Late Islamic not unlikely)

Early Islamic: GCW.T2(1); OWG.T9(1); MBG2.T8(1); MBG2.T10(1); MBG2.TU(5)
(Early?) Islamic: GCW2.T1(1); ICW.T2(1);ICW.T3(2); ICW.T5(1); ICW.T9(4)

5.4.34. KS1832

KS1832 (39R 305875 m E 3534858 m N; 32 m asl; surveyed Feb 15) is heavily disturbed and its original boundaries are unclear. The area immediately next to the river has been destroyed for the construction of several fish farms. The rest of the site has been levelled for use as agricultural land. A local farmer confirmed that a mound under 1 m high existed in this location. Remaining area ca. 0.7 ha, height 0.8 m (Map 5.13). Moderate to poor visibility.

Date: Neo Elamite, Middle Elamite, Achaemenid, (Old Elamite not unlikely)

Old Elamite: GEW3.T6(1)
Middle Elamite:GEW2.T3(1); GEW2.T5(3); GEW2.T6(2)
Neo Elamite:GEW3.T2(3); GEW3.T3(2); GEW3.T5(1); GEW3.T6(3)

Elamite: GEW.TU(8)
Achaemnid:ASW1.T1(1); ASW1.T11(2); ASW1.T13(3); ASW1.T14(1)

5.4.35. KS1586-2

KS1586 (39R 308491 m E 3531881 m N; 27 m asl; resurveyed Feb 15) is a large multi-period site, recorded by Moghaddam. It was re-surveyed and a random sample was selected in order to check the density of occupation of different periods across the site. Natural erosion and agriculture have destroyed much of the site. Remaining area ca. 5 ha (Map 5.14).

Date: Achaemenid, Parthian, (possibly) Sasanian

Achaemenid: ASW1.T2(1); ASW1.T13(1); ASW1.T14(1)
Parthian: PCW.T3(1); PCW.T13(1); PCW.T15(4); BGW.T1(1); BGW.T2(2)
Sasanian: PCW.T2(3)?

5.4.36. KS1834

KS1834 (39R 308426 m E 3530393 m N; 31 m asl; surveyed Feb 15) corresponds to two adjacent mounds visible on imagery. The area has been completely levelled. The area corresponding to the two identified mounds as well as the area of pottery scatter is marked as KS1834. Area ca. 4.9 ha (Map 5.14). Poor visibility because of plowing and cultivation.

Date: Early Islamic

Early Islamic: SPW?(2); IGP.TU(5); IGP or SPW(3); DBG(4); MBG2(4); MIW.T1(1)
Islamic: ICW.T5(1); ICW.T9(11)

5.4.37. KS1835

KS1835 (39R A 309311 m E 3525477 m N; 29 m; surveyed Feb 15) is a mound identified on imagery. Except for one strip of land, the entire area has been levelled for agriculture. Estimated area ca. 1.5 ha. Surface visibility is good on the remainder of the mound, and poor within the levelled areas.

Date: Early Islamic, (possibly) Middle Islamic

Early Islamic: MBG2.T7(2); IGP.T3(1); BGW.T2(1); MBG2.T6(1); DBG(8);
Early/Middle Islamic: ICW.T3(1); SGW1?(1); ICW.T6(2); MBG2(1); MYG2(3); MGG2(1)

5.4.38. KS1836

KS1836 (39R 301205 m E 3523049 m N; 30 m asl; surveyed Feb 16) is a large mound south of the village of Arab Hasan, identified on imagery. Surface collection confirmed the existence of a site that has been heavily disturbed by modern construction activities (Fig. 5.37). Only the southern part of the mound, on which an abandoned cement block workshop and a kiosk stand is partially preserved. In addition to pottery, metal slag has been found on the southern mound. Remaining area ca. 4.2 ha. Remaining height 1.5 m (Map 5.17). Visibility is very poor on other parts of the site.

Date: (possibly) Achaemenid & Sasanian, (primarily) Early Islamic

Achaemenid?: ASW1.TU(5)
Sasanian-Early Islamic: GCW1.T1(3); GCW1.T2(1); GCW1.T5(1)
Early Islamic: GCW1.T1(2); GCW1.T4(1); GCW2.T5(1); DBG(1); MBG2.T7(1); MBG2.T9(1); MBG2.TU(3)

5.4.39. KS1837

On satellite imagery, several mound complexes are found in the lower part of the plain, particularly near the Karun. The signature of natural and anthropogenic soil heaps in such locations is very similar and no conclusions could be made prior to a site visit. KS1837 (39R 298186 m E 3522892 m N; 31 m asl; surveyed Feb 16) was one such location where survey confirmed evidence of human occupation. The area is almost entirely levelled for agriculture. Nevertheless, pottery has been found on some of the soil heaps on southern side of the farms. In addition, a pit was visible in a bulldozer cut on the side of the only preserved mound, in the western part of the area (Fig.

5.38). Pottery, (animal?) bone, and bitumen were visible inside the pit. Area ca. 2.5 ha, height 2.3 ha (Map 5.18). Poor visibility.

Date: (most likely) Early Islamic; (Sasanian and Middle Islamic not unlikely)

Early Islamic: MBG2.T3(1); MBG2.TU(2); IGP?(2); GCW1.T1(1)
Early/Middle Islamic: ICW.T3(1); ICW.T9(1)

5.4.40. KS1838

KS1838 (39R 299605 m E 3521353 m N; 28 m asl; surveyed Feb 16) corresponds to a small mound, identified based on imagery. The area was completely levelled for agriculture. Area ca. 0.6 ha (Map 5.17). Poor surface visibility due to cultivation.

Date: Sasanian-Early Islamic

Sasanian-Early Islamic: ICW1.T1(1); ICW1.T3(1); ICW1.T6(1); MBG2.TU(2); MYG2.TU(1)

5.4.41. KS1839

KS1839 (39R 299316 m E 3521198 m N; 28 m; surveyed Feb 16) corresponds to a small mound, identified based on imagery. The area was completely levelled for agriculture. Area ca. 0.6 ha (Map 5.17). Poor surface visibility due to cultivation.

Date: Early Islamic

Early Islamic: MBG2.T2(1); MBG2.T7(1); MBG2.T8(1); MBG2.TU(1); GCW2.TU(1); GCW2.T1/T2(2)

5.4.42. KS1840

KS1840 (39R 300089 m E 3521291 m N; 28 m; surveyed Feb 16) corresponds to a large mound identified on imagery. The area was levelled for agriculture. Surface pottery confirmed occupation, at least on the western part of the mound. Area ca. 3.7 ha (Map 5.17). Poor surface visibility due to plowing and cultivation.

Date: (possibly) Achaemenid, Parthian-Sasanian

Achaemenid: ASW1.T13(1); ASW1.TU(3)
Parthian: MYG1.T6(2); MYG1.TU(3); BGW.T1(2)
Sasanian?: GCW1.T1(2)?
Parthian-Sasanian: PCW.T3(4); PCW.T13(1)

5.4.43. KS1841

KS1841 (39R 301146 m E 3520778 m N; 29 m; surveyed Feb 16) corresponds to two small mounds identified on imagery. Survey showed that the mounded features and the majority of the landscape around it were completely destroyed in the course of constructing several modern feeder canals and a large-scale agricultural development. Low density surface pottery on the approximate location of the selected features, and in the small soil heaps piled on the sides of the area was taken as evidence for the existence of the site prior to recent landscape transformations. Area of the site was estimated based on the sherd scatter, smaller than the area identified on the imagery, ca. 0.8 ha (Map 5.17). Very poor surface visibility.

Date: Early Islamic

Early Islamic:MBG2.T7(3); MBG2.T8(1); MBG2.TU(4)
Early? Islamic: BGW.T2(1); YMG2.T6(1)

5.4.44. KS1843[319]

KS1843 (39R 297685 m E 3513126 m N; 29 m asl; surveyed Feb 22) consists of a cluster of mounded features southeast of Negini, selected on imagery based on the proximity of the mound cluster to the river and to the Negini mounds. KS1843 was the only archaeological site recorded in this area, and it was confirmed that the rest of the mounds located east and south of Negini were

[319] There is no KS1842. This name was given to the KS1622B, before this area was defined as related to Askar Mukram.

devoid of archaeological material. The site is destroyed, partly as a result of levelling for agriculture and partly as a result of canal construction. Low density pottery scatter on the farm. More pottery in the soil heap that seems to have been formed as a result of levelling of the site. Area ca. 1.4 ha, height 0.4 m. Moderate site visibility.

Date: Neo-Elamite

Neo-Elamite: GEW3.T6(2); GEW3.T7(3)
Elamite: GEW.TU(6)

5.4.45. KS1844

KS1844 (39R 297155 m E 3520737 m N; 30 m asl; surveyed Feb 23) is a small site north of the village of Magernat 3, selected for survey based on imagery. Road construction has completely destroyed the site. However, sherds appear in the soil heaps left from the levelling of the site. Area ca. 1 ha (Map 5.18).

Date: (most likely) Early Islamic (late Sasanian not unlikely)

(Most likely) Early Islamic: ICW.T1(1); ICW.T2(3); DBG(1); BGW.T3(2); GCW.T2(2)
Islamic: ICW.T8(1); IRW(1)

5.4.46. KS1845

KS1845 (39R 296833 m E 3521437 m N; 29 m asl; surveyed Feb 23, 26) is an area composed of several very small mounds with an anthropogenic signatures on imagery. All the mounds have been destroyed, either for road construction or for agriculture. Surface pottery as well as strips of soil left from some of the mounds did, however, confirm the existence of archaeological deposits. Given the level of site destruction, satellite imagery was the primary guide for marking the position and extent of the collection areas. Surface collection across the site suggests an Early Islamic date. Total area ca. 5.8 ha (Map 5.18).

Date: Sasanian-Early Islamic

• KS1845-1

This area corresponds to the mound that is adjacent to the large modern canal along the road (Fig. 5.27). It has been nearly completely obliterated by the construction of the canal and the road. Pottery is, however, found in the soil heaps between the road and the canal. Poor visibility.

Date: (most likely) Early Islamic

Early Islamic: GCW2.T3(1); IRW.T1(1)
Islamic: GCW2.TU(1); BGW.T3(1)

• KS1845-2

Originally composed of three small mounds, only one of which is preserved. The village and a small morgue are located on this mound (Fig. 5.28). The eastern mound was destroyed for canal construction and the western mound was levelled for agriculture. The pottery left from these two are found around the central mound, and hence collected together. Moderate visibility on the central mound, poor visibility elsewhere.

Date: (most likely) Early Islamic

(most likely) Early Islamic: GCW1.T1(3); GCW1.T6(2); GCW2.T6(1)
Early Islamic: MBG.T7(1)

• KS1845-3

A small mound visible on the imagery. Completely levelled.

Date: (most likely) Early Islamic

Early Islamic: GCW1.T1(1)
(Most likely) Early Islamic: MYG2.T6(1); GCW1.T2(1); GCW2.T

• KS1845-4

A small mound. Mainly levelled. Low density pottery scatter on the remaining part.

Date: (most likely) Early Islamic

No diagnostic, body sherds of GCW1 collected.

• KS1845-5

One of the larger mounds of the cluster. The center of the mound has been levelled and turned into agricultural land. Only two heaps are left to the north and south. High density cultivation covers the cultivated area. Pottery collected from remaining heaps.

Date: Sasanian-(most likely) Early Islamic, (Achaemenid not unlikely)

Achaemenid:ASW1.TU(2)
(Most Likely) Early Islamic: GCW1.T1(1); GCW1.T5(1)
Sasanian-Early Islamic: GCW1.T3(1); GCW1.TU(1)

• KS1845-6

The center of the mound has been levelled and turned into agricultural land. Only two soil heaps are left to the north and south (Fig. 5.30). High density cultivation. Pottery collected from remaining heaps.

Date: Early Islamic, (Middle Islamic not unlikely)

Early Islamic: GCW1.T1(1); GCW1.T7(1); MBG2.T2(1); MBG2.T5(1); MBG2.T7(2); OWG.T7(1)
(Most likely Early) Islamic: GCW1.T2; MBG2.TU(1); ICW.T3(1)

• KS1845-7

A small mound that has been levelled. No visibility on the levelled and farmed part. Good visibility on the small strip that is left of the mound to the east (Fig. 5.29).

Date: Islamic

(Early or Middle) Islamic: GCW2.T1; GCW1.TU(1); BGW.T3(1); ICW.T1(1); ICW.TU(1)

5.4.47. KS1846

KS1846 (39R 298478 m E 3526627 m N; 31 m asl; surveyed Feb 23) is a large mound cluster, north of the village of Sheykh ‘Abd al-Amir, selected for survey based on the imagery. The site is known as Diban ‘Abd al-Amir, and is recorded in the inventory of the ICHHTO. Yet, no signage was found at the site. Despite agricultural activity, morphology of the site on the ground is comparable to that observable from the imagery. Major damage has been caused by the construction of two fishery pools, which were never used. According to two of the villagers, the fish farms were never exploited because of a complaint made by the villagers over unauthorized use of the village land. Based on the spatial distribution of the mounds as well as modern features and activities, ten collection areas were chosen. Total area ca. 32.6 ha (Map 5.16).

- KS1846-1

Area of the southern fishery pools. Moderate visibility.

Date: Early Islamic (Late Sasanian not unlikely)

Early Islamic: ICW.T3(2); ICW.T4(1); GCW1.T1(1); GCW1.T2(2); GCW1.T3(2); MBG2.T6(1); OWG.T6(1); BGW.T3(1)
Islamic: ICW.T2(2); ICW.T9(2)

- KS1846-2

Area of the northern fishery pool. Moderate visibility.

Date: Early Islamic; Middle Islamic

Early Islamic: OWG.T6(1); OWG.T8(1); OWG.T9(1); OWG.TU(1); MBG2.TU(1)
Middle Islamic: MGG2.T5(1); MGG2.T8(1); MBG2.T5(1); UGP(2); UGP.T5?(1)
Islamic: ICW.T9(4)

• KS1846-3

A relatively well-preserved mound, which is used as the village cemetery. A small morgue has been built on the mound. Area is disturbed. Moderate surface visibility.

Date: Early Islamic; Middle Islamic

Early Islamic: GCW1.T3(1); MBG2.T7(2); OWG.T10?(1); OWG.T6?(1); IGP(1); ICW.T3(1); DBG(1)
Middle Islamic: UGP1(2); UGP2(2)
Islamic: ICW.T2(1); ICW.T9(6)

• KS1846-4

A large mound that is completely levelled and under cultivation. Pottery mainly selected on the edges of the farm. Poor visibility.

Date: Achaemenid, (primarily) Early Islamic; (late Sasanian not unlikely)

Achaemenid: ASW1.T13(3); ASW1.TU(5)
Early Islamic: GCW1.T1(5)?; MBG2.T8(2); MBG2.TU(2); OWG.T5(1); OWG.TU(1); YMG2(1)
Sasanian-Early Islamic?: MBG1.TU(1)

• KS1846-5

Composed of three very small adjacent mounds. Vegetation and surface visibility moderate.

Date: Early Islamic

Early Islamic: GCW2.T3(1); GCW2.TU(1); IGP(1); MBG2.T5(1); MBG2.T9(1); MBG2.TU(2)
Islamic: ICW.T2(1); ICW.T9(2)

• KS1846-6

Three small adjacent mounds within the borders of a farm. Dense cultivation. Poor visibility.

Date: (possibly) Late Sasanian, Early Islamic

Sasanian-Early Islamic: GCW1.TU(3)

Early Islamic: MBG2.TU(4)

- KS1846-7

A small mound within an elongated strip of farm. Dense cultivation. Poor visibility.

Date: (possibly) Achaemenid, Early Islamic

Achaemenid: ASW1.TU(6)
Early Islamic: GCW1.T1(1); GCW1.T6(1)?; GCW1.TU(1)?; ICW.T2(1); MBG2.TU(2); OWG.T9(1); OWG.TU(1)

- KS1846-8

A mound visible on the imagery, levelled and transformed into a farm. Dense cultivation. Poor to moderate surface visibility.

Date: Early Islamic

Early Islamic: GCW.T2(1); GCW1.T3(1); GCW1.T5(1); MBG2.T7(1); MBG2.TU(3); DBG.TU(1); OWG.T6(1); IGP.T6(1); IGP.TU(1);
Islamic: MYG2.TU(1); ICW.T9(1); IRW.T1(1)

- KS1846-9

A mound visible on the imagery, levelled and transformed into a farm. Dense cultivation. Poor to moderate surface visibility.

Date: (possibly) Achaemenid, Early Islamic, (possibly) Late Sasanian

Achaemenid: ASW1.TU(2)
Sasanian-Early Islamic:GCW1.T1(4); GCW1.T3(2)
Early Islamic: MBG2.T4(1); MBG2.T7(1); MBG2.T8(1); MBG2.TU(4); OWG.TU(1); ICW.T2(1)?; ICW.T5(1)

- KS1846-10

Area composed of a mound within the borders of a farm. The eastern side of the mound has been cut by bulldozers, but the rest is preserved. Visibility is moderate on the mound, poor in the rest of the farm due to intensive cultivation.

Date: Early Islamic, (Late Sasanian not unlikely)

Sasanian-Early Islamic: GCW1.T1(1); GCW2.T1(1)
Early Islamic: OWG.T9(2); ICW.T3(2); ICW.T9(1)

5.4.48. KS1847

KS1847 (39R 296291 m E 3522713 m N; 29 m asl; surveyed Feb 26) is a large mounded area, selected for survey based on imagery. Field visits showed that two small sites, KS1847-KS1848 are located to the east and west of a large, naturally raised area. KS1847 is part of farm, and it is not clear how much of it has been destroyed by plowing and farming. Remaining area ca. 0.2 ha, height 0.4 m (Map 5.18). Surface visibility is good on the mound.

Date: Prehistoric

5.4.49. KS1848

KS1848 (39R 296145 m E 3522375 m N; 27 m asl; surveyed Feb 26) is a large mounded area, selected for survey based on imagery. Field visit showed that two small sites, KS1847-KS1848 are located to the east and west of a large, naturally raised area. KS1848 has been largely destroyed and disturbed by human activity. In addition to levelling for agriculture, several cuts and pits have been dug all over the mound. Surface-water wash has deepened the man-made cuts. The pottery collected from the site, suggests possible sugar production. Area ca. 0.9 ha. Height 0.5 m (Map 5.18). Poor surface visibility.

Date: Early Islamic, Middle Islamic

(Most likely Early) Islamic: BGW.T3(1); MBG2.TU(2)
Early-Middle Islamic*: GCW1.T1(3); GCW1.T2(1); GCW1.T6(1); GCW2.T1(2); GCW2.T2(1); IRW.T1(1); ICW.T9(1)

5.4.50. KS1849

Ks1849 (39R 293962 m E 3519188 m N; 28 m asl; Feb 27) is a mound cluster, south of the village of ‘Abduli Beyt Khalaf, selected for survey based on imagery. The area is highly disturbed. Several large and small canals have been built to the south, east and north of the site. Illegal excavation has been carried out in several spots. Other areas are plowed, partially levelled, and cultivated (Fig. 5.32). A complete vessel was found in a pit (Fig. 5.33, Appendix A, GCW.T1, sherd 1849-107-1). Total area ca. 8.5 ha. Height 1 m (Map 5.19). Poor surface visibility due to intensive cultivation, flood basin irrigation, and salinization of the surface soil.

Date: (possibly) Achaemenid, Early Islamic, (Middle Islamic not unlikely)

Achaemenid: ASW1.T1(1); ASW1.T13(1); ASC2.T1?(1)
Early Islamic: GCW1.T4(1); GCW1.T6(1); GCW2.T6(1); GCW2.T4(1); OWG.T5(1); OWG.T6(1); MBG2.YU(3); MYG2.TU(1);
Early-Middle Islamic*: GCW1.T1(4); GCW2.T1(2)

*Several basin forms are comparable to the sugar molds illustrated in the Susa excavation reports. The sugar refinery excavated at Susa dates to the early Middle Islamic period. Pottery from the surface of KS1849 includes early Islamic types, suggesting that the basin form used for sugar may pre-date the Middle Islamic period.

5.4.51. KS1850

KS1850 (39R 294330 m E 3519380 m N; 29 m asl; surveyed Feb 27) is in fact part of the mound cluster recorded as KS1849. Given the very early date of the pottery and the height of the mound, however, it was recorded as a separate site. Two large irrigation and drainage canals intersect at this mound, which has resulted in the destruction of a majority of the site’s area and disturbance of the rest (Fig. 5.31-5.32). On the better preserved part of the mound, several illegal

excavation pits have been dug. Pottery density is high, especially inside the drainage canal that has cut the southern part of the site. Area ca. 1.8 ha. Height 2.5 m (Map 5.19). Visibility is moderate on the mound.

Date: Late Susiana, Uruk[320]

5.4.52. KS1851

KS1851 (39R 293036 m E 3517277 m N; 33 m asl; surveyed Feb 27) was identified in the field, during the survey south of the village of ‘Abduli Beyt Khalaf. The site is composed of a single high mound located southeast of a large cluster of small mounds. Therefore, two separated collections were made. Total area ca. 26.8 ha. Height 0.5 m (Map 5.19).

Date: Prehistoric (LS); Old Elamite, Middle Elamite, Early Islamic

- KS1851-1

The highest and most distinctive mound of the area, adjacent to the road. The water treatment plant of the village is built on top of it. Digging by bulldozers has destroyed much of the eastern half of the mound (Fig. 5.34-5.36). We were informed that digging was carried out in the course of the construction of natural gas line, but soil is constantly removed by villagers and used for construction. Archaeological material, including brick, ceramics, ash and bone is visible in the

[320] See assemblage. Bibliography: Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*; Moghaddam, *Later Village Period Settlement Development*; Weiss, “Ceramics for Chronology Discriminant and Cluster Analyses of Fifth Millennium Ceramic Assemblages from QABR Sheykheyn, Khuzistan.”; Delougaz and Kantor, *Chogha Mish: Final Report on the Last Six Seasons of Excavations, 1972-1978*.

deep section made by bulldozers, suggesting a long occupation as supported by the date of the assemblage.

Date: Prehistoric (LS); Old Elamite, Middle Elamite

Prehistoric: 12, See fig ***.
Old Elamite: GEW.T5(1); GEW1.T3(1); GEW1.T6(4)
Middle Elamite: GEW2.T1(1); GEW2.T2(2); GEW2.T6(1)
Old-Middle Elamite: GEW.T3(2)

- KS1851-2

A cluster of low mounds surrounds area 1 to the north and west (Fig. 5.34). The mounds are more numerous and better preserved north of the road. They are under cultivation but visibility is still moderate. Pottery density is low. Several mounds that previously existed south of the road have been levelled and turned into agricultural land. Despite poor visibility, low density ceramic scatters can be observed. Site boundaries were estimated based on the mounded features on the imagery as well as current ceramic scatters.

Date: Early Islamic

Early Islamic: GCW1.T2(1); GCW1.T6(1); GCW2.T1(1); MBG2.T9(1); MBG2.TU(3); MBG2/OWG.TU(3); OWG.TU(3)

SURVEY OF ‘ASKAR MUKRAM

As it was explained in the survey goals and objectives (5.2.4), the urban complex of ‘Askar Mukram was redefined as one mega-site, composed of four zones. KS1622A corresponds to the area surveyed by Moghaddam in 2001, located on the west bank of the Gargar. KS1622C corresponds to the remains of the city on the east bank of the Gargar. KS1622B represents the extensive remains with evidence of metal production to the north of ‘Askar Mukram. Finally, KS1622D marks the vast area west of ‘Askar Mukram that seems to have been specialized in the production of building material (see infra).

5.4.53. KS1622B

KS1622B (39R 302223 m E 3509352 m N; 34 m asl; surveyed Feb 16) is a large area composed of multiple mounds, approximately 1 km north of the site of ‘Askar Mukram, visible on imagery.[321] Since the southern part of the plain consists of vast clusters of natural mounds, and since this area was not surveyed in 2001, it was necessary to confirm on the ground the existence and extent of material remains. Therefore, a walking survey was conducted around the southern and western edges of the mounded area. Once the existence of a site was confirmed and its approximate boundaries were defined, six collection areas were opportunistically surveyed in an attempt to capture the diversity of material culture across the site (Map 5.22, 5.24).

Pottery density varies considerably across the site. Areas 5 and 6 (see below), which flank the deeply incised bed of a seasonal stream, appear to have been the center of activity (Fig. 5.39-5.40); accordingly, the density of material culture drops considerably beyond these zones. High concentration of metal slag, the simple and functional nature of pottery, and the proximity of the site to ‘Askar Mukram, suggest that this area could have been the industrial zone of the city. Total area ca. 151 ha.

Date: Early Islamic, Middle Islamic

- KS1622B-1

Marks the western edge of the site. Low-density sherd scatter on several natural mounds. Surface plowed and dry-farmed. Area of pottery collection ca. 1 ha. No diagnostic sherds; several body sherds of GCW and ICW and MBG2 were found; Good to moderate visibility.

[321] First reported by Ahmadzadeh & Omidfar.

Date: (possibly) Early Islamic, (possibly) Middle Islamic

- KS1622B-2

Pottery density is average. Surface plowed and dry-farmed. Area of pottery collection ca. 2 ha. Good to poor visibility, depending on the density of cultivation.

Date: Early Islamic (Late Sasanian and Middle Islamic not unlikely)

Sasanian-Early Islamic: GCW1.T1(6); BGW.T2(1)
Early Islamic: ICW.T6(1); ICW.T3(1); GCW1.T4(1); MBG2.T5(1)
Islamic: ICW.T9(5); YMG2(1)

- KS1622B-3

Marks the southern edge of the site. A small mound, height ca. 1.5 m, area less than 1 ha; levelled in all sides but the center. Brick and pottery visible on the preserved center of the mound. Poor visibility on the levelled and cultivated areas.

Date: Early Islamic

(Most likely) Early Islamic: IRW.T2(1); GCW1.TU(3)
Early Islamic: MBG2.TU(2)

- KS1622B-4

The northern edge of the site. A large area consisting of several mounds covered with slag and plain pottery. Surface-water erosion is the most active landscape transforming agent, washing away the site through several erosional gullies that flank the deeply incised bed of a seasonal stream. The northern part of the site also seems to have been destroyed by the construction of the road that defines the northern border of the site. Pottery collection in an area ca. 1 ha. Good visibility.

Date: Early Islamic (Achaemenid, and Parthian not unlikely)

Achaemenid?: ASW.TU(7)?

Early Islamic: GCW2.T3(1); MBG2.T5(1); GCW1.T1(1); GCW1.T2(1)
(Most likely Early) Islamic: ICW.T3(4); ICW.T5(1); GCW2.T5(1); BGW.T3(3)
Islamic: ICW.T9(2); IRW (1)

- KS1622B-5

This is the central part of the site and densest concentration of pottery and slag. It is similar to Area 4; gully formation as a result of surface-water erosion.

Date: Early Islamic, (Parthian, late Sasanian, and Middle Islamic habitation not unlikely)

Parthian? : BGW.T1(2)

(Most likely) Early Islamic: GCW1.T1(7); GCW1.T3(1); MBG2.T8(1); MBG2.TU(2);ICW.T2(1)
Islamic: GCW1.T2(3); BGW.T2(1); ICW.T9(1); IRW.T1(1)

- KS1622B-6

This is the southeastern-most edge of the site. Originally consisted of several mounds, covered with moderate density of pottery, slag and brick. Bulldozers have destroyed much of the northern and western parts of the area. There is better site preservation to the south and east. Area of pottery collection ca. 1 ha. Visibility good to poor, depending on density of cultivation and site destruction.

Date: Early Islamic, (possibly) early Middle Islamic

(Most likely) Early Islamic: IRW.T1(2); GCW2.T6(1); GCW1.T1(1); BGW.T2(1)
Islamic: GCW2.TU (1); ICW.T8 (3); ICW.T9(3)

5.4.54. KS1622C

KS1622C (39R 301433 m E 3505461 m N; 33 m asl; surveyed Feb 19) corresponds to the eastern side of ‘Askar Mukram. Muslim geographers of the tenth century confirmed that the town of ‘Askar Mukram stood on both sides of the Gargar. Surveys conducted by Moghaddam in early 2000s and by Ahmadzadeh & Omidfar in the early 2010s demarcated the boundaries of the larger

and more accessible side of the town, located on the western bank of the river. It was noted, however, that surface material culture covers a large area on the eastern bank. The remains of bridge(s) that connected the two sides of the river also highlight the significance of the eastern bank in the life of the city. Therefore, one of the goals of the 2014 survey was to visit the features on the eastern side of the river and to mark the approximate boundaries of its archaeological remains. Given the huge size of the site and the time constraints of the field season, site boundaries were established through an opportunistic vehicle survey, aided by CORONA and aerial imagery (Map 5.22-5.23).

The eastern side of the site of ‘Askar Mukram, although threatened by the rapid advance of fish farms toward the site, is far better preserved than the western side. Within the zone of archaeological remains, gully formation is the major destructive agent, though currently in a limited area. In addition to a high sherd density, architectural remains are attested by numerous brick fragments and by sections of buildings revealed in the gullies. Total estimated area ca. 110 ha.

- KS1622C-1

Approximately 1 km north of the main area of KS1622C, an isolated area, approximately 5 ha, densely covered with brick fragments and pottery was surveyed (Fig. 5.41-5.42). Several illegal excavations have been conducted on the mound, which overlook the valley of the Gargar and the western side of ‘Askar Mukram. Good visibility. Good visibility.

Date: Early Islamic, (primarily) Middle Islamic

Early Islamic: ICW.T9(1); OWG(1)
Middle Islamic: MGG2.T10(3); BGW.T3(1); UGP1.T1(5)
Early/Middle Islamic: ICW.T2(1); ICW.T3(5); ICW.T5(2); ICW.T6(1); ICW.T7(1)

• KS1622C-2

Main area of KS1622C (Fig. 5.45-5.46). High concentration of pottery and brick. Archaeological features exposed by clear crop marks on the surface as well as by sections cut through the structures by gullies (Fig. 5.47). Pottery collection in an area ca. 8 ha. Good visibility.

Date: Early Islamic, Middle Islamic

Early Islamic: MBG2.T7(1); MBG2.T10(11); IGP.T6(1); ICW.T5(1); ICW.T9(7); IGP(3); ICW.T3(3); OWG.T5(1); OWG.T8(1); MYG2(1)
Middle Islamic: MGG2.T5(1); MGG2.TU(3); UGP(3); MGG2(3)?
Early/Middle Islamic: MBG2.T6(1); BGW.T3(4); ICW.T6(3)

• KS1622C-3

Pottery collection on and around the remains of the bridge (Fig. 5.49).[322]

Date: (primarily) Early Islamic, Middle Islamic

Early Islamic: BGW.T3(1); MBG2.T8(1); MYG2.T6(1); OWG.T5(1); MGG2.T5(1); IGP(4); ICW.T9(4); SPW(1)
Middle Islamic: ICW.T2(1); MBG2(1); UGP2(1)
Early/Middle Islamic: IRW.T1(1); ICW.T3(1); ICW.T4(1); ICW.T6(1)

5.4.55. KS1622D

KS1622D (39R 299774 m E 3507744 m N; 25 m asl; surveyed Feb 22) includes eight Islamic-period sites recorded by Moghaddam in 2001, KS1568, KS1570-KS1579, as well as the area between them. The Shushtar-Ahwaz road separates ‘Askar Mukram, KS1622A, from this area. The 2001 report mentions that brick kilns were observed on these sites. One of the 2014 survey objectives was to check the possibility that these sites were part of the urban complex of ‘Askar Mukram. Survey confirmed that the dominant feature on these sites, which spread over an area known as Sedrat Chaii, are kilns with huge amounts of brick and gypsum (?) and very little

[322] The bridge is described in chapter 6, as a part of the urban landscape of ‘Askar Mukram.

pottery (Fig. 5.55-5.60). Therefore, all these formerly recorded sites were included under the site number KS1622D that stands for the industrial area of the ‘Askar Mukram urban complex. Only on one site, KS1571, was occupation as early as the Achaemenid period recorded by Moghaddam. It is possible that this site was an ancient settlement subsumed in the expansion of ‘Askar Mukram (Map 5.22-5.23).

5.4.56. Negini

Based on CORONA imagery and Moghaddam's data, an area that would most likely cover all the mounds with surface pottery was selected (300 ha). A grid consisting of 25-ha squares was placed over this area. Within each 25-ha square, between one to three 1-ha squares were opportunistically selected based on imagery, depending on the distance of the 25-ha squares from the center of the site. Ten percent of this site's area was surveyed, in 25 m wide transects (Map 5.21). Time constraints on the survey did not allow for collection and post-survey analysis of pottery from the sampled areas. At the end of each transect, pottery was examined and grouped according to different ware types (Table 5.1, Fig. 5.62-5.67).

Based on the dominance of GCW (1, 2), datable to the Sasanian and Islamic periods, and ICW, datable to the Islamic period in all sample areas (Fig. 5.62, 5.5.64, 5.65), the main period of the use of the site seems to have been from the Late Sasanian and Middle Islamic times. [323] Given the similarity of GCW2 and coarser varieties of PCW (Fig. 5.65), datable to the Parthian period, the extent of Parthian and Middle Islamic period occupation across the site is difficult to determine.[324] The dominance of Sasanian-Early Islamic and Early Islamic period ware types is, however, clear. The detailed results per sample square are listed in Table 5.1.

[323] The majority of diagnostics recovered from the site belong to the GCW 1 type.
[324] The extent of the Parthian period appear to have been overestimated.

5.5. Conclusion

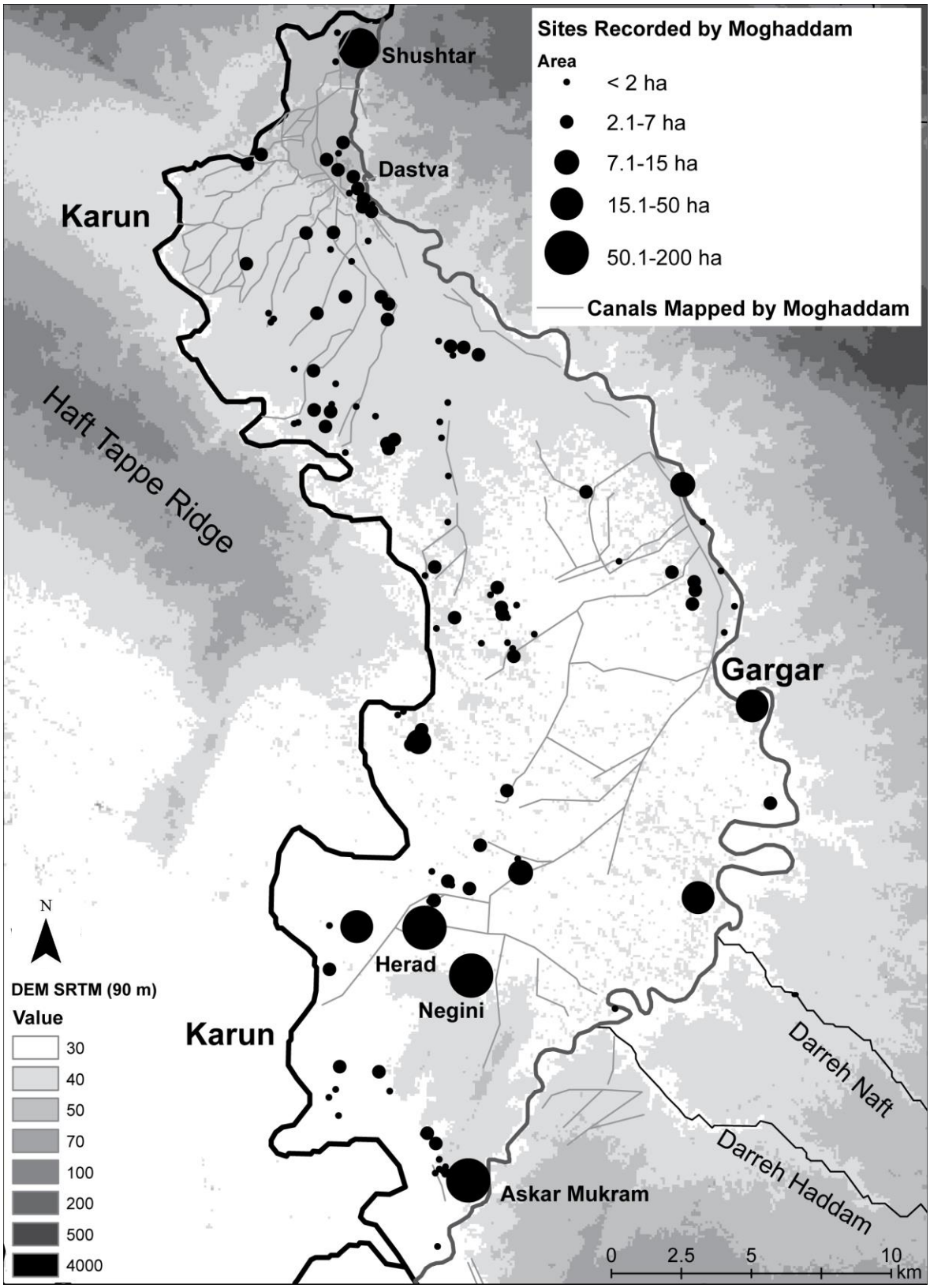
The 2014 survey aimed at answering questions raised during the remote-sensing study of the plain (chapter 4). Some of these relate to settlement pattern and land use across the plain and some to the mapping and study of ancient canal systems.

Some of the main conclusions and results of the survey are summarized here. Survey results suggest two patterns of settlement distribution across the plain. One pattern is defined by the sites aligned with relict water channels. In this zone, areas with maximum hydraulic advantage were densely populated. Therefore, in the apparently "empty" areas near these water channels, human activity seems to have been characterized by intensive farming and agricultural installations that are not easily captured in non-imagery aided surveys. Despite their small size, these are indeed the type of site that is essential for our understanding of the history of irrigation and agricultural production on the plain. In this upper part of the plain, the significance of the site of Dastowa seems to have been under-appreciated. The evidence gathered by the survey suggests that the entire outcrop of Dastowa needs to be understood as one site, and that most areas of the site seem to have been occupied during the Parthian period.

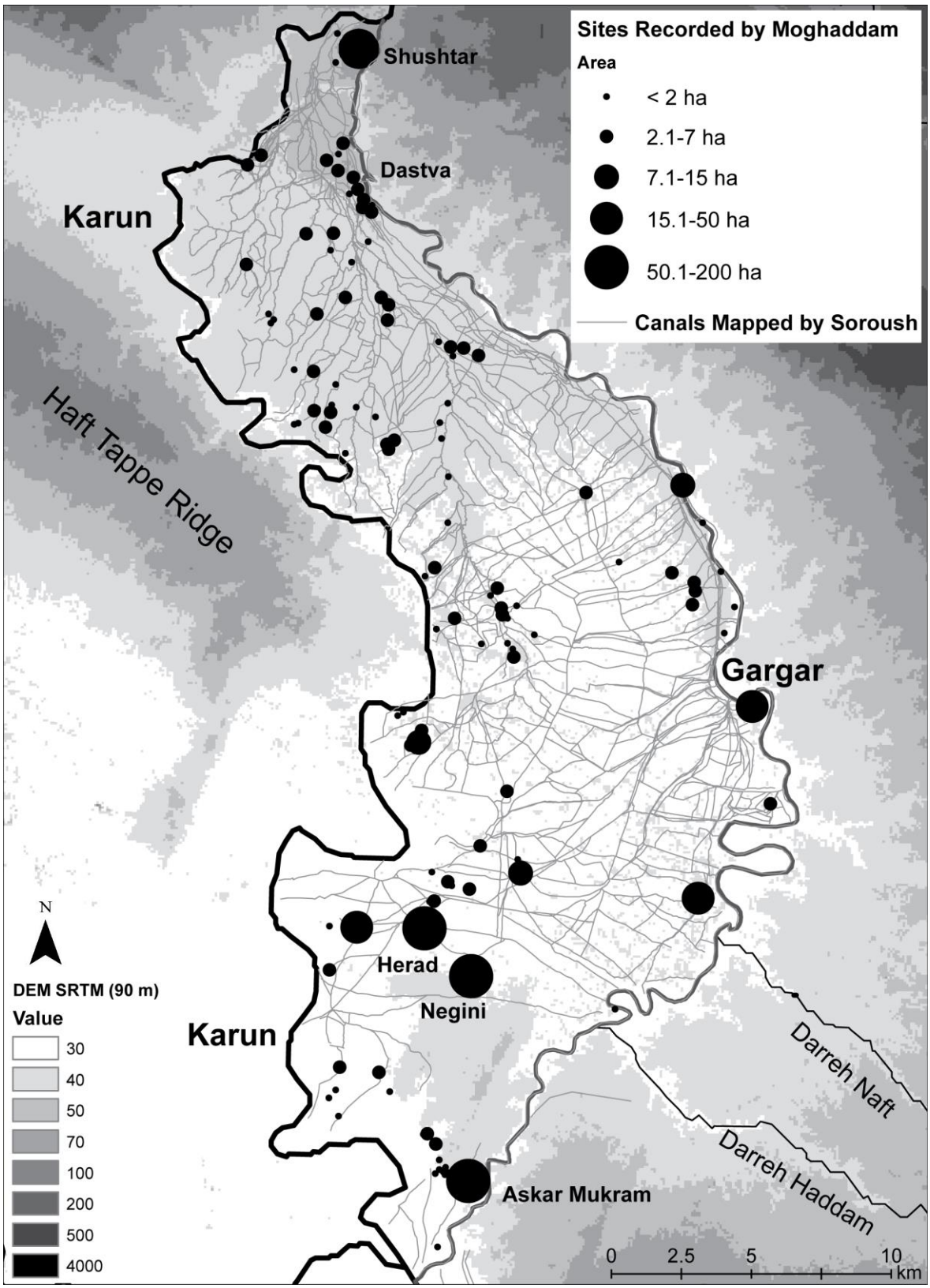
The second pattern is defined by the expansion of later historical sites, especially of Islamic date, particularly in the lower and less agriculturally advantageous areas of the plain. The most important site of this type is 'Askar Mukram. I have used the survey observations to argue that the urban complex of 'Askar Mukram expanded over a much larger area than previously suggested, including both residential and industrial areas. In addition, I have proposed that the existence of the large, sprawling site of Negini (and perhaps Herad) should be understood as a part of this phenomenon.

With regard to the ground-truthing of ancient canals, the information collected in the 2014 season enabled me to modify the mapped canal system and increase the certainty of remote-sensing reconstructions. In addition, I was able to obtain a more reliable understanding of the capacity of ancient canal systems of the Miyanab. Finally, it was possible to observe the modes of transformation of ancient irrigated features in the modern landscape and the signature of each of these changes on historic satellite and aerial imagery.

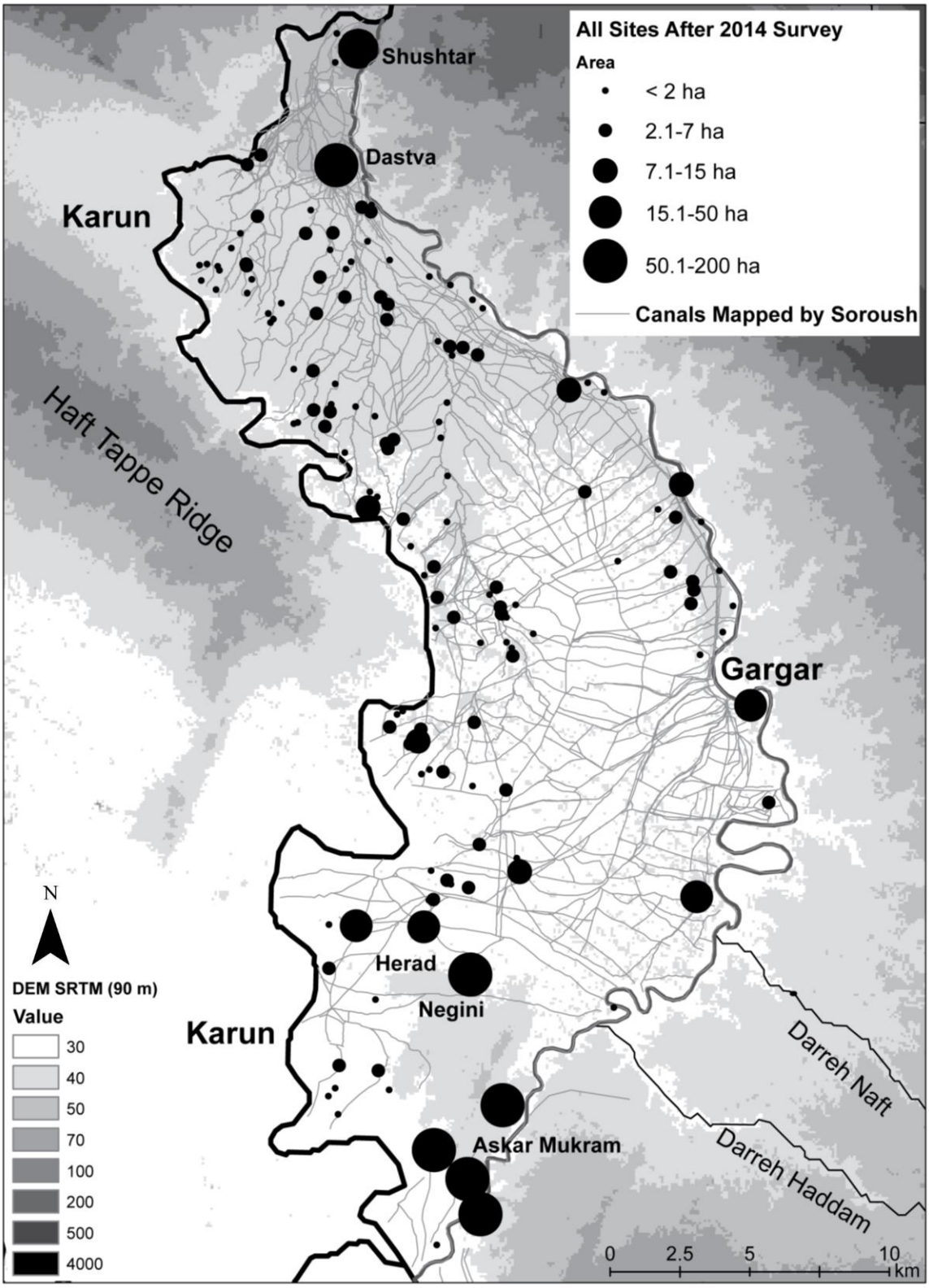
Map 5.1 Sites and relict canal on the Miyānāb. (After Moghaddam 2005, 2012)



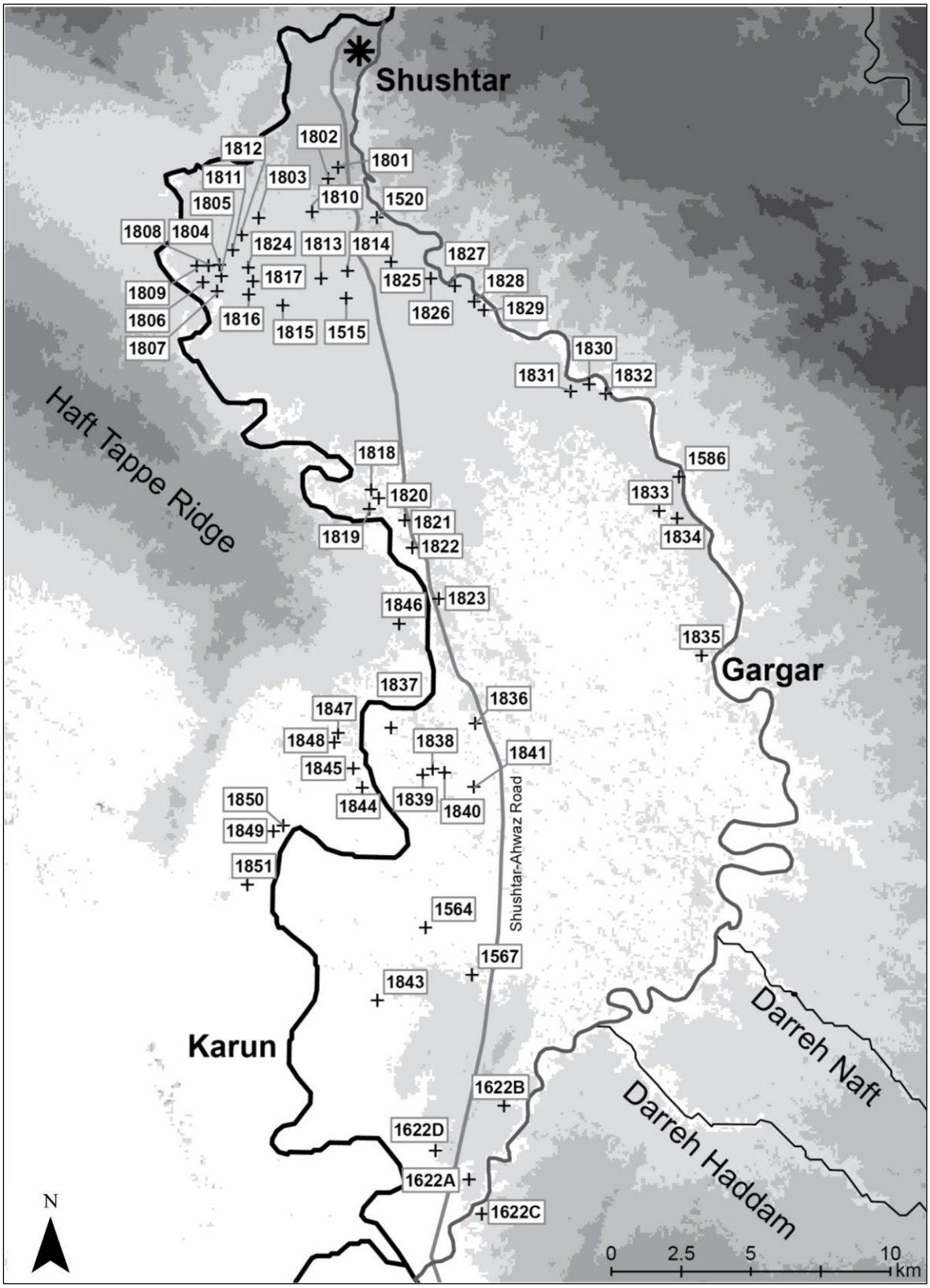
Map 5.2 The Miyanab sites recorded by Moghaddam, laid over the canals mapped by Soroush



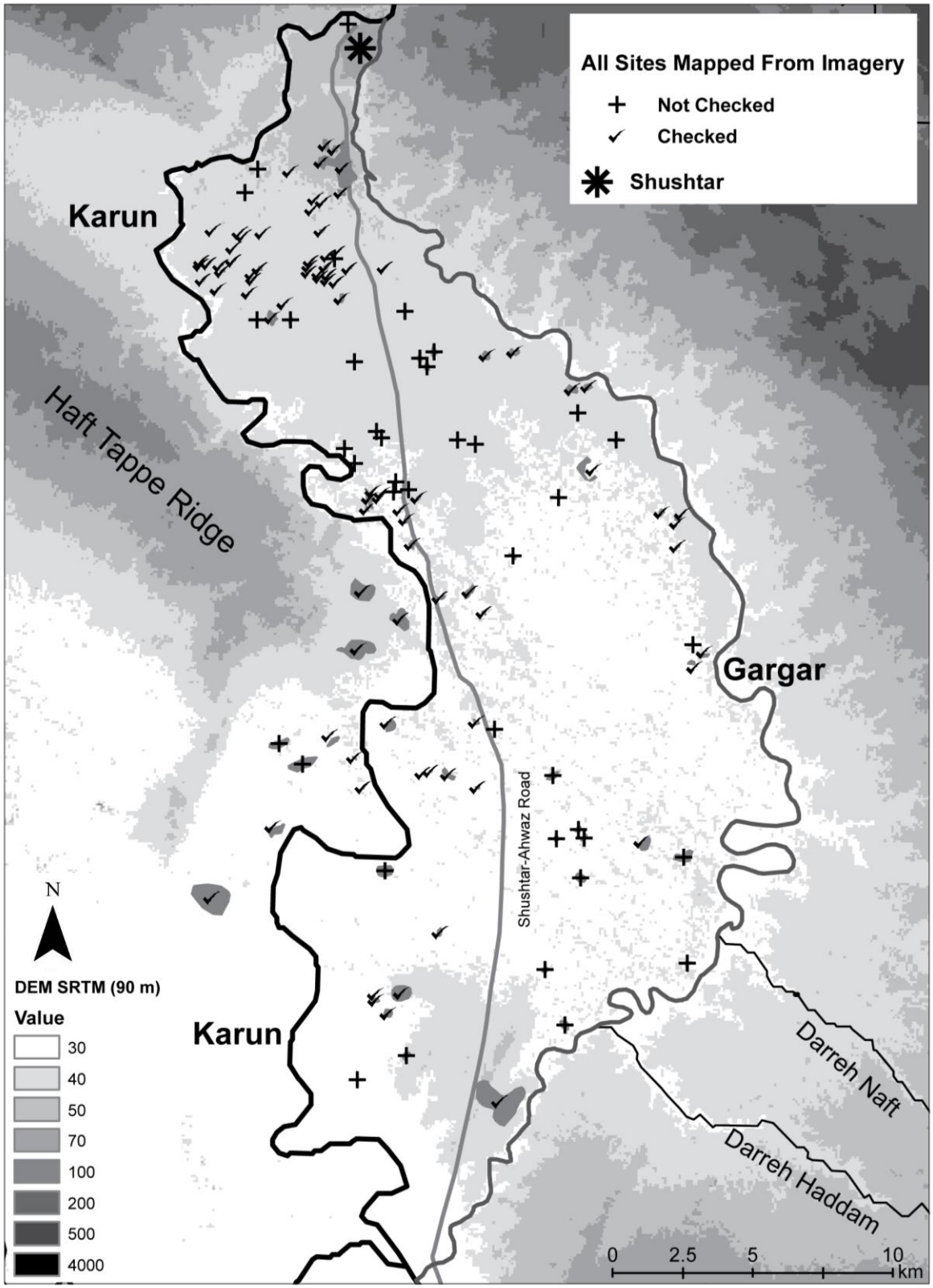
Map 5.3 Settlement pattern on the Miyanab plain; data from the 2001 and 2014 surveys integrated.



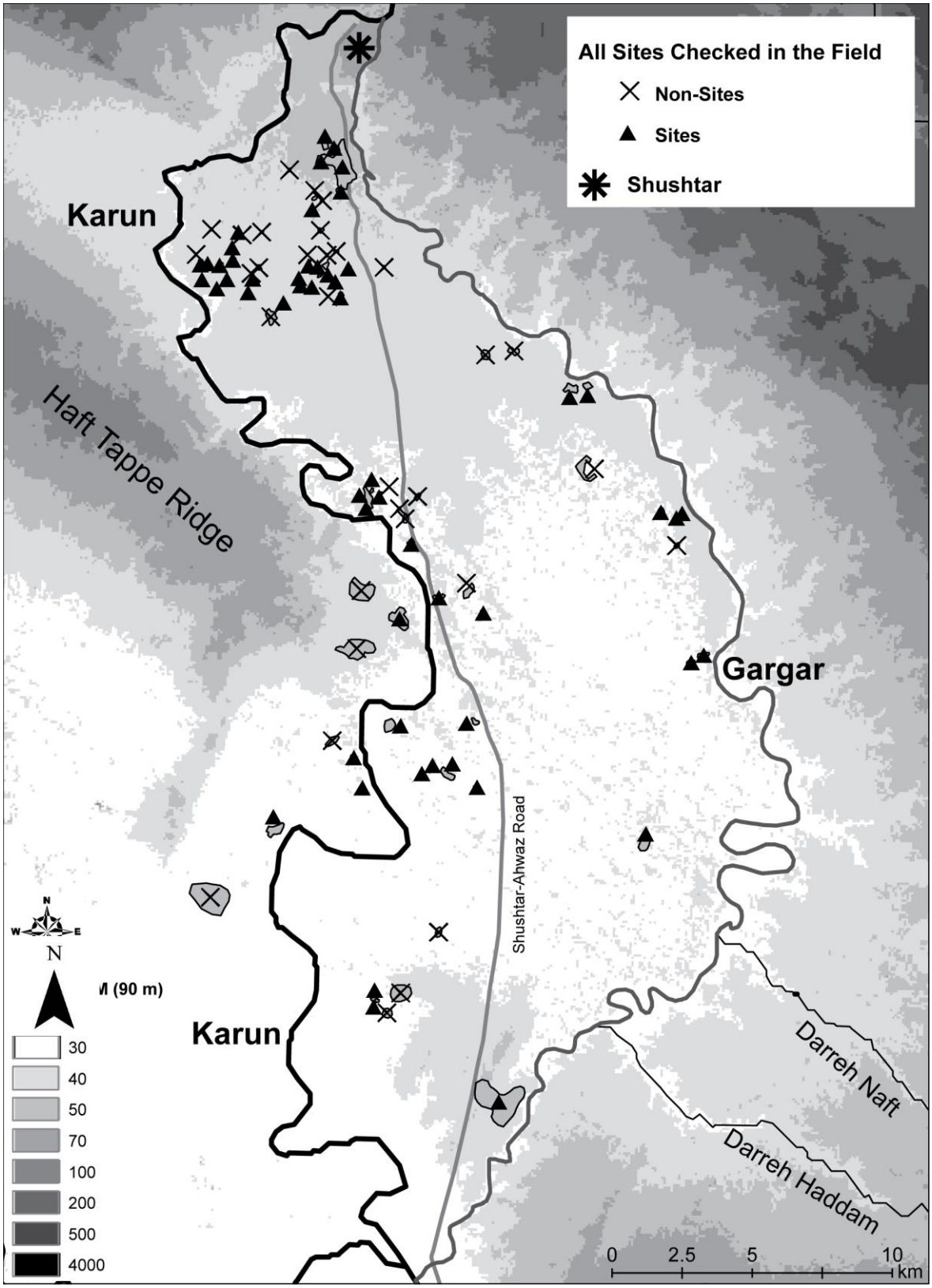
Map 5.4 All sites recorded or revisited in the 2014 Survey.



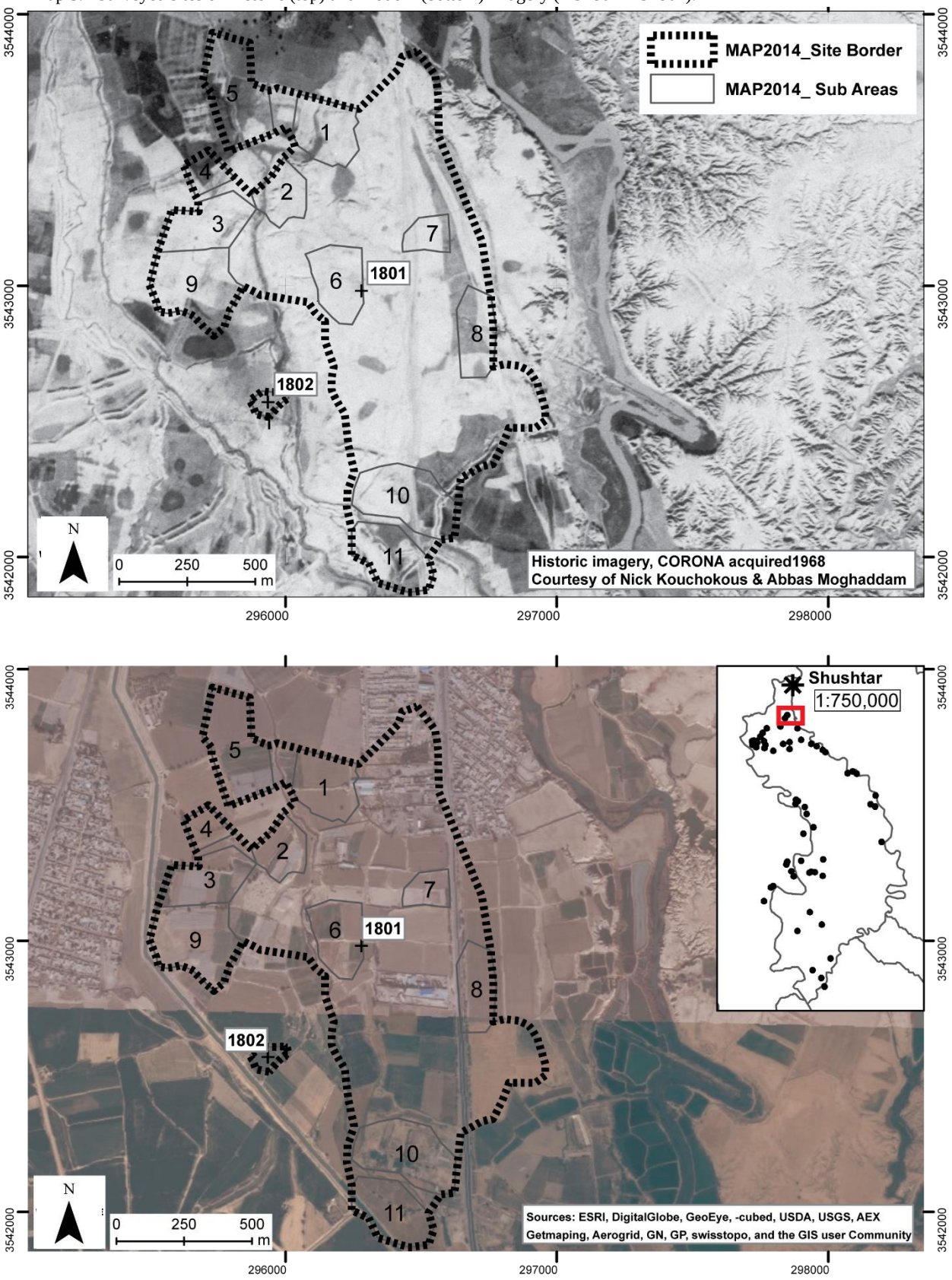
Map 5.5 All sites mapped from Imagery: checked vs. un-checked



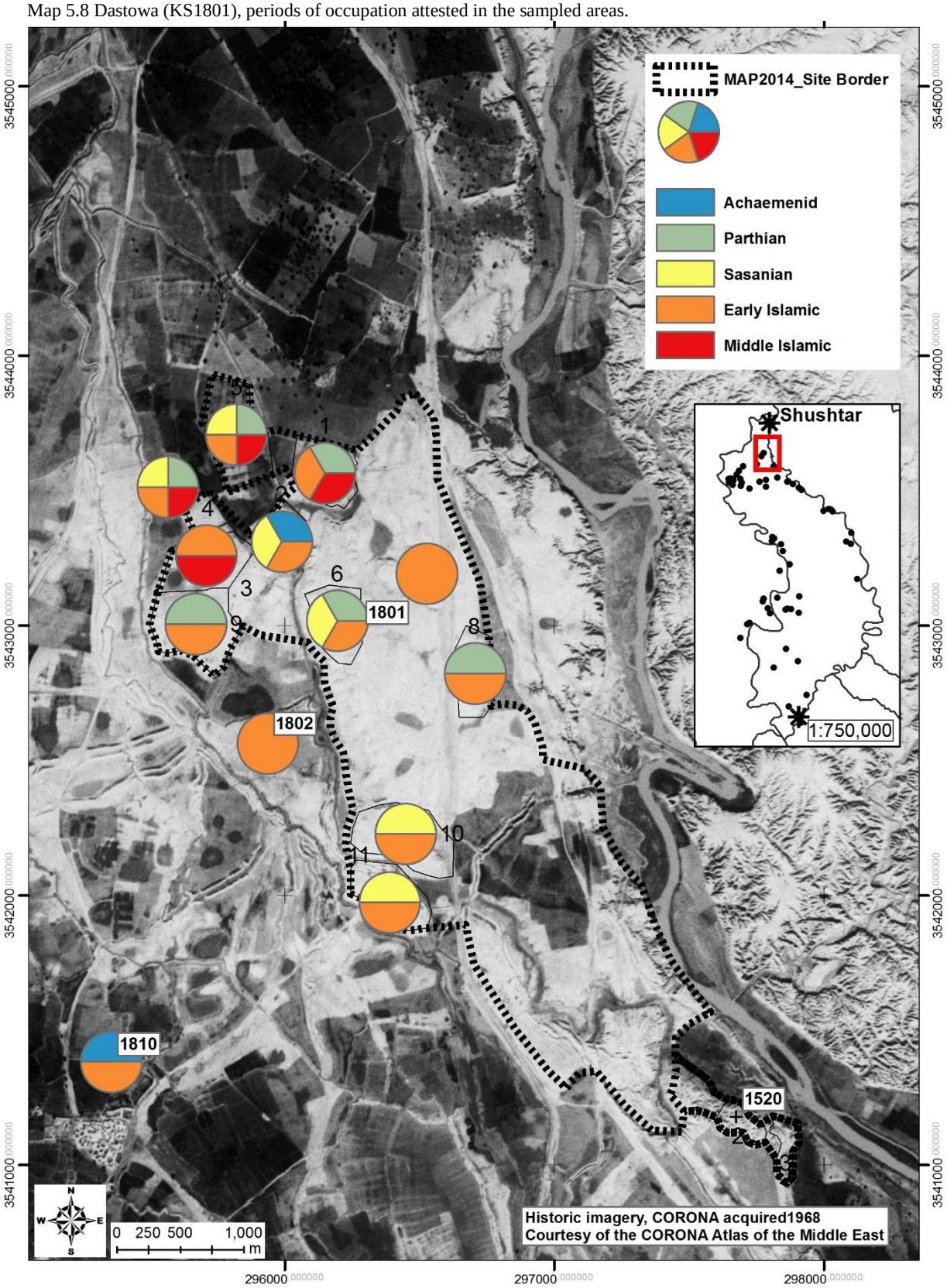
Map 5.6 All visited locations; confirmed sites vs. non-site.



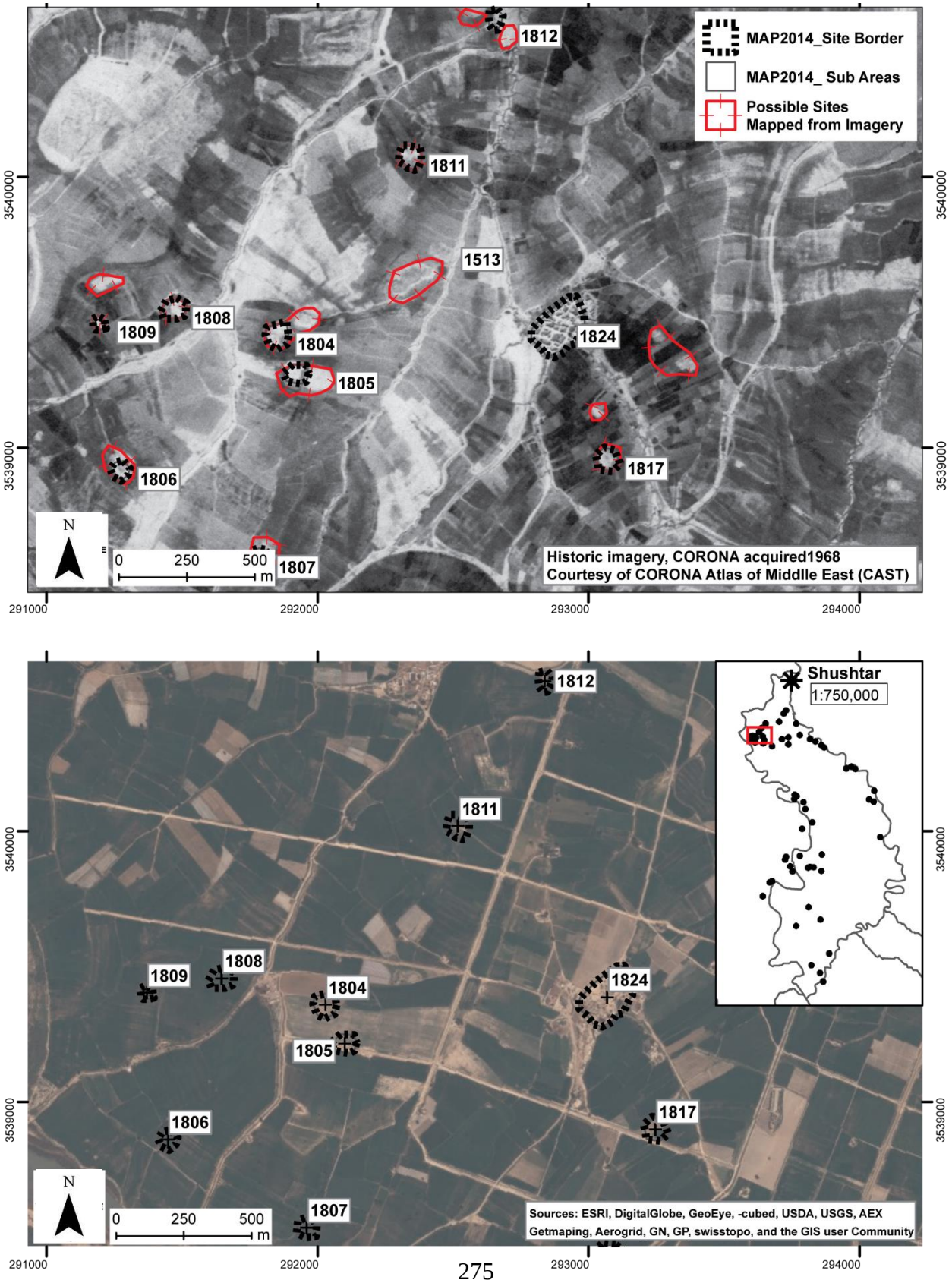
Map 5.7 Surveyed sites on historic (top) and modern (bottom) imagery (KS1801-KS1802).



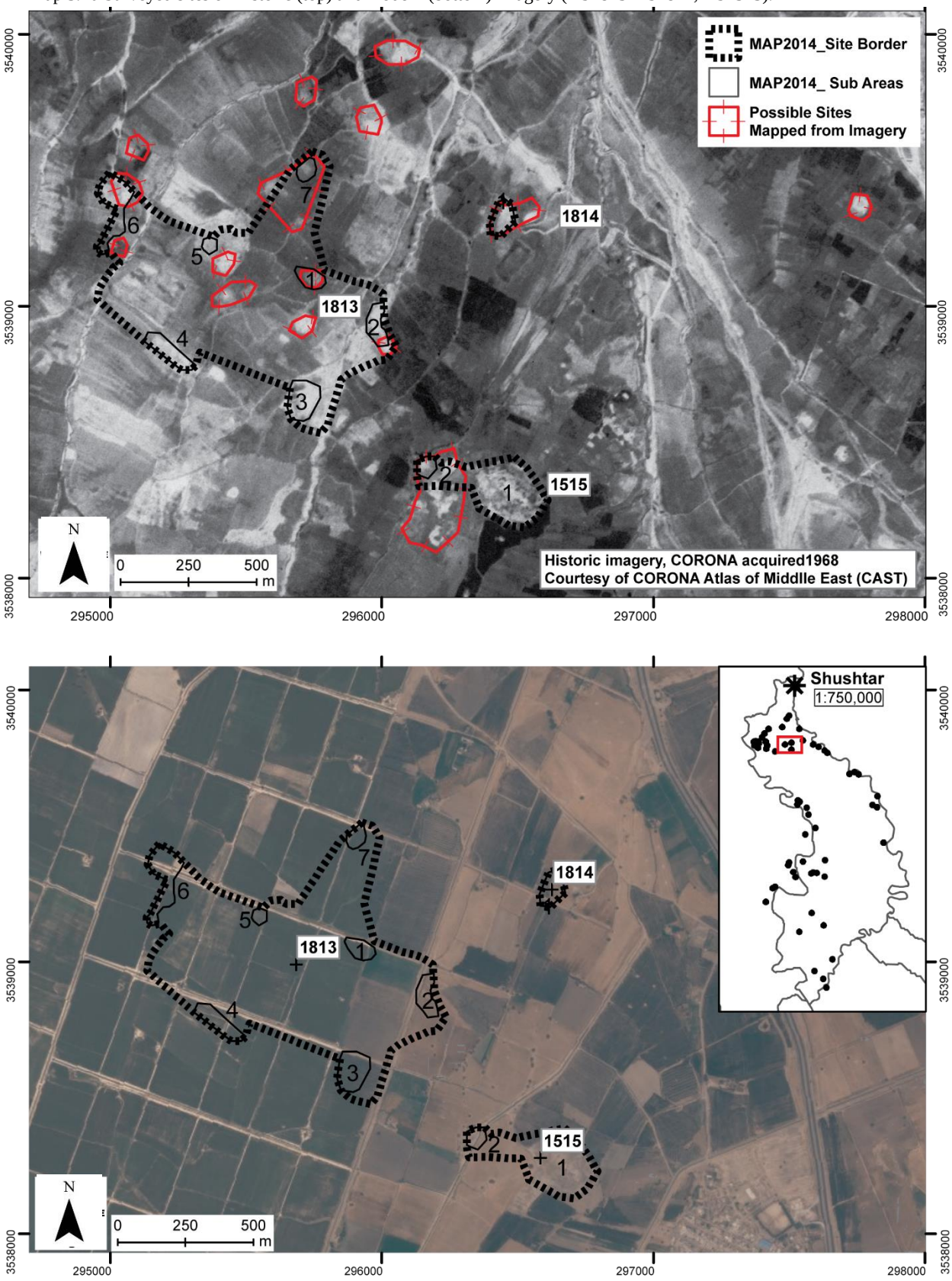
Map 5.8 Dastowa (KS1801), periods of occupation attested in the sampled areas.



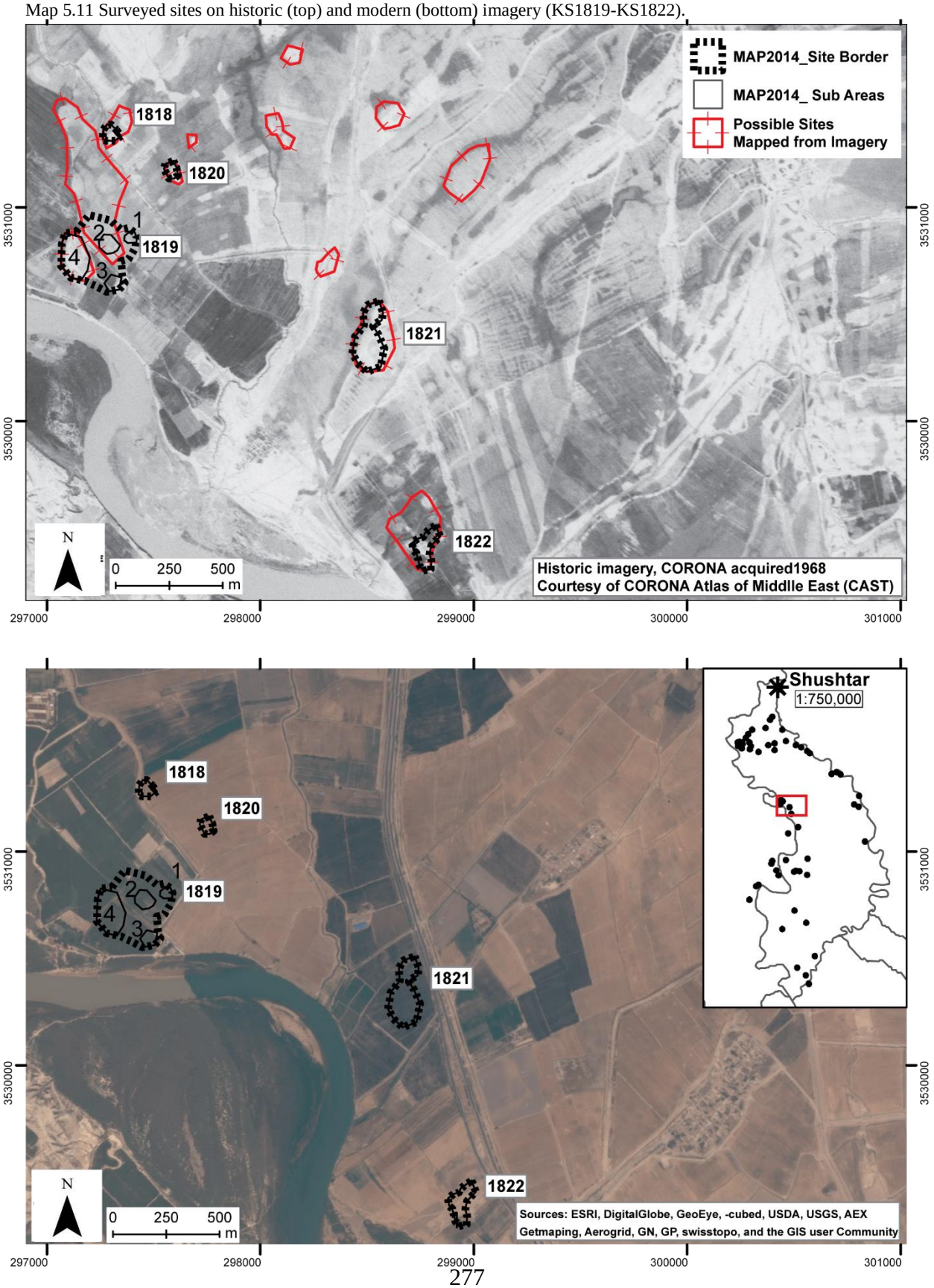
Map 5.9 Surveyed sites on historic (top) and modern (bottom) imagery (KS1804-KS1812, KS1513, KS1824).



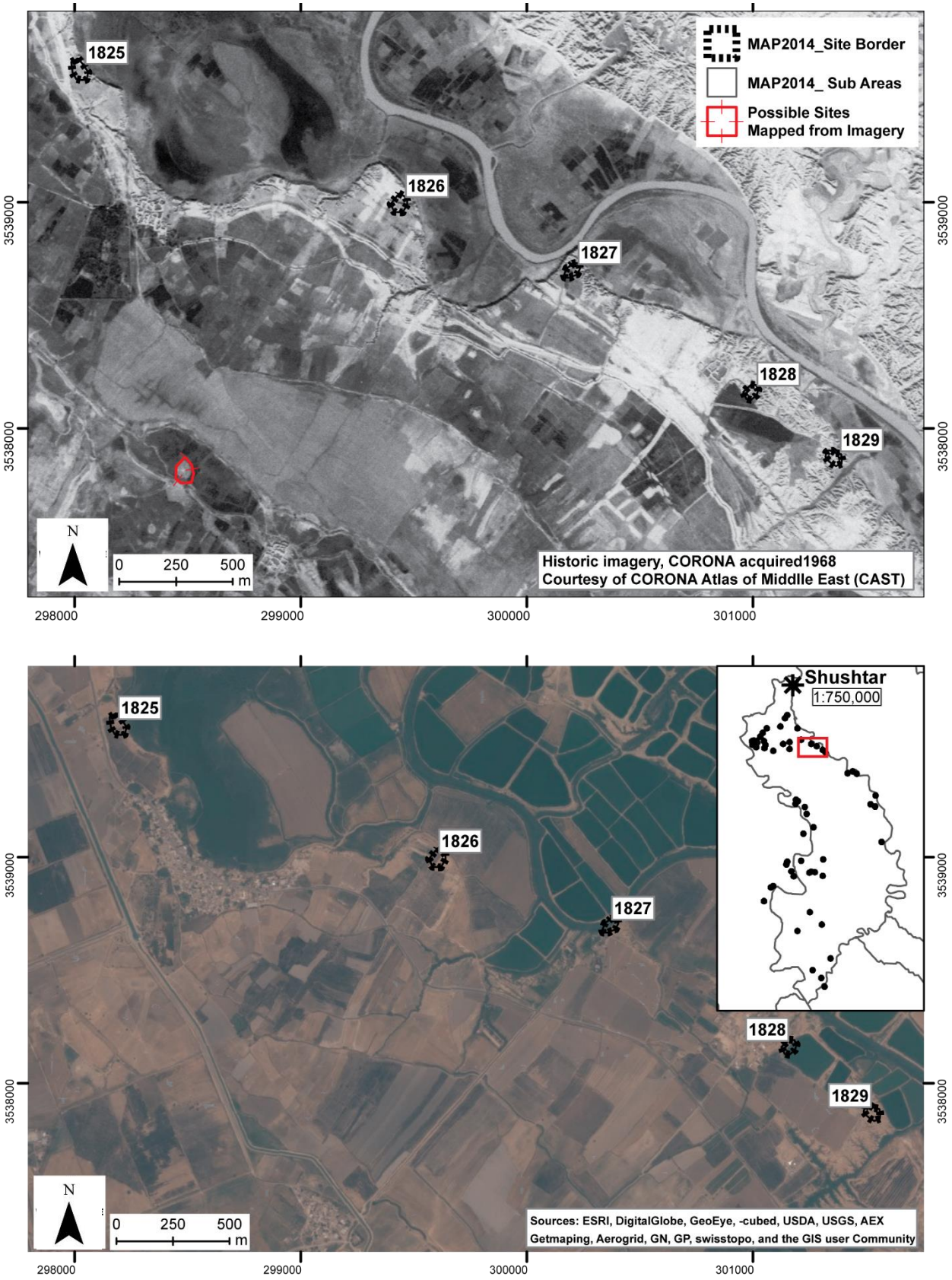
Map 5.10 Surveyed sites on historic (top) and modern (bottom) imagery (KS1813-KS1814, KS1515).



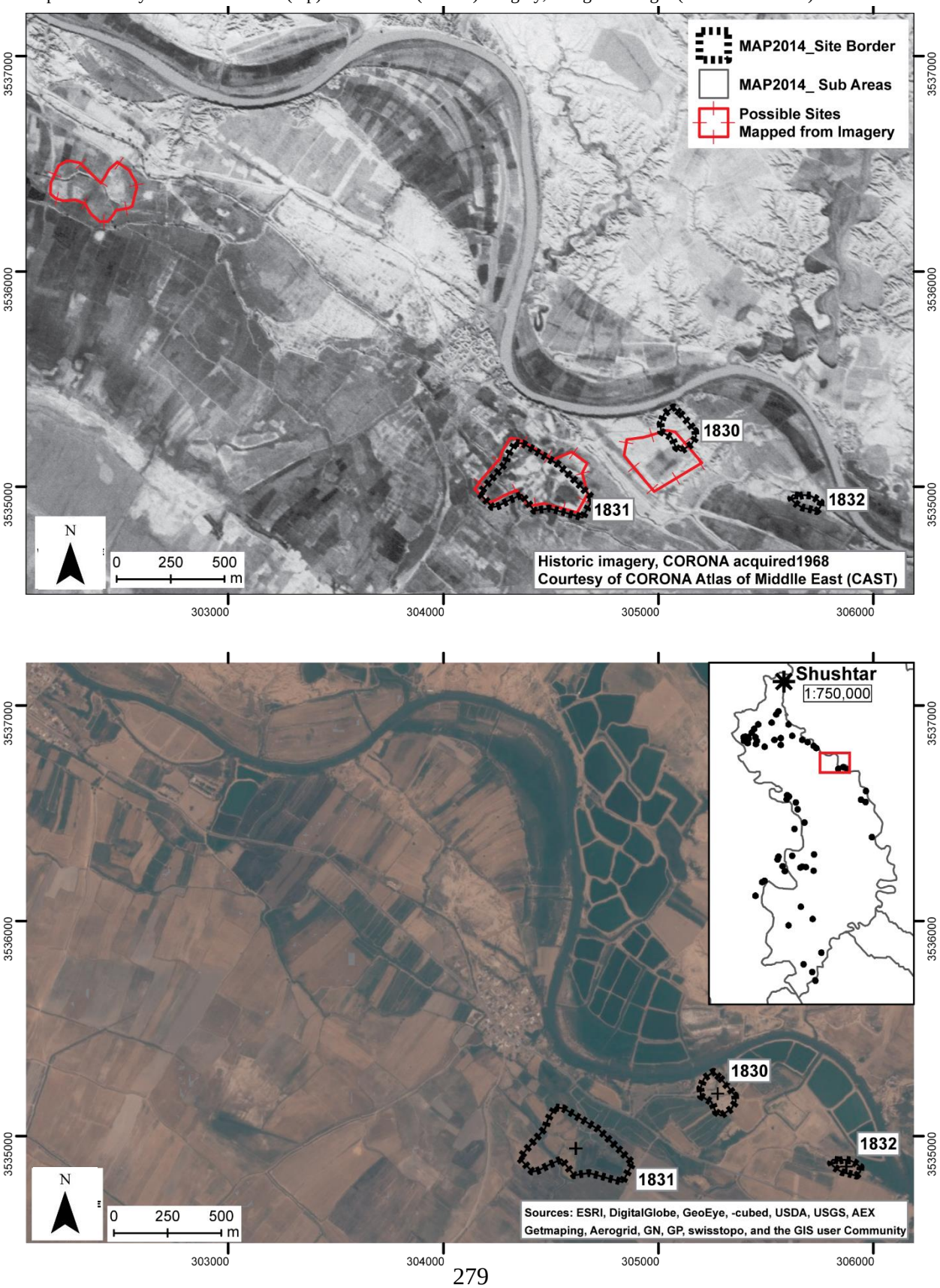
Map 5.11 Surveyed sites on historic (top) and modern (bottom) imagery (KS1819-KS1822).



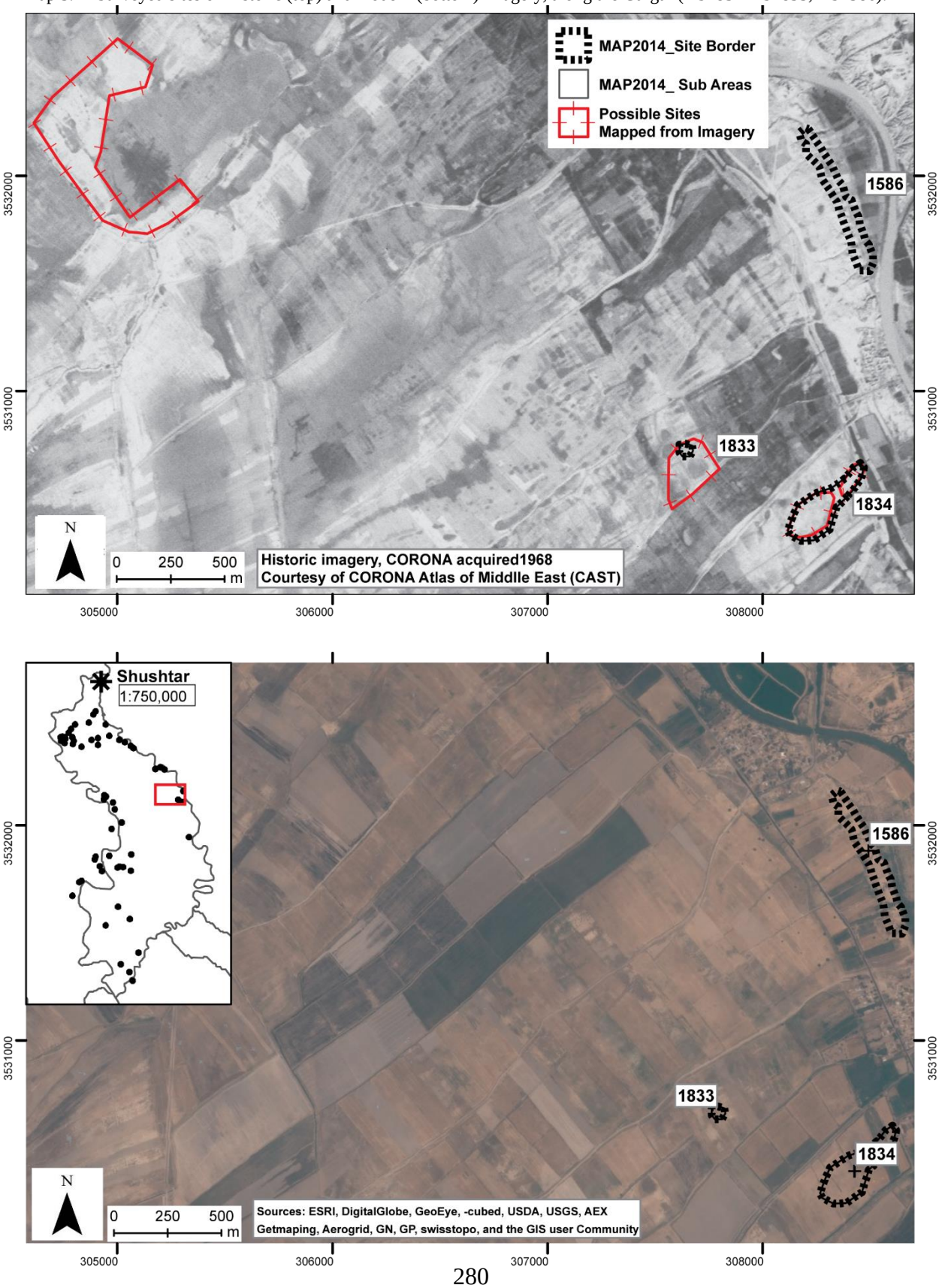
Map 5.12 Surveyed sites on historic (top) and modern (bottom) imagery, along the Gargar (KS1825-KS1829).



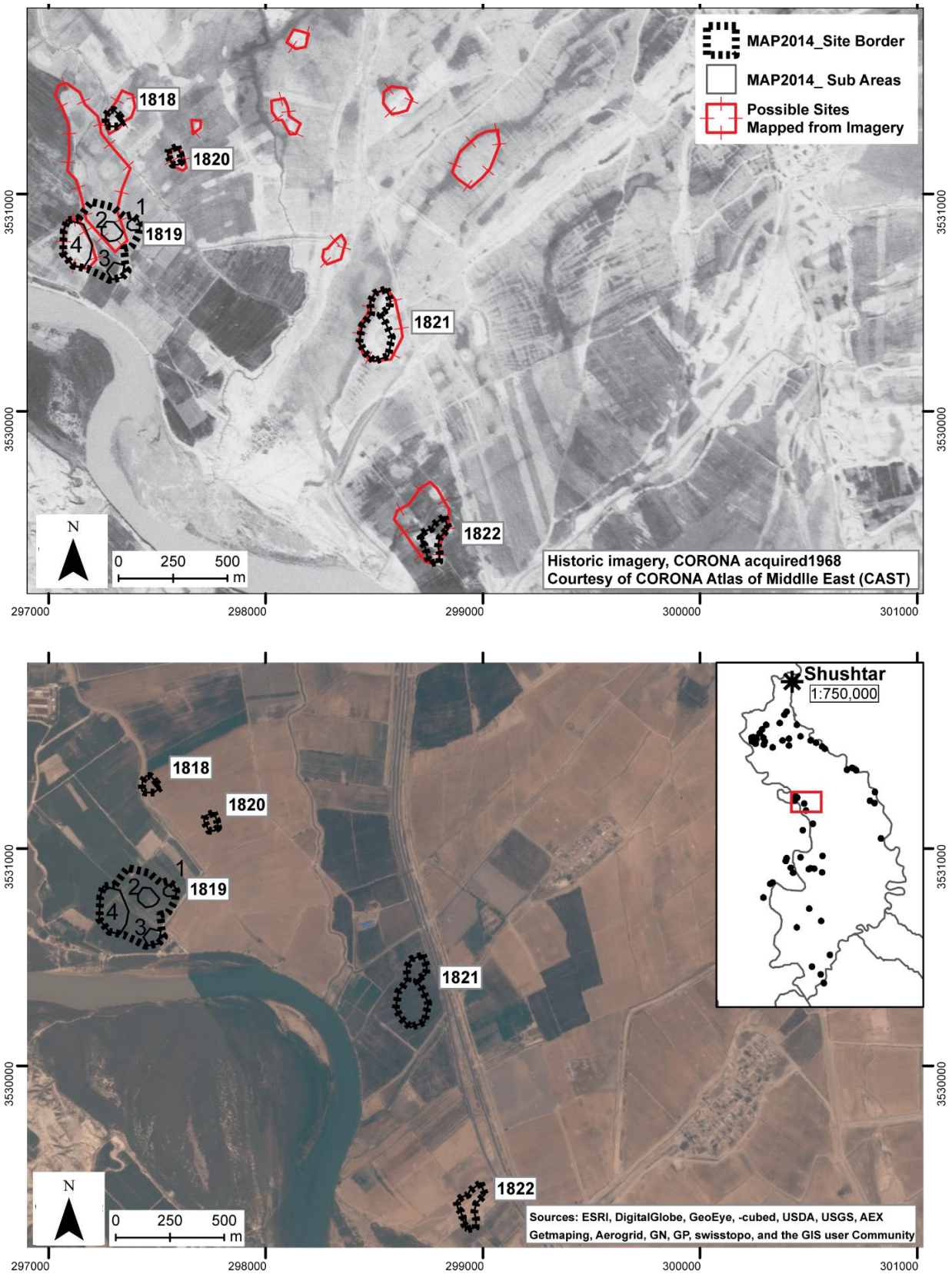
Map 5.13 Surveyed sites on historic (top) and modern (bottom) imagery, along the Gargar (KS1830-KS1832).



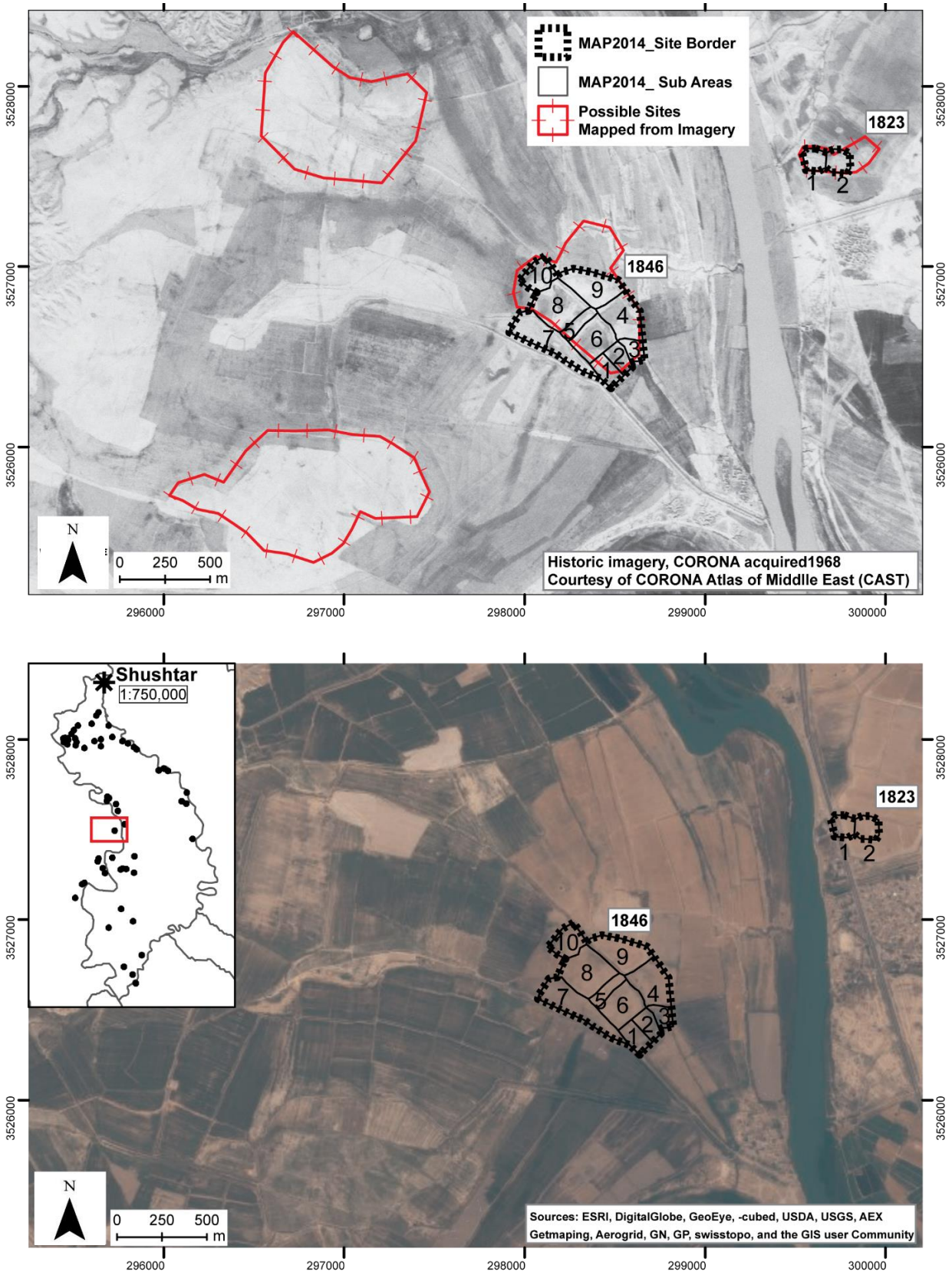
Map 5.14 Surveyed sites on historic (top) and modern (bottom) imagery, along the Gargar (KS1834-KS1835, KS1586).



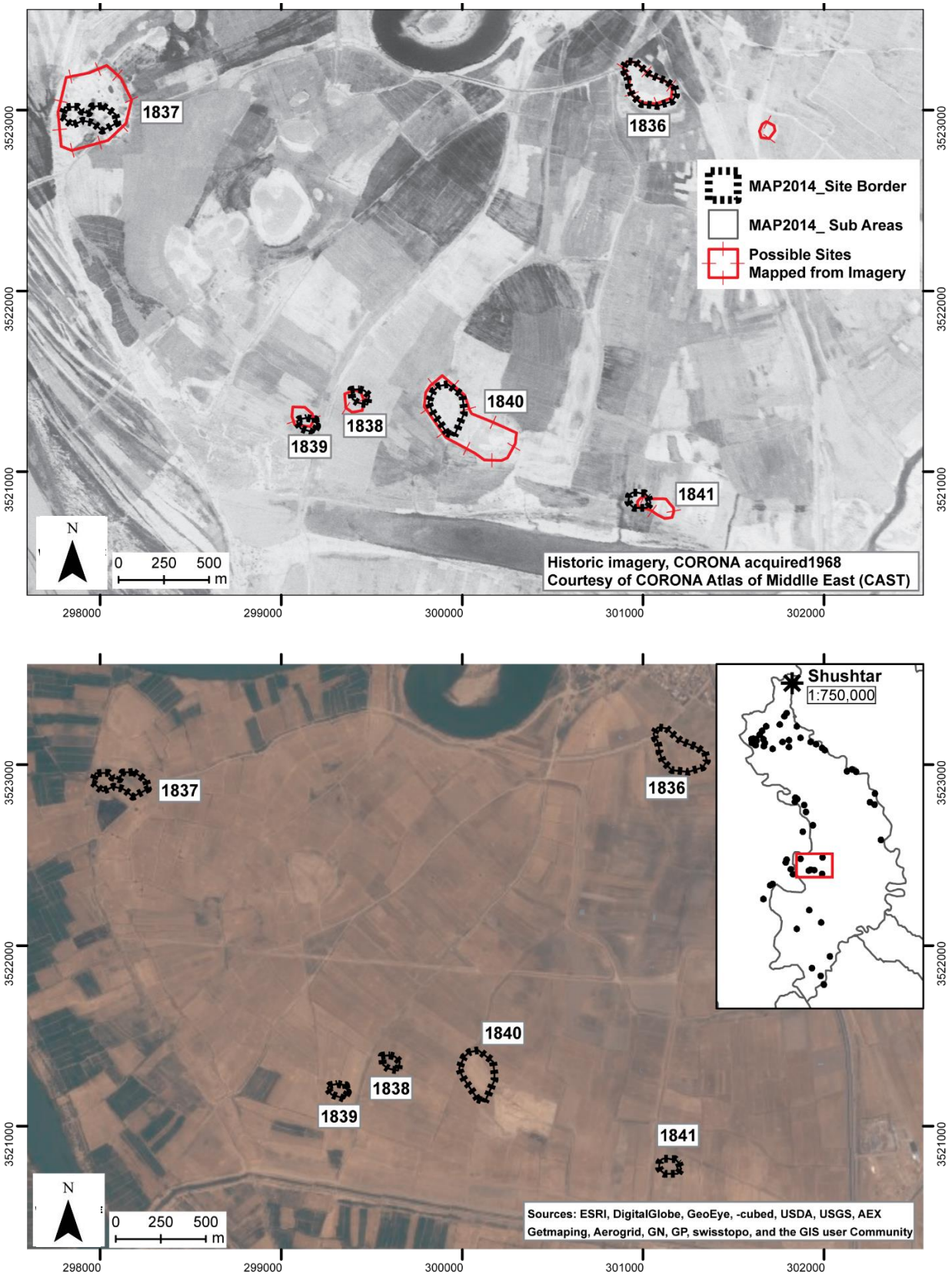
Map 5.15 Surveyed sites on historic (top) and modern (bottom) imagery, near the Karun (KS1819-KS1822).



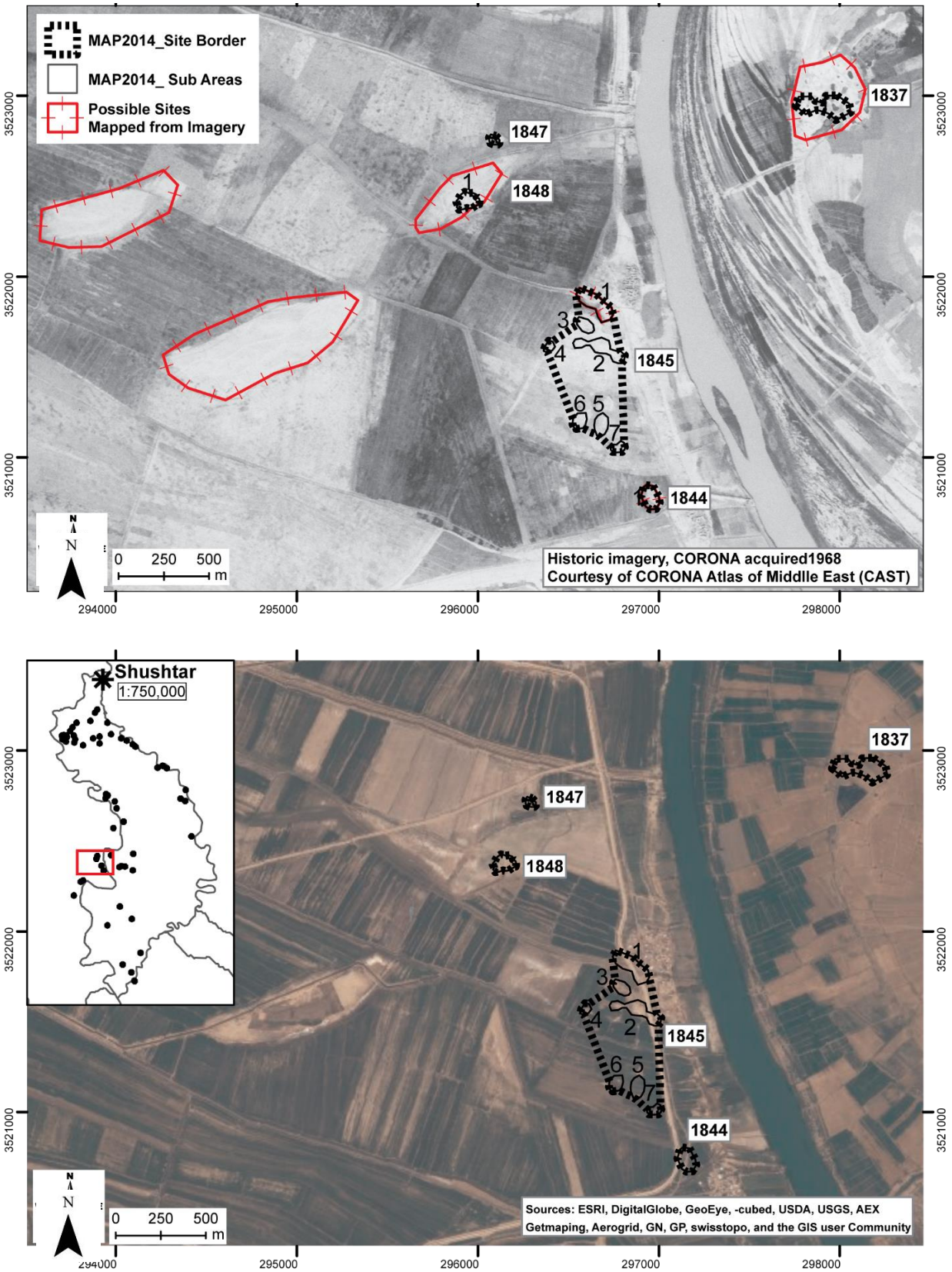
Map 5.16 Surveyed sites on historic (top) and modern (bottom) imagery, near the Karun (KS1823, KS1846).



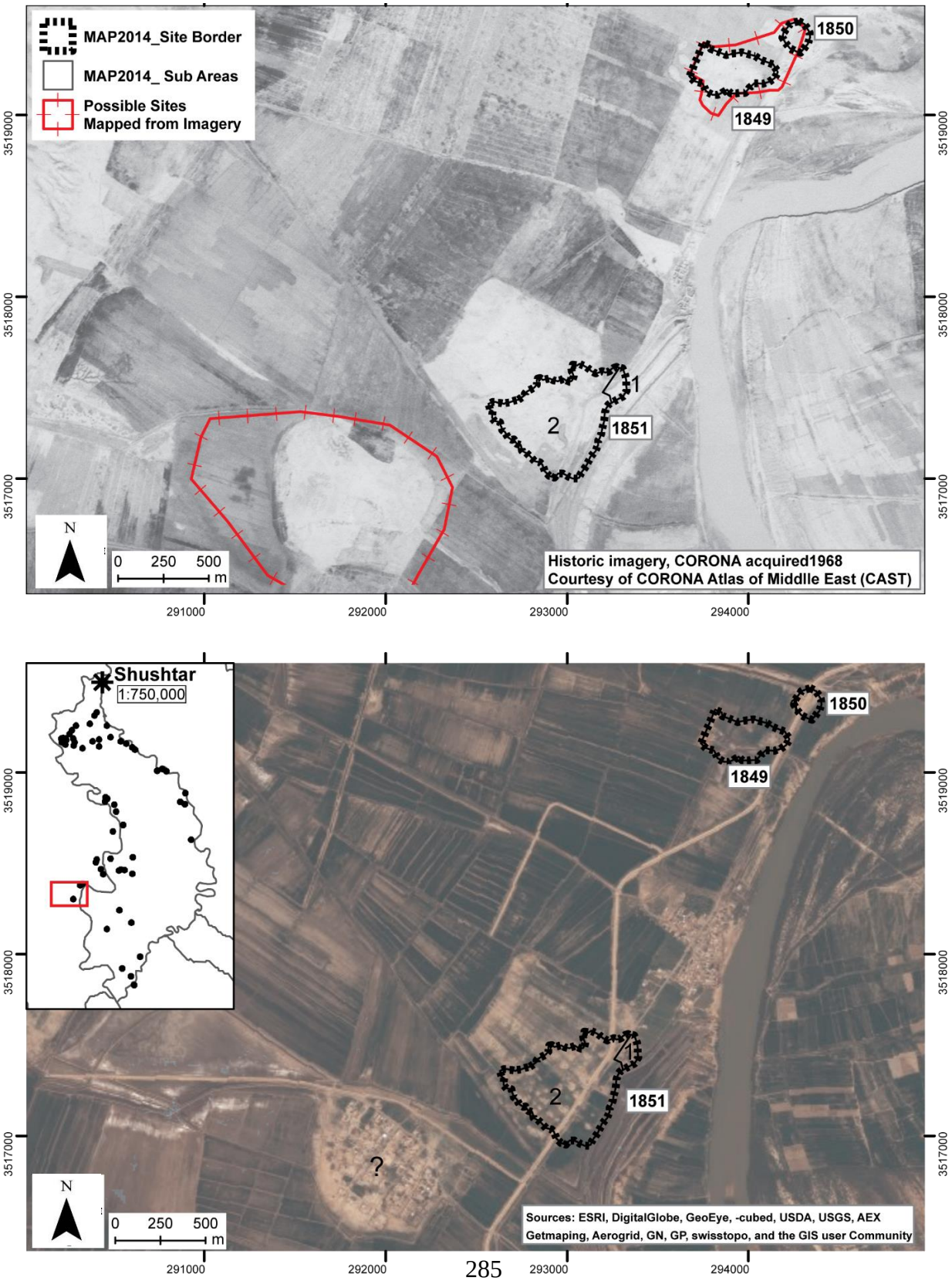
Map 5.17 Surveyed sites on historic (top) and modern (bottom) imagery, near the Karun (KS1836-KS1841).



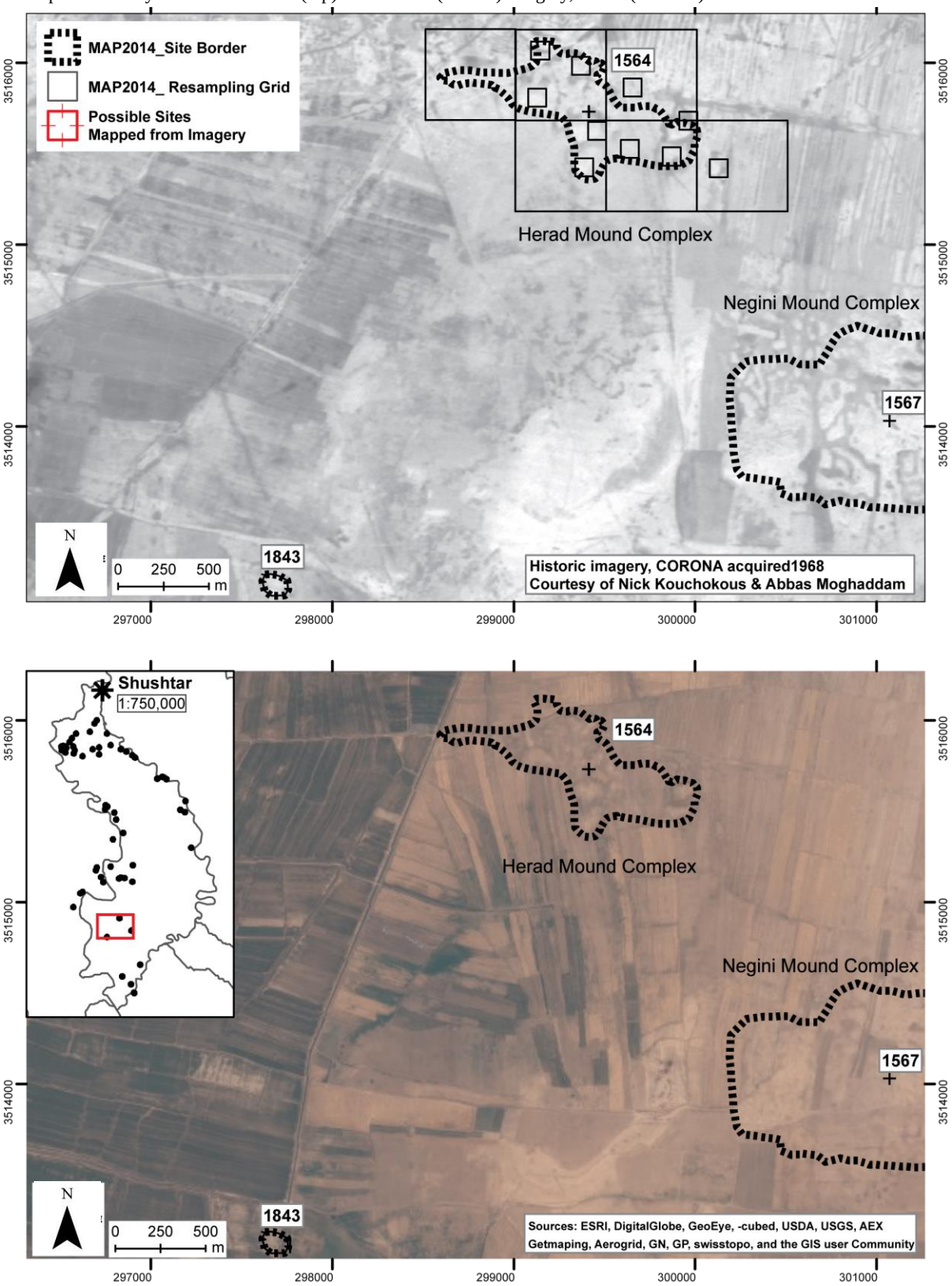
Map 5.18 Surveyed sites on historic (top) and modern (bottom) imagery, near the Karun (KS1837, KS1844-KS1848).



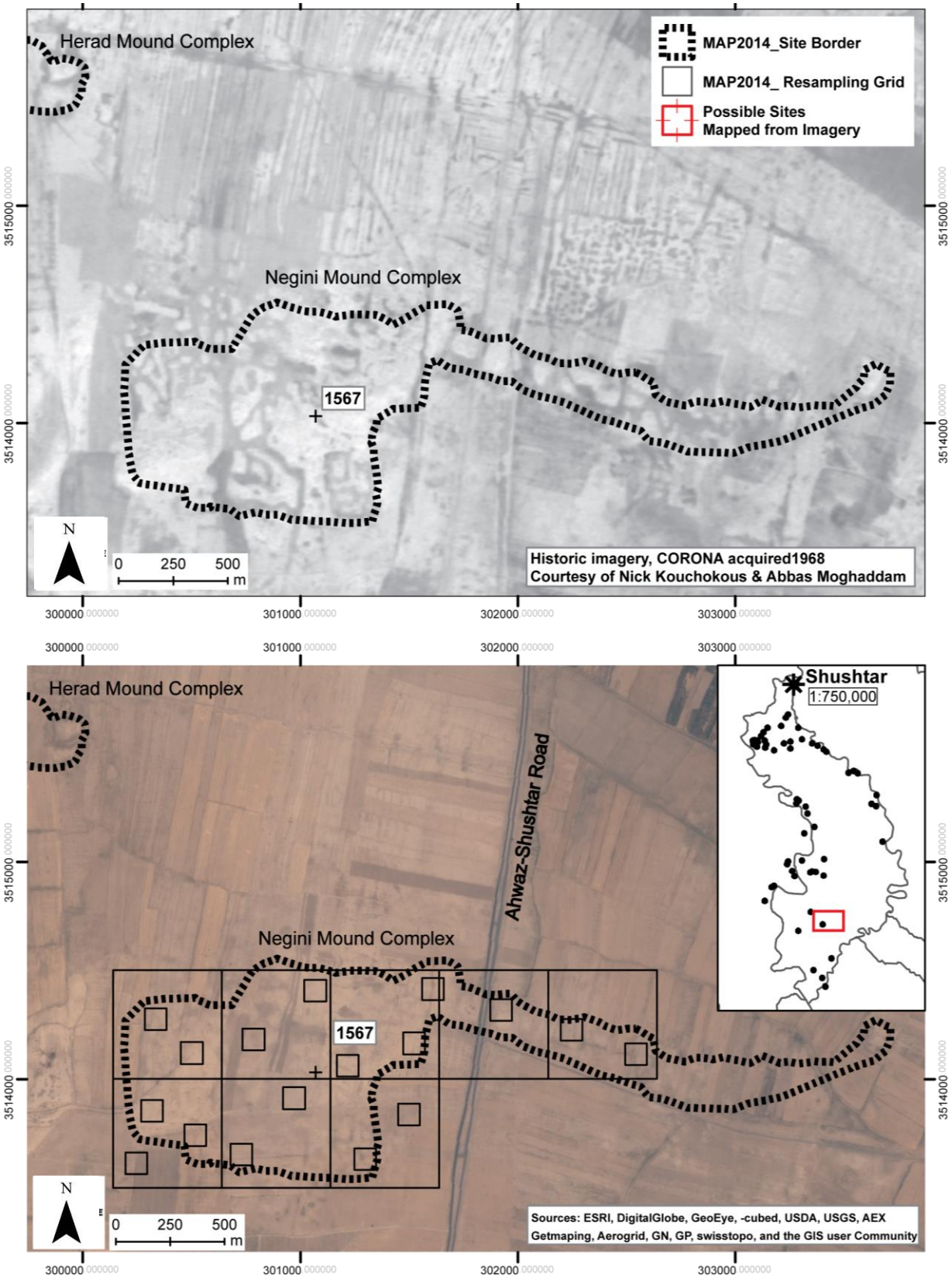
Map 5.19 Surveyed sites on the historic (top) and modern (bottom) imagery, near the Karun (KS1849-KS1851).



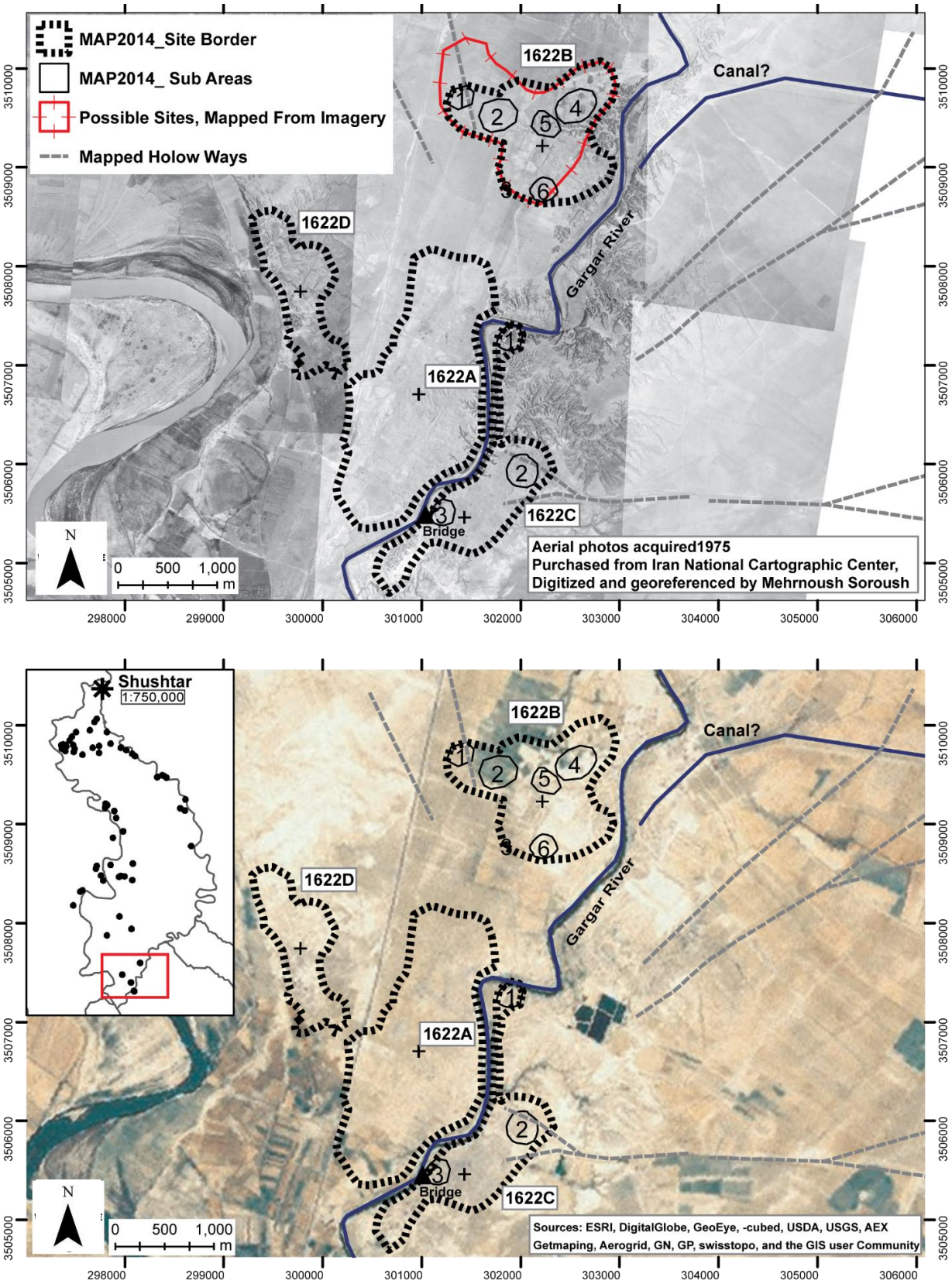
Map 5.20 Surveyed sites on historic (top) and modern (bottom) imagery, Herad (KS1564).



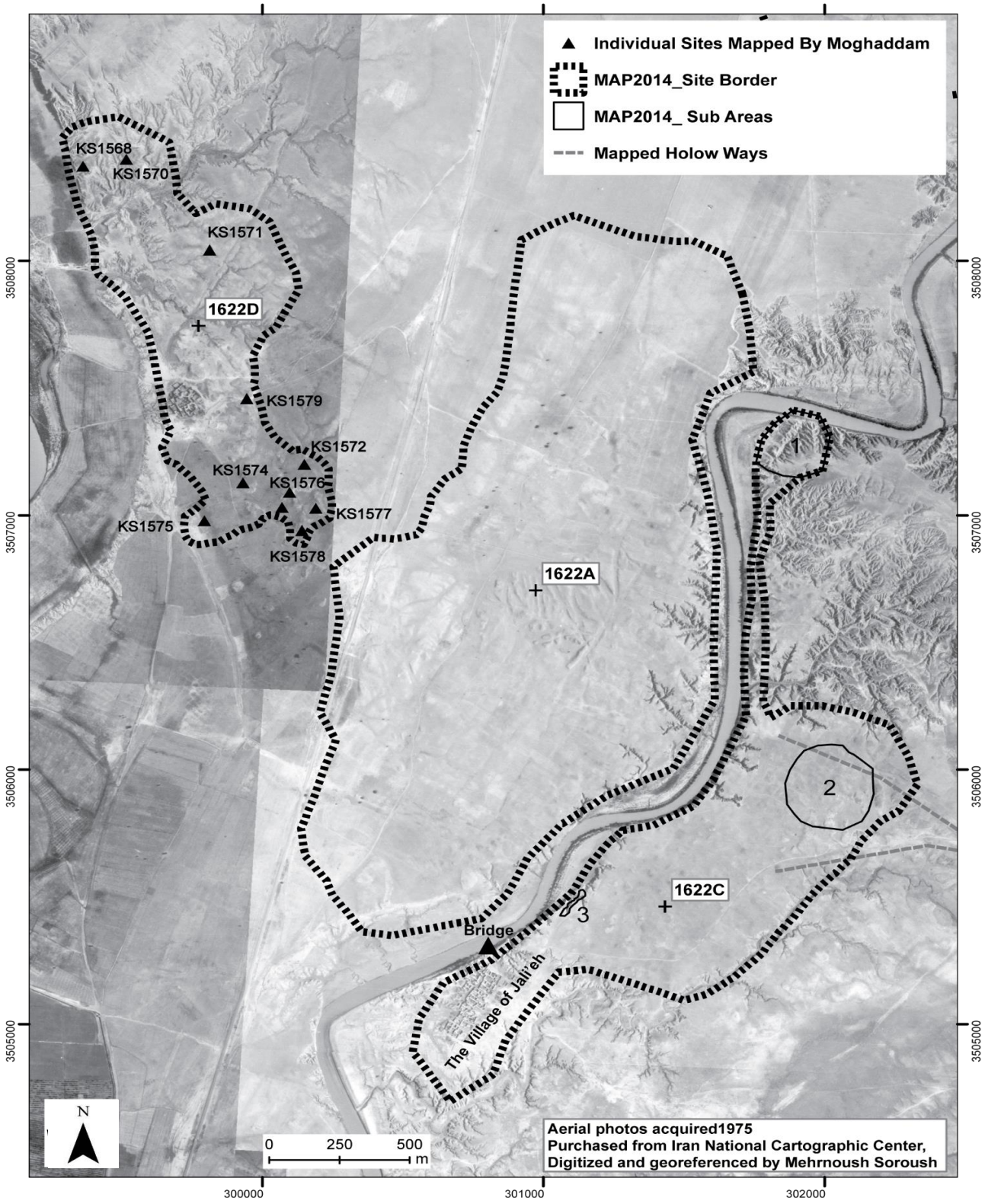
Map 5.21 Re-study of the Negini (KS1567).



Map 5.22 Landscape study of the urban complex of ‘Askar Mukram (KS1622).



Map 5.23 Landscape study of the urban complex of ‘Askar Mukram (KS1622, areas A, C, D).



Map 5.24 Landscape study of the urban complex of ʻAskar Mukram (KS1622, area B).

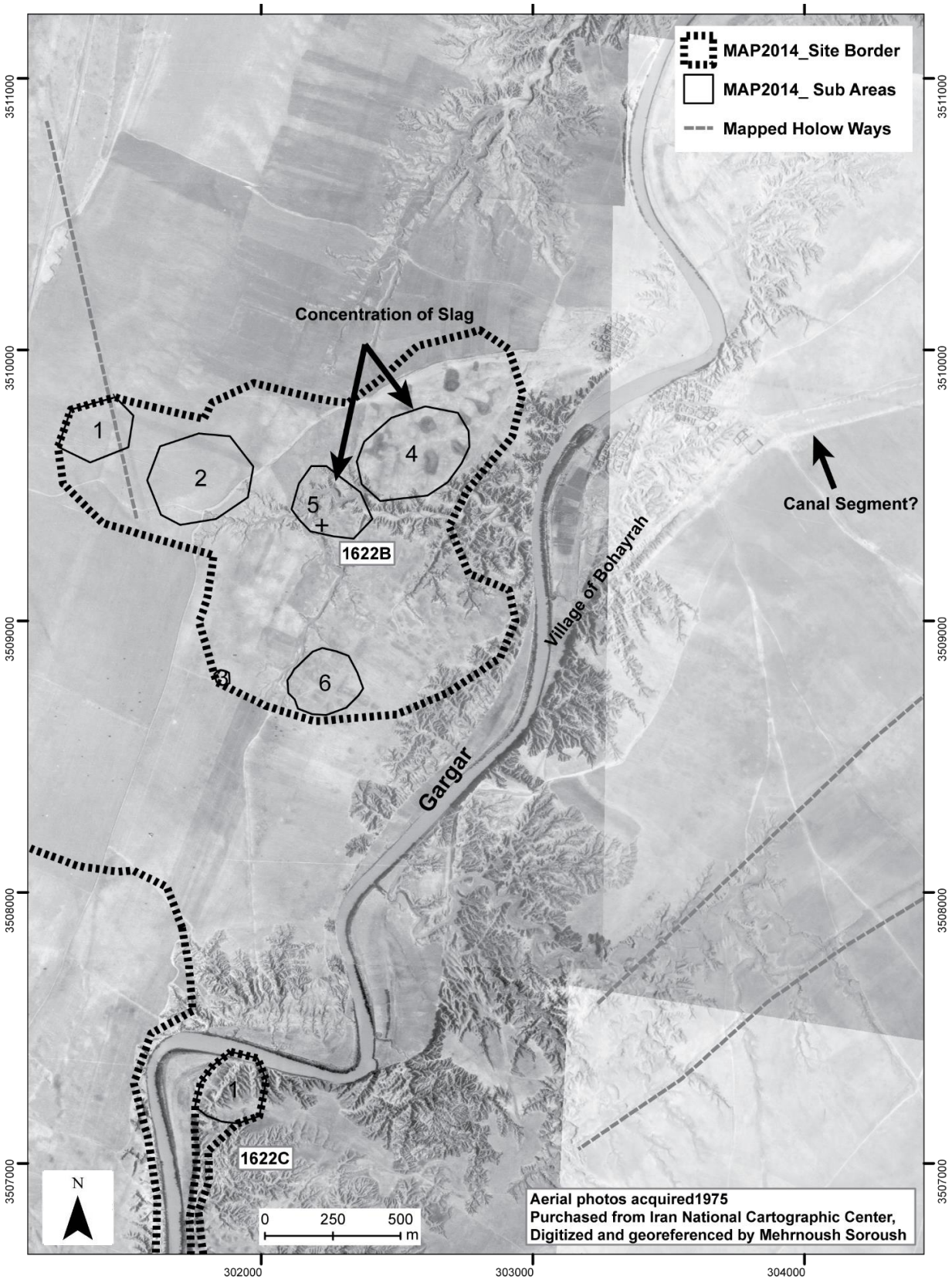


Figure 5.1 One of the main branches of the Dariun passes through Dastowa; areas 2&4 to the right (east) of the canal; areas 3-5 to the left (west) of the canal.

Figure 5.2 Most of Dastowa consists of private farms. Land leveling and large, presumably old, pits have exposed stratigraphy. Photo showing a large pit west of the area 7, facing west.

Figure 5.3 Dastowa, view to the west end of the area 9. The mound is cultivated, but the stratigraphy is exposed along the bulldozer-cut section.

Figure 5.4 Dastowa, view from area 10 to area 11. A gas station and several buildings have completely covered the area 11, the debris deposited on its western edge is visible in the background, containing a large number of ceramics; a complete cup is recovered from there (sherd PCW.T1 No. 180-18-1).

Figure 5.5 The negative impact of water erosion and land levelling on the archaeological record along the Gargar is dramatic. In most cases, site stratigraphy is best visible on the edge of the river which cannot be accessed. Photo taken at KS1520, which is almost entirely destroyed since it was surveyed by Moghaddam in 2001, facing NE toward the Gargar valley.

Figure 5.6 After flowing in a deep and narrow course, immediately south of the Dastowa the Gargar enters a wide (up to 1.5 km) valley. Photo taken at KS 1520, facing SE.

Figure 5.7 Several small levelled mounds are now part of the agricultural lands of the Hamzeh Co. View from the site KS1804 to KS1805.

Figure 5.8 Ceramics, which seem to come from the levelled mound, recorded KS1805, are deposited near the site.

Figure 5.9. KS1806 facing S.

Figure 5.10 Typical for the sites in the Map 5.9, concentration of pottery, presumably collected from the site KS1806, next to the levelled mound.

Figure 5.11 What seems to have been the end of the field canals of the Dariun system, south of KS1809, is now used as a drainage canal (foreground) while water for irrigation is pumped from the Karun (middle ground).

Figure 5.12 One of the oldest preserved canals of the Dariun system, south of Gelalak, near KS1812. The canal seems to have been wider in the past.

Figure 5.13 KS1812 is very disturbed. Pottery is visible in the debris from the excavation of a well.

Figure 5.14. A modern canal passing to the east of KS1812 is nonfunctional because of design error. Instead, water from the well excavated at KS1812 is pumped in the old canals to supply the nearby fields.

Figure 5.15 KS1813 is very disturbed; none of the features visible on the imagery are preserved on the ground. Dense concentration of pottery is visible in various areas of the site, for example along this canal passing south of the site.

Figure 5.16 KS1813, area 4, dense concentration of pottery visible along the canal passing south of the site (above).

Figure 5.17 KS1813, remains of glass production at the location where two levelled mounds known as Tall-i Šīšeh-ī once stood.

Figure 5.18 KS1813 is entirely destroyed. Photo taken E of the area 6, where an old canal used to pass, facing N.

Figure 5.19 The canals that ran along the Gargar, such as this one near KS1827, seem to have been short-lived because of water erosion; see Ch 7.7.2.

Figure 5.20 The south end of the above canal, destroyed as a result of water erosion along the Gargar valley.

Figure 5.21 Similar to Fig 5.19, this channel along the Gargar, N of KS1830, seems to have gone out of use because of water erosion.

Figure 5.22 The expansion of fish farms in the Gargar valley is rapidly obliterating the cultural and archaeological landscape. View from KS1827 facing E.

Figure 5.23 KS1826 is very disturbed, similar to other sites along the Gargar. Illegal excavations and land leveling visible in the foreground, a hen house to the left, and water erosion along the river, in the background.

Figure 5.24 In the areas preserved from water erosion, development and expansion of villages are the main obstacle to the recovery of archaeological material. Expansion of the village Shalili Koochak, east and north of KS1829.

Figure 5.25 KS1828 was destroyed by a fish farm. The site was visited on the same day that the farm was being filled. Similar sites might have been buried under numerous fish farms along the river.

Figure 5.26 KS1828. Pottery was visible near and in the filling pond.

Figure 5.27 KS1845, view from the road to the E of the site, destroyed by road and canal construction.

Figure 5.28 KS1845, view from the area 2 to the area 3, facing N.

Figure 5.29 KS1845 view from the canal to the strip left from the levelled mound in the area 7, facing W.

Figure 5.30 Typical for several survyed sites are small strips left of the levelled mound. View from the remaining strip of the area 7 to the two remaining strips of the area 6, facing NW.

Figure 5.31 KS1850, much of the eastern side of the site is destroyed by a modern canal and road; view from the road to the site, facing W

Figure 5.32 View from KS1849 to KS1850, facing NE.

Figure 5.33 KS1850, a disturbed site, several small excavated holes observed. Pieces of a complete vessel were found here, see Appendix A, Sherd photos, GCW.T1, sherd 1849-107-1.

Figure 5.34 KS1851, view from the top of the area 1 to the low mounds of the area 2, facing SW.

Figure 5.35 KS1851, area 1, a high mound with architectural remains and ceramics from Late Susiana to the Middle Elamite period, heavily damaged by the construction of a gas pipe as well as soil robbing by the residents of the ʻAbduli village (in the background).

Figure 5.36 KS1851, area 2 is very disturbed.

Figure 5.37 All the sites that are not levelled are very disturbed. KS1836 is an example. Best preserved area of the site is where a small building is built, visible in the background.

Figure 5.38 In several hummocky areas, cultural remains are visible in the strips left of the original mound, in the middle of the levelled agricultural area. Photo taken at KS1837, a pit is visible at this location, in the western area of the site.

Figure 5.39 KS1622B, the density of ceramics and slag is high in the northern area of the site, as visible in this picture, in the foreground.

Figure 5.40 KS1622B, high density of slag and ceramics in the northern area of the site.

Figure 5.41 KS1622C, area 1, illegal excavation on the site.

Figure 5.42 KS1622C, area 1, view to the Gargar valley, facing E. This area may have been guarding an important feature, such as a bridge or a weir.

Figure 5.43 Several wells are visible on the western bank of the Gargar, all seem to have had the same base level which is now several meters above the river bed. View infront of KS1622C, area 1, facing W.

Figure 5.44 A distinctive line that runs along the western bank of the Gargar seem to correspond to the base level of the wells and can be indicative of the incision of the channel after the abandonment of the city.

Figure 5.45 KS1622C, area 2 is relatively well preserved; facing S.

Figure 5.46 KS1622C, area 2, crop marks reveal the alignment of the architectural remains.

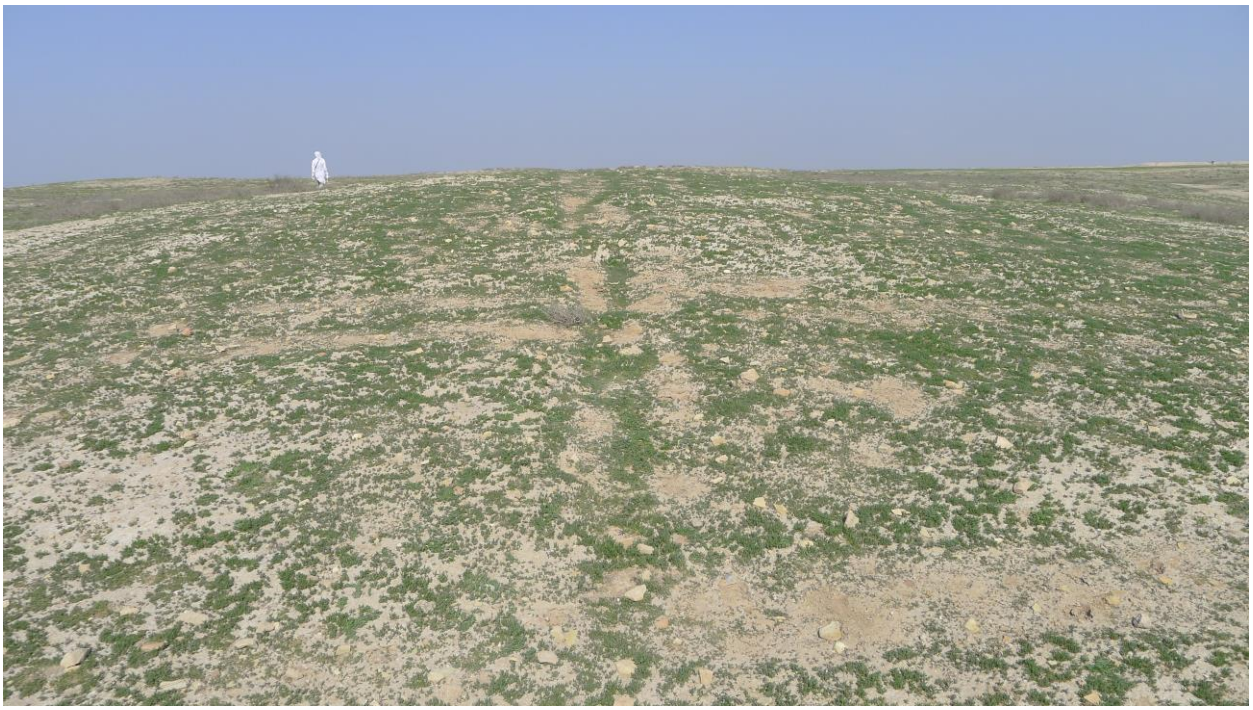


Figure 5.47 KS1622C, area 2, water erosion has created deep gullies cutting through both sides of the site.

Figure 5.48 KS1622A, the western side of the site is significantly damaged and continued to be threatened by land levelling.

Figure 5.49 KS1622C, area 3, the remains of a brick bridge, the best preserved part of the structure. Photo facing N.

Figure 5.50 KS1622C, area 3, remains of the bridge, facing SE. Several regularly-spaced projected features (to the right in this photo) south of the main preserved part may have been abutments.

Figure 5.51 The section on the western side of the bridge structure reveals stacks of seemingly unused pottery. They may have been sold in the shops mentioned by the compiler of Ibn Hawqal (chapter 6).

Figure 5.52 A Stack of pottery (see above).

Figure 5.53 The remains of a paved passage is visible in the background, which seem to have crossed over the river by the way of the brick bridge.

Figure 5.54 The remains of the paved passage.

Figure 5.55 The general landscape of KS1622D, a hummocky area, under dry farming.

Figure 5.56 KS1622D, several mounds are covered with a dense concentration of bricks and slag, and seem to have been kilns.

Figure 5.57 KS1622D, typical material on one of the mounds, suggesting the production of building material.

Figure 5.58 KS1622D, typical material on one of the mounds, suggesting the production of building material.

Figure 5.59 KS1622D, typical material on one of the mounds, suggesting the production of building material.

Figure 5.60 KS1622 D, the small number of ceramics found on the mounds is plainware, similar to what is found at KS1622B.

Figure 5.61 The correspondence between the base of the wells on the west bank of the Gargar (left black arrow), and the base of the bridge (right black arrow) suggests that the terrace marked with the red arrow was the bed of the Gargar prior to the abandonment of the city.

Table 5.1 Pottery sampled in the 16 test area of the site Negini

Sample Area Number	Pre-Ach	Achaemenid-Post Achaemenid	Parthian	Sasanian-Early Islamic (GCW 1,2)	Islamic (GCW2, ICW)	Coarse Vegetal Ware (IRW?)	Unident.	Total
1	-	5	5?	23	10	5	18	63
2	2	3	4	16	10	-	17	39
3	-	3	2	120	15	14	54	208
4	-	-	-	25	-	4	10	39
5	-	-	-	-	-	-	-	0
6	-	-	10?	115	10	-	39	164
7	2	-	5?	85	10	11	40	153
8	-	10?	5?	17	21	2	12	67
9	-	5	7?	4	20	2	14	52
10	-	7	17?	18	30?	-	22	87
11	-	-	-	-	-	-	-	0
12	-	3	30?	6	30?	13	24	106
13	-	9	10?	2	25?	7	13	62
14	4	10	20?	69	5	10	31	149
15	-	4	5?	16	8?	7	9	49
16	-	6	6	16	6	9	6	46

Figure 5.62 Ceramics from Negini, sample area 1. Gritty Common Ware (1,2) is dominant.

Figure 5.63 (Left) the Parthian ceramics from Negini, sample area 2. (Right) Prehistoric ceramics from Negini, sample area 7.

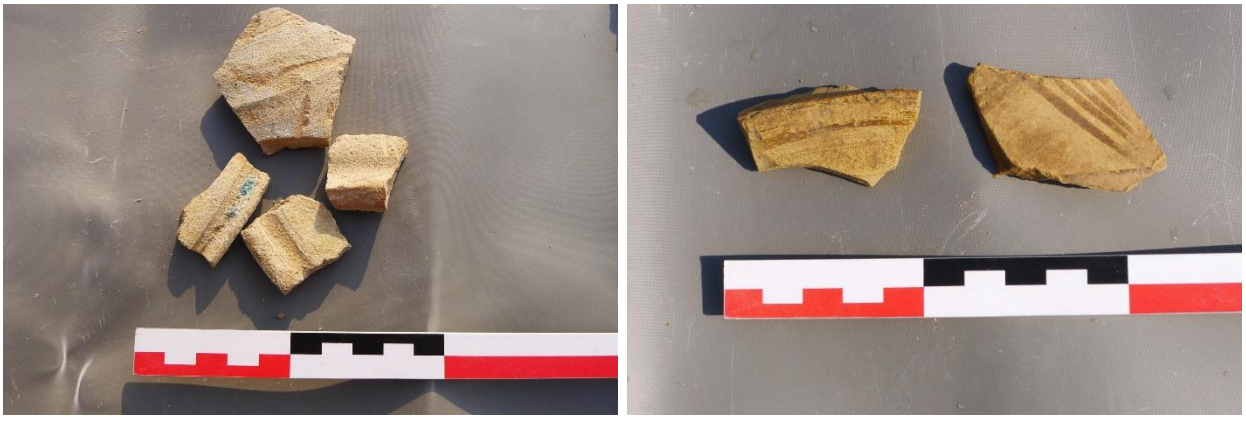


Figure 5.64 Sasanian-Early Islamic period ceramics (GCW) from the areas 1, 2, 3, 15.

Figure 5.65 (Left) the sherds identified as Islamic, GCW2, from the area 3. (Right) sherd identified as Parthian, PCW, from the area 15. Difficult to distinguish between the oarser categories of PCW and GCW2.

Figure 5.66 The sherds identified as coarse Islamic ware with vegetal temper (IRW), top, from the area 3, bottom, from the area 7.

Figure 5.67 The sherds identified as Islamic (ICW), top, from the area 14, bottom, from the area 15.

Chapter 6
Irrigation & Settlement on the Miyanab Plain: A Longue Durée Perspective

This chapter aims at bringing together various lines of evidence and arguments previously presented in order to propose a long term history of irrigation on the Miyānāb plain. A general outline of settlement pattern dynamics will be followed by a more detailed discussion of the critical phases of the evolution of hydraulic infrastructure and irrigation agriculture on the plain, including the question of Sasanian expansion and post-conquest decline as well as the history of the evolution of the Masruqān/Gargar. The chapter will conclude with a long term perspective on irrigation's role in the sociopolitical and environmental history of the Miyanab.

6.1 Long Term Patterns of Settlement on the Miyanab Plain

The methodology of this dissertation for assessing irrigation history combines site-canal association, an independent micro-study of canal systems, and examination of the local topography through remote sensing (refer to chapter 3 for details). The information derived from each of these datasets is continuously checked against the other datasets before the most likely scenario of canal evolution is put forward. Previously (chapter 2 & 5), I demonstrated the remarkable continuity observed in the settlement patterns in the Miyanab. Furthermore, sites recorded along the Gargar belong to all periods and their distribution pattern cannot be used as evidence to date the channel exclusively to the Sasanian or any other period. In addition, a general expansion of settlements datable to the Islamic period was observed in the lower areas of the plain (Map 6.1).[325] Shushtar is

[325] The latter pattern was noted by Moghaddam too.Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 54–55. The possible reasons for this expansion will be discussed in the discussion of the developments of Early Islamic period.

built on an alluvial fan. The gradual incision of the Karun at the fan-head has forced the inhabitants of the plain to build hydraulic structures in order to maintain and increase the water flow along former natural water channels in the alluvial fan. The heterogeneity of the topographic features along the Gargar suggests that the Masruqān canal of the early Islamic sources may have been formed from various smaller scale projects joined through a combination of natural and human processes. This long-term perspective will form the basis for a more detailed discussion of the history of hydraulic features and of the development of irrigation in the later historical periods.

The sequence of maps of the historical periods demonstrates that early settlements are distributed within the same general areas as later ones (Map 6.2-6.9). No clear alignment of sites with a series of east-west wadis is observable.[326] Prior to the Elamite period, it is difficult to make a definite claim about the alignment of sites along any water course, except for the lower course of the Karun where the river passes between the Haft Tappeh and Kupal anticlines (Map 6.2). Since the Old Elamite period, however, a consistent pattern of settlement on the Miyanab becomes visible. The majority of sites of all periods are located along a hypothetical straight line that connects Shushtar to the tip of the nose of the Kupal anticline (Map 6.3-6.7). This line corresponds with one of the main distributary channels of the Dariun canal system. The modest size of the present channel may belie its historical significance, functioning as the main feeder of irrigation on the plain. The longevity of this channel is supported also by the distinct levee visible on the SRTM terrain model (Map 6.10). The Dariun splits into two branches at the Band-i Khak. The channel under discussion corresponds to the west branch of the Dariun, which continues its course

[326] Moghaddam's stance on the hypothetical east-west wadis is not clear. He alludes to the existence of such channels, but his discussion of the early history of irrigation on Miyānāb revolves primarily around the role of the Karun, which is more in line with the findings of this research.

to the south toward ‘Elleh and feeds several distributary canals until it empties into the Karun near the Arab Hasan village. It is counter-intuitive to assume that an irrigation canal of this size was dug as early as the Old Elamite period. Research has demonstrated that early irrigation agriculture was practiced through the management of surface run-off and the flood-recess method.[327] Despite landscape destruction along the banks of the Gargar, sites of all periods are attested, albeit in low density, along the canal from Dastowa to approximately north of the village (and the site) of Dowlatabad. In addition, while in every period-map one or two sites are found along the Darreh Haddam and Darreh Naft stream, an expansion into the eastern plain is observed in the Middle Elamite period, and after that, in the Early Islamic period at a more significant scale. From the Parthian period onward, archaeological sites increase towards the north, especially in the area immediately southwest of the Dastowa ridge. In addition, infilling is observed in the area between the main Dariun channel and the Karun River (Map 6.7-6.8). Of course, it is important to remember that Shushtar had become the center of the plain least by the Sasanian period. Since the Islamic period, infilling is also observed east of the main feeder channel of the Dariun in the north, as well as also along the Gargar (Map 6.9). [328]

6.2 The Dariun and the Origin of Canal Irrigation on the Miyanab

At this point, it is possible to present and discuss the hypothesis of this research about the roots of large-scale canal irrigation on the Miyanab plain. The braided pattern of the natural streams flowing on the Karun fan has been gradually replaced by a network of gravity-based canals

[327] Wilkinson, *Archaeological Landscapes of the Near East*, 72–75; Kirkby, “Land and Water Resources of the Deh Luran and Khuzistan Plains.”
[328] For infilling see also Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 53, 55.

as the river both shifted westward and started to incise its channel head. This scenario conforms to Kirkby's outline of the regional geomorphological processes in the Upper Khuzistan plains (chapter 2), and to the similar patterns studied and observed in the Belgo-Iranian studies of paleoenvironment of the Lower Khuzistan plains. According to the Kirkby, at least after the late Chalcolithic, the fan heads of the rivers In Khuzistan were characterized by braided streams and an aggrading regime. This pattern was replaced by an incising regime after the mid-second millennium BCE. By 500 BCE, all the rivers in the upper Khuzistan plains were incised in stable channels.[329] A similar pattern has been suggested in studies of lower Khuzistan, best demonstrated in the fan-head of the Jarrahi river.[330] The fact that a great number of weirs were built at all the fan heads of the major rivers in Khuzistan along with the patterns of fan head incision suggests that these weirs were built in order to restore the flow of water onto former alluvial fans. It is noteworthy that feeder canals behind the known weirs in Khuzistan are located several meters above the water level in the incised river beds.[331] I argue that this phenomenon explains the origin of the irrigation system of the Miyanab plain: the Dariun canal network. The feeder canal of the Dariun, which lines up with the hypothetical line between Dastowa and 'Elleh, may have replaced a main branch of the Karun which once flowed close to the surface of the plain. Moghaddam notes that early sites seem to be distributed in a linear pattern along this line. He argues that the line between Dastowa and 'Elleh represents the early course of the Karun, and that settlement patterns suggest that the "Old Karun" migrated westward to its present course, certainly by the Achaemenid

[329] Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 77.
[330] Walstra, Heyvaert, and Verkinderen, "Assessing Human Impact on Alluvial Fan Development: A Multidisciplinary Case-Study from Lower Khuzestan (SW Iran)."
[331] Ibid.; Heyvaert et al., "Susa and Elam."

period and possibly earlier.[332] Moghaddam's theory is based on the location and date of the archaeological sites located to the east and west of the discussed levee. Because no early archaeological sites are recorded in the north and northwestern part of the plain, he proposes channel migration only for the segment of the river that flows east of the nose of the Haft-Tappeh anticline. Yet, the relative linear course of the river and the limited space available for westerly movements suggest that channel migration has been minimal in this segment.

The sites of earlier periods are usually more likely to be buried under fluvial sediments when compared to the later periods. Kouchoukos demonstrated the remarkable rate of sedimentation on the Susiana plain, and underlined the negative impact of this process on our understanding of early settlement distribution in Khuzistan.[333] The problem of the burial of early sites may be most severe in the north and northeastern part of the Miyanab because of the aggradation of the braided fan channels followed by irrigation deposition. That sediment accumulation is significantly greater in the alluvial fan compared to downstream has been demonstrated in the Diyala River basin.[334] Alizadeh et al. observed an early irrigation channel that was buried under c. 2 m of irrigation alluvium.[335] It is likely that the absence of early sites north of the plain is a consequence of higher rates of deposition as well as urban and agricultural development, which also is greatest in the north. While I agree with the argument of a likely westerly shift of the Karun, maximum channel shift must have occurred at the fan head, north of the plain rather than in the south. The dating of the shift from small-scale modifications of a

[332] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 48–53.
[333] Kouchoukos, "Landscape and Social Change in Late Prehistoric Mesopotamia."
[334] Wilkinson, *Archaeological Landscapes of the Near East*, 80.
[335] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 79.

braided river fan to the enforcement of a large-scale man-made canal system is uncertain. The final answer to this question will not be possible before a systematic program of geomorphological research is carried out on the plain. The pattern of settlement expansion along the main Dariun feeder, however, suggests that this shift happened more or less during the Achaemenid to Parthian period, between the middle of the first millennium BCE and the middle of the first millennium CE. An earlier date is more likely given the sudden increase in the number of archaeological sites with Achaemenid-type pottery.

It is now time to bring together the evidence from settlement patterns and canal modeling (Fig. 4.14-4.15). The first phase of the canal evolution corresponds to the first large-scale program of artificial irrigation, with the main distribution node located south of the Dastowa outcrop. Then, a strategic shift occurred and the headworks were moved northward toward the fan head. It is possible that this change took place in the course of the gradual westward migration of the Karun. An avulsion event approximately at the location of the Shadorwan, however, could have forced a quick adjustment of the irrigation system. Prior to fan-head incision, avulsions were common at fan-heads in Khuzistan. The possibility of an avulsion event at the bifurcation of the Karun and the Gargar has been previously considered.[336] Based on the local topography, the hypothetical natural avulsion is more likely to have happened at the Shadorwan rather than at the Band-i Mizan. In the former place, the steep gradient on the side of the fan have posed no obstacle for the river's migration, while, at the latter location, avulsion would require the cutting of a canal through the highest topographic point on the Shushtar anticline. If the main Dariun feeder follows the course

[336] Tony Wilksinon, in his comments on a draft of Moghaddams 2012 publication (which was kindly provided to me by the author) pointed out that the most likely location for an avulsion on the Miyānāb is at Shushtar, and most likely where currently the Karun bifurcates. A recent poster presented by Heyvaert et al. (2013) also presents Shushtar as a likely candidate for an avulsion event.

of the (a) main river channel, the first phase of the large-scale canal irrigation on the Miyanab can be understood as an attempt to reconnect the network of the irrigation canals to the Karun, which had shifted to the west and had cut down its bed. The Parthian-period settlement map and the proximity of the main distribution node to the site of Dastowa suggest that this project probably took place in this period. Nevertheless, given that the local repertoire of pottery in the early Sasanian period was probably not much different than before, it is also possible that the first phase was part of the irrigation projects of the early Sasanian period. The problem with this scenario, however, is that it the first two phases of canal evolution must have been occurred within a short chronological span, 3rd-4th centuries CE.

6.3 Paleo-Environment of the Lower Miyanab plain

An enigmatic aspect of the early irrigation history on the Miyanab is the condition of the southern part of the plain, which is situated between the Gargar and the Dariun feeder canal. Because of the paucity of archaeological sites and the flat topography, it is very difficult to understand the paleo-environment of this area without geomorphological studies. Some suggestions, however, will be offered below.

This study dismisses the possibility of a network of east-west wadis supplying early settlements across the plain prior to the formation of the Gargar. Fan morphology precludes such a possibility for the northern half of the plain. In the south, this idea is undermined by the lack of any relict topographic feature on the terrain model or on the historic imagery. Although sedimentation may blur the traces of relict channels, the total obliteration of all evidence is unlikely. A clue may be found in the unusual angle of the Darreh Naft and Darreh Haddam streams in relation to the direction of the Gargar and the Karun (Fig. 6.1). By nature, distributary channels

flow more or less in the same direction as the main stream and join it at an acute angle, as is the case for all the wadis that join the Gargar, except the two streams named above. The latter are examples of a "barbed tributary", joining the Gargar (or the Karun if they were originally flowing farther west) at an obtuse angle. Note that the heads of these barbed channels follow the same direction as the rest of the wadis east of the Gargar (NE-SW), but, the channels quickly make a sharp turn and continue to the northwest.

It is possible that, during the early phases of human settlement on the plain, archaeological sites that are now found east of the Gargar were located near small streams that flowed from the Zagros piedmonts toward the alluvial fan in a NE-SW direction. As previous studies have suggested, agriculture here was based on the small-scale management of run-off water.[337] The small streams toward the north probably ended at the edge of the Miyanab fan, and were drained in a southerly direction through the low points that are typically formed at the edge of a fan. The run-off channels south of the fan also probably drained toward the Karun. This process may have further incised the edge of the fan over time. Prior to the formation of the incised river beds, the distributary channels that were formed in the aggradation area may have come together and joined the river bed in a disorganized drainage zone, which was also suited to marsh formation.[338] The southern part of the Miyanab plain, approximately south of the Arab Asad village until the Band-i Qir, may have been part of such a zone.

The alignment of the early archaeological sites with the course of the Karun south of Arab Asad is remarkable. Even if sedimentation has blurred some of the archaeological sites in the north,

[337] Lees and Falcon, "The Geographical History of the Mesopotamian Plains," 32–33; Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 77.
[338] Kirkby, "Land and Water Resources of the Deh Luran and Khuzistan Plains," 286–87.

the presence of most of the recorded sites of the pre-Elamite period in this part of the Karun flood basin is noteworthy. During the Elamite period, the number of sites in this area drops until another expansion occurs in the Achaemenid period. It is possible that early settlements favored this area because it was a drainage zone where streams flowed near the surface. Approximately after 4000 BC, the marshes may have begun to expand to this area, which was previously one of the zones most suited for human occupation.[339] Marsh expansion may have been responsible for the declining number of archaeological sites south of the Miyanab in the Elamite period. Nevertheless, given the small number of archaeological sites pre-dating the Achaemenid period, the proposed scenario is highly speculative. Alizadeh et al. disagree with Lees and Falcon over the cause of the aggradation at the site of Dar Khazineh (chapter 2). According to Lees and Falcon, the early phase of the aggradation caused by a winding river course was succeeded by a lacustrine environment, suggested by fine silt layers containing lymnea. They add that this evidence may represent a local effect caused by the impounding of a local lake or movements of the Naft-i Sefid anticline. Alizadeh et al., to the contrary, note that freshwater mollusks and other signs of sustained water-logging and persistent flow were absent at the site. They argued that seasonal floods, which were "widely distributed over the plain", were the sole cause of aggradation after c. 4000 BCE.[340] They argue that Dar Khazineh was located along a major wadi system that drained the foothills of the Zagros, prior to the digging of the Gargar. At the same time, the authors add that seasonal floods may have happened only under "specific conditions," because in other areas east of the Gargar, prehistoric cultural deposits are found at the plain surface (e.g. KS1638) or at very shallow depth (e.g. KS1642) (Fig. 2.6 right). This argument is contradicted by the fact that the two latter sites are

[339] Ibid.
[340] Marine mollusks are however mentioned among the fauna retrieved from the site stratigraphy.

located in the same wadi system as is Dar Khazineh. If the eastern plain was drained through a regional system of wadis flowing near the surface, their impact could not have been local and limited to specific conditions during a period of active plain aggradation. Therefore, the model of a marshy environment proposed by Lees and Falcon seems to better explain the local topography. A [local?] lacustrine system may have been caused either by the proposed northward expansion of the marshes into the aggradation zone, or by an even smaller-scale phenomenon, such as the drainage of the small streams on the Zagros piedmont to the wadi created at the intersection of the Miyanab fan and the Naft-i Sefid ridge. The fact that both sides of the Gargar south of Manhush, belonged to the same landform prior to the formation of the Gargar is supported by the striking similarity of their surface soil, seen through CORONA imagery. The signature of the soil surface that is preserved between the highly active gullies of the east Gargar shows a striking similarity with that of the west bank: a hummocky salinized bad land suggestive of water-logging over a long time (Map 6.11).

The Achaemenid period marks a new phase in the configuration of settlement on the plain. The radical increase in the number of sites with Achaemenid material along the hypothetical old course of the Karun suggests changes in patterns of irrigation and the local hydrological regime. It is possible that a more stabilized river channel provided the opportunity for sites to cluster in this area again. Another peculiar aspect of the archaeological landscape is that a great number of the sites of all periods are found in the south where the river shows significant lateral movement. Several relict meanders, scroll bars and ox bows, as well as the saline top soil that suggests constant flooding up to 2 km east and west of the current river channel, demonstrate that channel migration and seasonal flooding have been constant. This zone consists primarily of a hummocky landscape;

sherds are found on individual mounds or on clusters of mounds as large as 100-200 ha. Yet the nature of the original occupation on these mounds and the function of these sites is unclear. The extensive sites of Herad and Negini are good examples: a large number of sherds from later historical periods were collected together with fewer sherds datable to the prehistoric and early historic periods (Table 5.1, Fig. 5.62-5.67). These sites were recorded as large, continuous habitations. It is, however, unclear whether these finds represent actual settlements or sherd scatters moved by water. Note that significant change in terms of access to water has happened in this zone over the several millennia of occupation attested by these sites. While ample surface water could have attracted early settlements, later historical sites in this zone had little or no access to the water supplied by canal systems. Therefore, unlike the northern part of the plain, the concept of "continuity" does not seem to accurately describe the dynamics of land use here.

6.4 The Masruqān Project and the Question of Sasanian State Investment

Undoubtedly, the most heated subject in the irrigation history of the Miyanab is the evolution of the Masruqān (Gargar). The main questions that have been addressed in past scholarship include: When was the canal created? Was it created through a large scale monumental project? If so, who was the patron of the project? Was it created gradually involving natural processes? If so, what was the contribution of human action?

In the following pages, I will attempt to answer these questions in light of the evidence and discussions presented previously. I argue that the heterogeneity of the morphology of the eastern wadis along with the features preserved on historic imagery and terrain models suggest that the Masruqān was probably not created all at once. There seems to have been a major canal building project between Shushtar and Dastowa, in order to reuse an existing natural drainage channel. This

project was most likely carried out in the Sasanian period. South of the Band-i Qir, a separate canal project may have been merged with the Masruqān canal.

As discussed before, there is little evidence to suggest that a system of major east-west wadis was cut by the construction of a large canal from Shushtar to the Band-i Qir or beyond. In addition, the unusual direction of the largest wadis east of the Miyanab, i.e. Darreh Naft and Darreh Haddam, points to the possibility of a shift in the local hydrological regime south of Miyanab. Furthermore, the curvilinear path of the Gargar is curious. Man-made canals are straight and linear, unless they need to follow natural levees or terraces. It is questionable why an entirely artificial canal would follow such a course given that it does not appear to have used a naturally elevated feature. The possibility of the human-modification of a natural wadi along the current course of the Gargar must therefore be considered. Two different processes may have contributed to the formation of a natural channel. One that was explained before is the formation of a line of low-point bars at the intersection of the Miyanab fan and the slope of the Naft-i Sefid anticline, which would have gradually deepened through water erosion.

The second process may have involved the formation of a "captured stream" across the nose of the Kupal anticline. Stream capture, or stream piracy, occurs when a watercourse is diverted from its own course, and flows instead down the bed of a neighboring stream. This phenomenon can happen naturally for several reasons, including tectonic movement. It is possible that the impounding of the drainage system of the Naft-i Sefind anticline behind the emerging fold of the Kupal created a natural channel through the nose of the Kupal. As a result, the streams east of the Gargar and south of the village of Manhush, which originally drained down a low slope

toward the Karun, began to drain in a new direction through the nose of the anticline toward the lower segments of the Karun.

Alternatively, the course of the Gargar through the nose of the Kupal anticline may be man-made. Both these possibilities were considered by Woodbridge. He noted that, while the linearity of the channel across the anticline and its low sinuosity could suggest human intervention, the need for a natural watercourse to maintain erosion power across the growing fold might create a similar result. Continuous erosion through the nose of the anticline is evident by the intensified meandering of the Gargar north of Naqishiyat.[341] Whichever scenario was the case, it appears that the Masruqān was created in the course of one or more drainage projects, involving the digging of new canals as well as the reuse of an existing natural drainage channel. Woodbridge made an observation on the gravel samples collected in his study of the Gargar, which can lend support to theory of the reuse of a natural channel. According to him, the gravel samples of the Dar Khazineh terrace and the Naft-i Sefid terrace were markedly different from all of the other gravel samples in the region, lacking limestone/carbonate gravels (0%-2%) (Fig. 6.2).[342] Assuming that these were not

> *"…flukes, then this indicates that the gravels of these river terrace deposits were predominantly derived locally from the Agha Jari Formation calcareous sandstones of the hills of the Shushtar and Naft-i Sefid Anticlines. It could definitely be that the lower part of Gargar, say south of the Mahibazan, was an old river channel which was reused by digging the northern part of the Gargar Canal (east of Shushtar). However, an*

[341] Woodbridge, "Responses of River Karun and the River Dez to Human Activities," 21–24.
[342] Woodbridge, "The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran," Appendix 1.2, 1.3.

extensive sediment sampling program along the Gargar and all its terraces is needed before this initial observation would be properly tested." [343]

In sum, the northernmost segment of the Gargar east of Shushtar, probably as far south as the Mahibazan, is most-likely man-made.[344] Although the digging of this channel created a vulnerable point that thereafter became prone to channel migration, I see no reliable evidence suggesting the creation of the straight channel through avulsion. While this research argues for a project of smaller scale than has been previously assumed, the required investment would still have been considerable and requires a justification. The resettlement of deportees at Shushtar in the third and, probably also, fourth century CE, and the establishment of a substantial textile industry provide a plausible context for these projects.

Unraveling the evolution of the segment of the Masruqān between Naqishiyat and the Band-i Qir is very complicated, because several features are preserved on historic imagery in this area that have an uncertain relation to the canal (Map 6.13). The first feature resembles a monumental linear canal, and comes from the direction of the Darreh Naft toward the Bohayr village. The canal-like feature was visited and documented in the 2014 field season. It is ca. 40 m wide and possesses two upcasts ca. 5 m wide and 4 m high.[345] The small size of the soil heaps compared to the width of the channel undermines the certainty of its identification as a canal; it is too shallow for its size (Fig. 6.3). At least three more linear features are preserved on the imagery, which come from the direction of the Gargar south of 'Askar Mukram and run along the southern

[343] E-mail message, March 3 & 22, 2015
[344] Woodbridge even doubts that this part is entirely manmade because of the significant depth of the canal. Personal Communication, Dec 6, 2015.
[345] At present, two small canals have been dug on the canal upcast using its elevation.

face of the Kupal in a NW-SE direction. The two canals that are immediately south of the anticline disappear after ca. 12 km; the one further south runs to the east before ending at the sinuous natural drainage depression of the basin. The two to the north came from a location on the anticline itself, unlike the one to the south that runs in the plain level and may have joined the Gargar. Unfortunately, these features are now destroyed by development and cannot be checked on the ground. Despite the unusual proportions of the canal section near Bohayr, there is a striking alignment between its direction and that of the two parallel canals preserved south of the anticline. The area between the two relicts canal is blurred by excessive water erosion and by the ruins of the eastern part of ‘Askar Mukram. It is possible that the Bohayr canal connected to one or two of the canals that run parallel on the southern faces of the anticline. If these monumental features were indeed canals, there seems to be no source for them other than Darreh Naft. The water of this stream presently contains a high amount of salt and gypsum and is of very low quality for irrigation. We do not know whether or not this was the case in the past. This information is critical because it can help understanding whether the canals supplied water or diverted water away from the plain. It is possible that the subsequent incision of the Darreh Naft and Darreh Haddam, especially after the avulsion of the Karun that increased erosion rates (Fig. 5.61), has exposed the contaminated geologic strata since Late Antiquity. Water erosion appear to have blurred the eastern end of the canals south of the anticline. The remaining evidence on imagery favors the idea that they belonged to a drainage system, rather than an irrigation system, because they lead toward poorly drained land which is not suitable for irrigation and because no outlet is preserved along the canals. Another question is whether these canals were built when the Masruqān was already flowing through the anticline or whether they predate the formation of the lower course of the Masruqān? Since the traces of the canals south of the anticline are blurred by the ruins of ‘Askar

Mukram, the project may have predated the foundation of the city, on the east bank. A canal that was dug to drain the water of the Darreh Naft across the anticline prior to the Islamic period may have become part of the later Masruqān. Another possibility is that the canal project was unfinished. In any case, it is very likely that one or more canal projects, independent of the irrigation system of Miyānāb, were carried out in this zone, [346] which may have subsequently contributed to the formation of the later Masruqān. In the absence of geomorphological data, however, our understanding of these features and their relationship to the history of the Gargar remains speculative.

The conditions that led to the avulsion of the Karun into the course of the Masruqān between the 10th-14th centuries are not known. Because this area is very flat, minor geological forces can cause the river to leave its course in favor or a new one. [347] The fact that the present name of this area, the Band-i Qir, contains the Persian word for weir (*band*) has encouraged most scholars to consider the collapse of a weir the most likely cause for the river's migration. The presumed role of a Sasanian weir is based on an incorrect assumption because the structure known to the locals with this name, nonetheless, is located on the Masruqān canal, c. 5 km upstream from the confluence of the channel with the Karun (chapter 2). It is still likely that human intervention triggered the avulsion, in a different way compared to what it has been presumed. While a possible human role has been solely considered passive, i.e. lack of maintenance, it is possible that intensive irrigation in this zone in the Islamic period caused the avulsion.

[346] Moghaddam (2004) identified these canals but erroneously assumed that they were all parts of the monumental Sasanian irrigation canal. A topographic and structural approach to canal identification demonstrates that these canals cannot be related to the irrigation network on Miyānāb.
[347] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 285 ff.664. Quoting geomorphologist, Vanessa Heyvaert.

Downstream from the Band-i Qir, the former course of the man-made channel is marked by a straight levee on the terrain model. South of Wais, the Karun continues its meandering course, while the large levee on the SRTM terrain model demonstrates that the Masruqān took a sharp turn from here to the southwest in the direction of Ahwaz. Past scholarship has been silent about the end of this segment: How did the Masruqān exactly connect to the Karun at Ahwaz? The silence may be due to the contradictory accounts in the sources.

Islamic geographers disagree over whether the Masruqān debouched into the Persian Gulf marshes,[348] or ended at Ahwaz. [349] The statements of the latter group are very specific and hard to ignore. Iṣṭaḫrī noted that the Masruqān ended at Ahwaz and did not continue beyond there. According to him, the channel was dry most of the year because all the water that ran through it was distributed to the agricultural fields and nothing was left to reach Ahwaz. [350] The author of Ḥudūd-i l-ʻālam echoed Iṣṭaḫrī, noting that whatever was left of the water in the canal returned to the Karun. [351] Verkinderen has recently addressed this problem, and suggested that the Masruqān split into two branches south of the Kupal anticline (Fig. 6.4). One was the main straight channel that is now occupied by the Karun. He identifies the second branch with one of the canals that ran along the south face of the Kupal, discussed before. Verkinderen proposes that the second channel took a circular path toward the east, then cut through the Ahwaz anticline and continued its course in a straight channel toward south, Nahr Mālih (*Ar.* the salty river), before reaching the marshes at the historic town of Dawraq.[352] Verkinderen's proposal is based on two assumptions: first, the

[348] *Ḫur*, 176; *Rus*, 91; *Suh*, 162.
[349] *Ḥud*, 372; *Iṣṭ*, 89; *Ḥaw*, 2:251.
[350] *Iṣṭ*, 89.
[351] "wa ānčehi bemānad bāz rūdih Šuštar uftad" *Ḥud*, 46.
[352] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 286–91.

contradictory accounts of the medieval authors indicate that two separate channels existed at the same time, and the differences between them is due to the fact that each author described one of these channels as the main watercourse. Second, a bridge called Qanṭarat Arbuq crossed over a major water course approximately two farsaḫ east of Sūq al-Ahwaz. This distance matches the location where the Nahr Mālih reaches the Ahwaz anticline. If the Nahr Mālih contained enough water to impede movement across this crossing, it must have been connected to a substantial water course north of the Ahwaz anticline, and the only possible source would be the Masruqān.

I disagree with Verkindern's solution to this problem, and suggest that some of the authors may have thought that a channel that branched off from the Karun immediately south of the confluence of the river with the Masruqān (behind the Shadowan of Ahwaz) belonged to the same canal system. While Verkindern's scenario fits well with Ṭabarī's information on the distance between Qanṭarat Arbuq and Ahwaz, it cannot be supported by the features on the ground. On one hand, there would have not been enough water in the Masruqān to allow for directing a large flow away from the channel. Iṣṭaḫrī, Ibn Ḥawqal, and the author of Ḥudūd stated that all the water in the channel was used to irrigate fields, upstream from Ahwaz. Furthermore, the levees, on the STRM terrain, that represent old irrigation outlets taking off of the Masruqān model become very small immediately north of Ahwaz, suggesting that little water was left in the system to return back to the Karun (Map 6.12).

As discussed earlier, the channel identified by Verkinderen seems to predate the formation of the Islamic Masruqān. Even if it was functioning in the Islamic period, it would contain either excess irrigation water or the overflow of the Masruqān/the Karun during the flood season. If a bridge was ever erected across the Ahwaz anticline at this point, a minor seasonal flow was

probably running below it, not a substantial watercourse that could have been mistaken by the medieval authors as the main course of the Masruqān. The Nahr Mālih itself could have been passed easily by boat, like other canals in the flat plains of southern Khuzistan. Admittedly, rejecting Verkindern's scenario poses a challenge in the identification of the location of the Arbuq bridge. While identifying the location of the Qanṭarat Arbuq is not the topic of the present research, a location further to the east on the Kupal river fits better with the information that the bridge provided crossing over an impassible gorge, even though the distance is not consistent with Ṭabarī's account.[353]

Between the Band-i Qir and Ahwaz, therefore, the Masruqān consisted of only one channel, and ended at Ahwaz. Ibn Ḥawqal noted that the Masruqān returned toward the Karun and joined it at the Shadorwan in a perpendicular angle.[354] The accompanying map also illustrates that the Masruqān joined the Karun upstream from Ahwaz (Fig. 6.5). A large relict channel on the CORONA imagery seems to be the most likely candidate for the final segment of the canal before joining the river.

Even this segment of the Masruqān canal may have incorporated smaller canal projects: The meandering course of the Karun, upstream from the Band-i Qir, and the straight segment

[353] The bridge is said to have crossed over a roaring stream, on the way between Ram Hurmuz and Ahwaz. If it was broken, the next possible route toward Ahwaz was to go to 'Askar Mukram and use the pontoon bridges, or to collect boats at the marshes in the south and build a pontoon bridge somewhere south of the broken bridge. Such a topographical setting seems to fit the deep valley which is created by the incision of the Kupal River. Note that if the bridge was at the location proposed by Verkindern, people would probably had no difficulty crossing the meager drainage channel north of the bridge or use boats to cross the calm water of Nahr Malih. The evidence provided by Verkinderen presents a difficult problem to solve. Especially tricky is that Qantarat Arbuk is said to be located at a channel named Shurāb (Per. Salty Water). Even though Shurab is a very common river name in Persian, it supports the idea of a connection between the bridge and the present Nahr Malih. In any case, this difficult problem cannot be solved by assuming the existence of a mighty man-made channel at a location where the supporting ground evidence is lacking.

[354] "rāje'an elā 'amūd nahr Tustar 'inda neṣf al-aysar min Hurmuz wa koteba moqabelan li-Hurmuz ilā al-asfal al-Šadorwān." *Ḥaw*, 2:251.

downstream from the confluence with the Gargar, are connected by a straight channel segment ca. 2.5 km long (Map 6.14). It is likely that this short channel was simply formed by the avulsion of the river, the only scenario considered in past scholarship. It is also possible, however, that an irrigation canal existed between the Band-i Qir and Ahwaz prior to becoming integrated into the Masruqān system. Other main feeder canals in this area also have similar sharp connections to the river, e.g. the end segment of the same canal north of the Ahwaz anticline as well as the outlet of the canal that started behind the Shadorwan of Ahwaz and passed through the city (Map 6.16). Medieval authors have particularly emphasized this sharp connection. Another possibility is that this canal segment was dug in the Early Islamic period in order to increase the water supply in the Masruqān below the Band-i Qir. In any case, it is surprising that no scholars have considered the possibility that the Karun migrated to the bed of the Masruqān through a man-made outlet.

Between ʻAhwaz and Kut-i Seyyed Saleh, the Karun again follows a nearly straight course. A large canal that used to run parallel to the river is visible both by its levee on the SRTM DEM and by the linear raised feature on the CORONA imagery. Thanks to the medieval authors, in particular the detailed descriptions of Muqaddasī and Abu Dulaf, we know that the Early Islamic city of Ahwaz was located on both sides of the latter canal.[355] The western side, Jazira, was smaller. The larger and most prosperous side, Medina, was on the eastern bank of the canal (Map 6.16). In the 10th century, a large beautiful bridge straddled the canal, connecting the two sides of the city. The new bridge, built by ʻAḍud ad-Dawla, replaced an older one. In addition, other canals tapped the Karun behind the Shadorwan and supplied water to the eastern and western banks. These canals, their domestic and agricultural function, along with the associated hydraulic structures,

[355] *Muq*, 411; *Dlf*, 28.

have been described in detail by Muqaddasi and Abu Dulaf. [356] Van Roggen's documentation of the relict canals at Ahwaz prior to their obliteration by modern development (Map 6.16) illustrates the description given in the historical sources.

The problem with this reconstruction is that it cannot explain why some authors, including Muqaddasī, stated that the Masruqān debouched into the marshes. "Nahr al-Mašruqān splits south of the city, i.e. Ahwaz, and is dry most of the year, and joins the marshes at a location called Dawraq."[357] Rejecting Verkinderen's solution to this problem, leaves us only with another canal that reaches the marshes south of Ahwaz: The Nahr Bahreh (Map 6.15, 6.17). The large canal that tapped the Karun behind the Shadorwan of Ahwaz, and flowed through the city, appears to have divided south of the city. The largest branch, the Nahr Bahreh, drained to the marshes.[358] It may be that Muqaddasī, and other authors mentioning a connection with the sea, considered that the large canal that flowed through Ahwaz and the Masruqān channel were one system. Note that the confluence of the Masruqān and the head of the Ahwaz canal were probably only a couple of hundred meters apart. Alternatively, the Masruqān may not originally have ended at Ahwaz, and may have continued its course parallel to the Karun; perhaps, the canal was modified after the construction of the Shadorwan weir, creating two distinct individual irrigation systems. Conversely, the Ahwaz canal system may have predated the Masruqān canal, if the latter was built in the Islamic period.

[356] *Muq*, 411; *Dlf*, 28; Bosworth, De Planhol, and Lerner, "AHVĀZ."
[357] *Muq*, 411.
[358] Verkideren has translated the Arabic verb "yašaqq" as divides into two and has used this translation to support the hypothesis that Nahr Malih was a branch of the Masruqan. However, this verb can simply mean split and can similarly refer to the relict canal system south of the city, discussed here.

The case of the Gargar bears a striking similarity to the Dargom canal in the Zeravshan valley in Central Asia. There, the monumental canal has been traditionally associated with imperial investments in the Achaemenid or Hellenistic period. In the past two decades, geoarchaeological studies have demonstrated that the current configuration of the canal was probably formed during the Sogdian period (c. 4th-8th centuries) when the political landscape of the region was fragmented. The Dargom also apparently developed gradually through the interaction of human and natural forces.[359] Similarly, there is good reason to believe that several smaller-scale canal projects that were carried out for various at different times may have joined and formed the Masruqān, and that natural processes played an important role in the formation of the present Gargar. While no absolute dates are available for any of these projects, the segments that are more reliably datable to the Sasanian period include: from the Band-i Mizan to the vicinity of Mahibazan; from Naqishiyat to the Band-i Qir. Natural processes may have worked in tandem with human action in the formation of the Naqishiyat-Band-i Qir segment. The segment from Ahwaz to the vicinity of Kut-i Seyyed Salih seems to predate the Islamic period, but the scale of the Sasanian canal projects cannot be determined given the city existed prior to the Sasanian period.

6.5 Irrigation Agriculture after the Conquest: Islamic Decline Reconsidered

At this point, it is important to re-state a major argument of this dissertation: that no reliable evidence exists to support the idea that investment in the irrigation system of the region stopped after the Islamic conquest. Nor could it be proven that settlements on the Miyānāb plain

[359] Stride, Rondelli, and Mantellini, "Canals versus Horses"; Malatesta et al., "Dating the Irrigation System of the Samarkand Oasis."

experienced a general decline. A shift in the focus of settlement and economic investment in the Islamic period can, however, be demonstrated.

The resolution of the ceramic chronology of the region is too coarse to differentiate between the sherds of the Sasanian period and those of the Parthian and Early Islamic periods (Appendix A). Therefore, as discussed before, it is impossible to argue for a "Sasanian expansion" based on the surface finds only. In contrast, expansion of settlement in the Islamic period into agriculturally less desirable areas, south of the Miyanab and north of the Kupal, is evident. Surface finds on these sites are unquestionably Islamic. In addition, settlements and sites datable to the Islamic period continue to occupy the northern areas of the plain along the Dariun canal system, which is the most favorable agricultural zone on the Miyanab (Map 6.9).

In order to understand this change, it is necessary to zoom out of the Miyanab plain and look into the dynamics of urbanism and irrigation affecting the Islamic cities of 'Askar Mukram, Ahwaz, and Ram Hurumuz. In the beginning of this thesis, it was noted that the argument of post-conquest decline does not match the image of Khuzistan's agricultural wealth in the 10th century sources. The present study proposes that, in the Islamic period, the lower plains of Khuzistan became the focus of agricultural investment at the expense of the more ancient centers of production to the north. The situation is best seen on the Miyanab plain in the foundation of a new metropolis, 'Askar Mukram, in the hitherto underdeveloped areas between Shushtar and Ahwaz.

While the Masruqān had no fundamental role in irrigation agriculture on the Miyanab, the canal formed the backbone of the irrigation of the large agricultural zone that was located between the two urban centers of 'Askar Mukram and Ahwaz. This is evident in the size of the levee of the straight channel of the Masruqān along with the traces of many irrigation outlets that brought water

to the fields on both sides of the canal (Map 6.12, 6.19). Iṣṭaḫrī and Ibn Ḥawqal noted that nowhere in Khuzistan was more prosperous than the region (*Ar.* buq'at) of Masruqān.[360] They further noted that the water in this canal was primarily used for the production of sugar as well as dates and cereal. Apparently, under the assumption that the Gargar was built by the Sasanian kings for the purpose of irrigation of the Miyanab, past scholarship has identified the Miyanab with the region of Masruqān.[361]

One problem in identifying Masruqān is the confusion in the Islamic tradition about the administrative status of Masruqān, naming it variously a region *(Ar.* boq'at), [362] a town (*Per.* šahrak) Sūrat al-Arḍ,[363] a city (*Ar.* midīnat)[364] (Idrisi, p394) or an agricultural district[365] (Ar. rustāq).[366] Muqaddasī provided the clearest description, stating that the al-'Askar is a nice district (kūra); it is where the rustāq of Masruqān is located. Furthermore, his list of the towns in the kūra does not include Masruqān.[367]

Satellite imagery clearly reveals that the region which was intensively cultivated by the Masruqān canal was located outside the plain, between the two cities of 'Askar and Ahwaz. This is the best candidate for the Masruqān region (Map 6.19). Here, evidence of an extensive irrigation

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[360] *Iṣṭ*, 90–91; *Ḥaw*, 2:253.
[361] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 82; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 279; Moghaddam, "A Note on the Gargar Irrigation System." The assumption that the Masruqān irrigated the Miyānāb is observed only in recent studies. The speculations of the European travelers about the origin and function of the channel always pivoted around drainage of the excess water of the Karun for the construction or maintenance of the headworks at Shushtar. See for example Rawlinson, "Notes on a March from Zoháb," 73–74; Curzon, *Persia and the Persian Question.*, 2:377–79.
[362] *Iṣṭ*, 90–91; *Ḥaw*, 2:253.
[363] *Ḥud*.
[364] *Opus Geographicum Sive "Liber Ad Eorum Delectationem Qui Terras Peragrare Studeant.,"* 394.
[365] The meaning of rustaq is not clear. Authors have used it in different ways, including a subdivision of a kūra, or an agricultural district.
[366] *Muq*, 405.
[367] Ibid., 51, 4.5.

system is evident in the SRTM Digital Elevation Model, from the size of the levees of the channel of the Masruqān as well as numerous outlets on both sides of the canal. This identification is additionally supported through two other lines of evidence. First, Iṣṭaḫrī's description of the irrigated fields of Masruqān comes after his description of 'Askar Murkam, in the context of his boat trip from there to Ahwaz. Second, 10th century geographers report that the region of Masruqān produced the bulk of the exported sugar; neither Shushtar nor 'Askar produced much sugar. This rules out the identification of Masruqān with the Miyanab plain. Looking only at the Miyanab, 'Askar Murkam is not supplied by an irrigated hinterland. The identification of Masruqān with the area between the Band-i Qir and Ahwaz suggests that the city sat at the head of and probably controlled this large agricultural zone. It was previously noted that a Sasanian canal may have been enlarged to allow for mass production of sugar and other cultivars in Masruqān. It is similarly possible that a new canal was dug in the Islamic period to provide for the expansion of settlements and growth of agriculture in a previously underdeveloped area.

The irrigation system of the Masruqān region was probably one of the most sustainable of the post-conquest investments. The compiler of the Ibn Ḥawqal manuscript noted that in the 12th century the fortunes of Ahwaz had declined, while 'Askar Mukram maintained its status and became a more prosperous city than Ahwaz. In the 11th century, 'Askar was certainly important enough that its pontoon bridge was replaced by a large brick bridge. This suggests that the agricultural hinterland of 'Askar Mukram, i.e. Masruqān, must have been maintained.

Both Schindler and Bell observed extensive ruins of masonry structures along the Masruqān levee, some 5-6 miles southwest of Wais.[368] Levee systems demonstrate that the large

[368] Schindler, "Reisen Im Südwestlichen Persien," 879.

outlet canals that tapped the Masruqān ended upstream from this location. This supports Schindler's hypothesis that these blocks were probably remains of a large dam. As is customary in the literature, Bell attributed this masonry to "the time of Shapur". It makes more sense, however, that this dam was built in the course of the agricultural expansion of the Masruqān region in the Islamic period. Schindler observed a small dam downstream, close to Ahwaz. This was probably built in order to use the small amount of overflow from the bigger dam, as suggested by the small size of the associated levee systems. The small dam near Ahwaz was probably built after the first dam, when the pressure of development encouraged expansion to a smaller area downstream. Iṣṭaḫrī and Ibn Ḥawqal noted that after c. 30 km (6 farsaḫ), they had to get off the boat and continue their trip on foot in the canal bed because the canal was dry. This distance would fall somewhere between the location of the first and second dam. Why did neither author mention a dam? It can either mean that these dams did not exist at that time or they simply mentioned their progress along the passage, not the impeding features. If these dams existed, there is more reason to doubt the claim of the authors that water in the Masruqān was affected by the tides. It is not certain that the system entirely collapsed after the avulsion of the Karun; irrigation agriculture may still have been possible in the area between 'Askar and Wais.

6.6 The Heyday of the Islamic Period: The Urban Landscape of 'Askar Mukram

In a rather underdeveloped part of the Miyanab plain, a new settlement grew to become a large city and the administrative center of the kūra of the same name: 'Askar Mukram. The significance of this city in the literature on the Islamic economy and urbanism is well recognized.[369] It is something of a mystery that the site was systematically surveyed and officially

[369] See e.g., Wheatley, *The Places Where Men Pray Together*, 40, 141–42, 267, 255–56.

recorded only in 2001, especially given its visible location on one of the most frequently travelled routes in Khuzistan.[370] Elsewhere, I have elaborated on the significance of the city in the ongoing discussions of Early Islamic Urbanism. I have also discussed the textual data available on the configuration of the city, its name, and its foundation legends. [371] Here, only those aspects which are critical for the discussion of the dynamics of settlement and irrigation on the Miyanab will be summarized.

Ample references to the city are found in the 9th and 10th century sources; at that time ‘Askar was a large, prosperous trading hub. The name of the city appears frequently in the accounts of the Zanj revolts in Khuzistan. Several scholars of the 9th century were from al-‘Askar.[372] The fate of the city is not very clear, however, because after the 10th century, the authors simply copied earlier texts. The only valuable exception are the notes inserted by the compiler of the Parisian codex of Ibn Ḥawqal. He visited the city at the beginning of the 12th century and noted that ‘Askar was still a significant city, larger than ‘Ahwaz, which was then already in decline. In the 14th century, only a memory of the town was preserved in the name of the location, Laškar (Persian word for ‘Askar).

The Arabic sources give various tales concerning the foundation of ‘Askar Mukram and the origin of its name. The common element in these accounts seems to be a foundation date towards the end of the 1st century AH/7th CE century and a founder’s attribution to a military figure named Mukram. The texts disagree about the identity of this person, and his role in the

[370] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, 101–105; le Strange, *The Lands of the Eastern Caliphate*, 236; *Naj*, 32; Selby, “Account of the Ascent of the Karun and Dizful Rivers and the Ab-I-Gargar Canal, to Shuster,” 228. Layard made two extensive visits to the ruins and described his observations in detail. Layard, “A Description of the Province of Khuzistan,” 63–64.
[371] Soroush, “The Miṣr of ‘Askar Mokram: Preliminary Report and Framework for Future Research.”
[372] *Sm’*, IX:298.

foundation of the city. They do however agree that the city started as a military encampment. By this definition, the city is a miṣr, a class of Early Islamic city that is the subject of ongoing discussions in the study of Early Islamic urbanism.

The significant reorientation of the economic landscape of the region through the foundation of ‘Askar Mukram has been overlooked because of the prevailing assumption that it replaced the Sasanian city of Rustam Kawād/Rustāqubad.[373] The only reason for this common supposition is a statement by Yāqūt in the 13th century: “And, Ḥamza Iṣfahānī said that Rustāqubad is the Arabicized of Rustam Kawād, which is the name of a town (medina) in Khuzistan that was destroyed by the Arabs in the beginning of the Islamic era (*fī ṣadr-i Islam*). Then, the town (medina) that was the encampment of Mukram b. Meʿzāʾ al-Ḥāriṯ was laid out near it.” [374] The reliability of this statement is dubious. [375] On one hand, the relevant sentence in Tāriḫ-i sunni mulūk reads: “After the wars of Ḥajjāj, two other towns of Khuzistan were destroyed, one of which was called Rustam Kawād and was Arabicized as Rusiqābāḏ ….”[376] The text does not say that ‘Askar Mukram was built in its place. It is not clear whether Yāqūt used a different text or whether he only quoted Ḥamza on the first part, the destruction of Rustam Kawād, and added the rest. The fact that the early sources that mention or describe the city are silent about the relationship of ‘Askar Mukram to any pre-Islamic town strongly suggests that the idea may have

[373] Wheatley, *The Places Where Men Pray Together*, 143, 267; Moghaddam, “A Note on the Gargar Irrigation System”; Alizadeh et al., “Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations,” 81; Verkinderen, “Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period,” 281.
[374] *Yāq*, IV:123.
[375] For a detailed discussion, see Soroush, “The Miṣr of ‘Askar Mokram: Preliminary Report and Framework for Future Research.”
[376] *Ḥmz*, 2:48.

been an invention of Yāqūt or Ḥamza.[377] On the other hand, historical sources frequently mention Rustāqubad in the accounts of the wars of the late 7th century without pointing to a specific location. It seems that the Rustāqubad in question might be anywhere in the general area from south of Shushtar (Dastowa) to the vicinity of ‘Askar Mukram. In fact, the only reason to look for a specific location for Rustāqubad is the account of Yāqūt. None of the historical sources refer to a particular type of settlement or an administrative category, such as a medina or even a village (qarya) when naming Rustāqubad. Note that Balāḏurī specifically mentions that the battle of Mukram and Ibn Ziyād was fought at the location (al-Mawże’) that is now known as ‘Askar Mukram.[378] Therefore, there is no reason to presume that a Sasanian city existed here.

In order to assess the impact of the foundation of ‘Askar on the landscape, it essential to have a reliable estimate of the size of the entire city. In the 2001 survey, only the western side of the city was documented, although historical sources make it clear that ‘Askar Mukram was located on both sides of the Masruqān. Remote sensing and fieldwork allowed me to map the boundary of the urban landscape and its associated areas, and to record some of the best preserved landscape features.

This study confirms that a considerable part of the city, c. 110 ha, was located on the eastern bank of the river (Map 5.23-5.25). The formerly surveyed western part, area A, is estimated at 274 ha. Furthermore, two large industrial areas were recorded which probably served the city. The first, Area D, immediately to the west, is c. 100 ha in size. Several sites were recorded in this area in the 2001 survey of the plain. Their small size and proximity to ‘Askar Mukram was striking.

[377] Similarly, Ḥamza is the only source stating that Rustāqubad is Arabicized of Rustam Kawād. Yāqūt repeats this statement quoting Ḥamza.
[378] *Bal Fut*, 383.

During the field study, I observed that these small mounds were not settlements but kilns. Therefore, instead of individual sites, I re-mapped a large area that appear to have specialized in the production of brick, gypsum and other building materials for the city. The second industrial zone, area B, was previously unrecorded. It covers an area c. 150 ha, 1 km north of the city. The quantity of slag found here suggests that metallurgy was one of the main functions of this zone. The urban complex as mapped in the 2014 survey is estimated at c. 385 ha.[379]

The city which grew to this size was certainly an important hub in a flourishing economic trade network. ʻAskar was strategically located at the intersection of the main land route from Iraq (through Wasīt) to Fars and the water route that connected Shushtar and Ahwaz, i.e. the Masruqān. The sugar of Khuzistan which was widely consumed across the Iranian plateau, al-Iraq and Arabia was processed at and distributed via ʻAskar Mukram. The city was also active in the flourishing textile trade of Khuzistan and specialized in the production of the textile known as tirāz. By the 10th century, the city appears to have replaced Shushtar as the main way station between Ram Hurmuz and Susiana. Iṣṭaḫrī and Ibn Ḥawqal noted that the short land route went through ʻAskar Mukram. They only mention the route via Shushtar in order to give the distance between the cities.

The system of hollow ways that are preserved on the CORONA imagery leaves little doubt that the sites in the newly developed area north of the Kupal were connected to ʻAskar on daily

[379] Other areas that might be related to the urban landscape of ʻAskar Mukram are the two extensive sites of Negini and Herad. These extensive hummocky sites yield sherds of (primarily) later historical periods, all simple and non-decorated. They are located at the tail of the irrigated system of Miyānāb. Little evidence for architecture is found any were on these large sites. It seems very unlikely that these sites represent large settlements; further field research is needed to inquire whether these enigmatic sites were production zones, or waste zones related to other settlements, most likely ʻAskar Mukram.

basis (Map 6.20).[380] Linear hollows have been systematically recorded and studied in the context of Bronze Age settlements in the rain fed steppe of Upper Mesopotamia by the late Tony Wilkinson and colleagues.[381] However, as recently demonstrated by Jesse Casana, hollow ways are also visible on CORONA imagery that are associated with later historical period sites.[382] Dating old routes is very difficult. Hollow ways can be dated to a certain period only when they clearly articulate with reliably dated sites. At ‘Askar Mukram, the connection of hollow ways with the city is evident: several hollow ways radiate out of the site and are traceable for several kilometers. Two of the longest features are traceable for at least 30 kms. It is highly likely that these roads connected ‘Askar Mukram with the Islamic settlements to the east and continued the land route to Ram Hurmuz.

Naturally, the bridge(s) that connected the two sides of the city would have been important feature(s) of the urban landscape of ‘Askar and of the land route between Fars and Khuzistan. There are several textual references to the bridges of the city. In the 9th century, the government forces which camped at ‘Askar Mukram cut its bridge in order to avoid fighting with the Zanj army (266 AH/879 CE). [383] In the 10th century, Iṣṭaḫrī stated that the Masruqān was bridged at ‘Askar Mukram by a large jisr, the size of c. twenty boats.[384] Muqaddasī, who stayed in the city for half a day, noted that two jisrs connected the two sides. [385] Sometime in the 11th or early 12th century, a

[380] A hollow way is an ancient track that was create by continuous movement of heavy traffic, especially animals, along a fixed linear path over few centuries. Water erosion through these linear depressions usually adds to the depth and visibility of these old routes.
[381] Wilkinson, “Linear Hollows in the Jazira, Upper Mesopotamia”; Ur, “CORONA Satellite Photography and Ancient Road Networks.”
[382] Casana, “Radial Route Systems and Agro-Pastoral Strategies in the Fertile Crescent.”
[383] *Ṭab*, III: 1937. From the other details of the story it can be concluded that the Zanj and the governors’ troops camped on the western and eastern banks of Masruqan, respectively.
[384] *Iṣṭ*, 89.
[385] *Muq*, 410.

masonry bridge was built for the city; the compiler of the Parisian Ibn Ḥawqal codex added the following note: "And, on the Masruqān river, in the middle of 'Askar Mukram, there is a solid, beautiful bridge (qanṭarat) built of gypsum and brick, very wide, and at this bridge there are markets and shops (dakkākīn) and a nice mosque."[386] Remains of a large brick structure that is preserved on the eastern bank of the Gargar, in the middle of the city, is the best candidate for this bridge (Map 6.21-6.22, Fig. 5.49-5.50). Interestingly, in a section created by water erosion, stacks of fine plainware are visible in an area that once flanked the pathway to the bridge (Fig. 5.51-5.54). These may be the remains of a shop/storage on the bridge, as described in the text. It is reasonable to assume that the masonry bridge was built where a jisr previously stood. Further support for the hypothesis that this location was the crossing between the two banks for a considerable time comes from the hollow way system around the eastern side of the site. One of the longest features forks approximately 2.5 km northeast of the site, and one branch turns in the southwesterly direction and continues toward the center of the site where the ruined structure is located. A second branch of this fork that continues straight to the east may point to the location of the crossing, mentioned by Muqaddasī. Architectural remains and dense surface pottery suggest that a monument, which was isolated from the rest of the site (Map 16.22, possible bridge location a), overlooked the river at this location. It is possible that the significance of this spot was due, at least partly, to the crossing of the river. Another alternative location for the second crossing is where the ruins identified as a the Band-i Qir are located (Map 16.22, possible bridge location b).[387]

[386] *Ḥaw*, 2:251.
[387] For further discussion of this possibility, see the discussion of the Band-i Qir in this chapter.

We can only speculate about the boundaries of the new province. Pyne noted the difficulty of identifying the boundaries of this kūra because he could locate only one settlement (Zaydan) which was dependent on the ʻAskar. Hence, he defined its approximate boundaries based on the areas known to be part of the neighboring districts.[388] As mentioned above, it makes sense that the irrigated zone south of the city belonged to the new kūra. In addition, it makes sense that the cluster of settlements that were founded in the Islamic period along the northern face of the Kupal anticline belonged to the new province. To this, we can add Muqaddasī's statement that three waterways circumscribed and passed through the kūra of ʻAskar.[389] One of these three, I propose, was Masruqān; another was probably the stream that runs along the northern face of the Kupal. The third watercourse may well be the Karun, or alternatively, another small stream north of the anticline. In any case, the kūra appear to have included at least the areas south and east of the city. It is hard to tell how much of the Miyanab plain, besides the city and immediate hinterland in its vicinity, was included in this administrative unit since the kūra of Shushtar was still maintained (Map 6.19). This area falls within the zone suggested by Pyne, but is smaller.

One of the most intriguing aspects of the development of this kūra is the problem of water supply. At ʻAskar Mukram, a permanent source of running water, i.e. the Masruqān, was available, but it was running at least c. 5 m below the plain. Lifting devices may have been used for water extraction. A number of wells in the city have become visible along the western bank of Gargar as a result of water erosion (Fig. 5.43). This evidence contradicts the testimony of Iṣṭaḫrī that because of abundant running water no city in Khuzistan used wells.[390] Further fieldwork is needed to

[388] Pyne, "The Impact of the Seljuq Invasion on Khuzestan," 177–178, Fig. 29.
[389] "yašaqaha wa yuḥatu biha ṯalaṯo anhār."*Muq*, 410.
[390]*Iṣṭ*, 90.

demonstrate the extent to which the city relied on well water. If this was an important source, then the change in the hydrological regime of the Gargar, which caused it to incise its bed for another 4-5 m, would have affected the city (Fig. 5.44, 5.61).

Moghaddam identified two strings of qanats north of the large Islamic settlement of Karevansera (Fig. 6.8-6.9). According to him, this technological change, i.e. reliance on subterranean channels, explains the new arrangement of the settlements in this hitherto underdeveloped zone. "A qanat system running from the north (near the foothills) to the south near the massive site of KS 1654 is indicative of a new agricultural strategy replacing the Sasanian method of large-scale channel based irrigation. Similarities between surface finds … among the new emerged towns in the east and south (KS 1622, KS 1654, and KS 1666) provides compelling evidence in support of this extensive qanat-based irrigation system, likely to have occurred in response to socio-political changes occurring in the region after the Islamic invasion." [391]

Beside the political determinism of this statement that ties a major technological shift--the replacement of canal-based irrigation with qanat systems--to the socio-political outcomes of the Islamic conquest, my study of all the available datasets of the CORONA and aerial imagery did not reveal traces of any qanat at this location. Qanat systems have a very distinctive signature on historic imagery. Normally, several strings, composed of multiple ring-shaped soil heaps, run parallel to each other and are easily recognizable. It is possible that what Moghaddam has identified as a qanat represents spoil heaps of several wells or a single subterranean channel. In any case, it is nearly certain that irrigation agriculture was never practiced in this zone. Even if, as

[391] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 55–56.

Moghaddam argues, settlements in this zone were established as base camps for the Muslim army, the density of sites which survived into the Middle Islamic period could be explained only if they were part of a strong economic network.

The kūra of ʻAskar was famous for the production and export of sugar as well as textiles. The position of the Islamic sites north of the Kupal near seasonal gullies of the Naft-i Sefid zone, along with the evidence of an extensive system of hollow ways, suggests that an agro-pastoral economy was practiced in this area. Besides dry-farming and animal husbandry, the cities north of the Kupal may have played a role in the textile industry and trade. Muqaddasī reports that large quantities of raw silk were exported to Baghdad from ʻAskar.[392] It is possible that some of the traded silk was produced in the kūra. Because Ram Hurmuz was famous for its silk production, however, the city probably served primarily as a trade hub. Yet ʻAskar was famous for other types of textiles: a good durable linen, hemp cloth, scarfs, etc. Textile industries require considerable amounts of water.[393] Muqaddasī noted that many ṭirāz factories of the Masruqān type were functioning in other cities along the waterways (Ar. anhār) of the region.[394] Because he speaks of several waterways in the kūra, he may be referring to the outlets of the Masruqān canals or the streams north of the Kupal. Future researchers need to investigate whether the streams along the northern side of the Kupal were able to support a textile industry. They may have contained more water and may flowed closer to the plain surface when compared to the present situation.

[392] *Muq*, 416.
[393] Most fabric preparation steps, including scouring, bleaching, and dyeing require water. Almost all dyes are applied to the textile substrate in water basins. Water is also used to wash the textile off the applied material, after each step.
[394] *Muq*, 410.

6.7 The Shushtar Historic Hydraulic System: A History of Sustainability and Resilience

One of the objectives of this dissertation is to explore the date and function of the famous historic hydraulic structures of Shushtar. In chapter two, the state of knowledge about these features, available textual data, and past scholarship were discussed. A systematic program of archaeological investigation (mainly in and under water) is essential before any definitive conclusion about the date of these structures can be made. Nevertheless, some findings concerning their history can be presented at this stage (Fig. 2.1; Map 6.23).

6.7.1 The Shadorwan[395]

Although the Shadorwan weir was most likely built in the Sasanian period, a rock formation may have raised the water level at this location prior to the construction of the weir. Several ridges in the bed of the Karun (and a few in the Gargar) act like natural weirs, raising water and creating rapids that are obstacles for boat navigation. The unusual curve of the plan of the Shadorwan is immediately notable. It has been suggested that the structure may have followed the shape of the foundation bedrock. Canal evolution also suggests that the main canal head(s) for irrigation of the plain always tapped the Karun around this location. It is possible that an existing natural reservoir encouraged a more systematic investment in canal head management in the Sasanian period.

Several scholars in the 18th and 19th hypothesized about the sequence of the construction of the Gargar and the headworks at Shushtar. Rawlinson suggested that the Gargar was the first

[395] Fig. 2.12-2.13, 2.19, 2.23-2.27.

component which was constructed by the Romans, for Ardashir I or Shapur I. When the Karun was diverted into the new channel, the high-lying fields south of Shushtar could not be irrigated. Therefore, the Shadorwan weir was built to force the water back into the Dariun irrigation system. Once the river was diverted back to its main course, the Band-i Mizan was built to regulate the water flow into the Gargar and prevents it from draining the river's water.[396] Rawlinson essentially explains an idea first mentioned by Mustawfī, that the Shadorwan and Gargar were built in one project.[397] Before Mustawfī, the sources attributed the Masruqān to Ardashir I and the Shadorwan to Shapur I. As Curzon noted, Rawlinson's theory does not explain why the Gargar was built in the first place. He, on the other hand, suggests that the Shadorwan weir and the Dariun canal where built by Ardashir or Shapur I, in order to irrigate the high-lying fields south of Shushtar. The river, however, scoured its bed and probably broke the weir. In order to properly deal with the problem of water erosion at the intake of the Dariun, Shapur I called in the Roman engineers. They built the Gargar to drain the excess water of the Karun in order to build a solid structure, i.e. the present the Shadorwan weir. In order to prevent further channel incision, the bed of the river between the Band-i Mizan and Shadorwan was paved.[398] Similar to Curzon, Van Roggen argued that a weir must have existed at this location prior to the construction of the Shadorwan in the Sasanian period. Van Roggen's model proposed that, in the first phase, a canal was built on the right bank of the Karun north of Shushtar in order to divert the river from upstream of the Band-i Mizan to downstream of the Shadorwan. Then, the Gargar was dug, and the river was diverted into this manmade channel. After that, the Shadorwan was built across the dry bed of the river. An ancient

[396] Rawlinson, "Notes on a March from Zoháb," 73–74.
[397] He does not make reference to any medieval author as the source of this idea.
[398] Curzon, *Persia and the Persian Question.*, 2:377–79. See the discussion of a "pavement" upstream the Shadorwan in the introduction of the Shadorwan in chapter 2.

weir or the ruins of it could have served to keep the water out of the dry bed of the river. After the Gargar was built and the Karun was directed to the artificial channel, the new weir was built in place of the old weir.[399]

The proposed sequence makes sense in general, but does not require the existence of an old weir to block the river from re-entering the dry channel. Van Roggen did not suggest a similar structure to keep the water in the channel of the Gargar and prevent it from re-entering into the dry bed of the Karun. Historic imagery and historic DEM show that the depression he identifies as the course of the diverted Karun ends upstream from the Shadorwan rather than downstream. Van Roggen's model presumes that the Gargar was built all at once, therefore the river had to be diverted entirely. According to the hypothesis of this dissertation, a large diversion canal was not necessary for the construction of the Gargar.[400] In any case, it makes sense that the construction of the Shadorwan took place after the Gargar project was completed, as stated by Mustawfī and others.

Past scholarship has taken for granted that the weir and the bridge of the Shadorwan were built at the same time in the Sasanian period. Verkindern (2009) is the only scholar who has drawn attention to the problem of the date of the construction of the bridge.[401] Verkindern and Khazraee provide a thorough discussion of the meaning of Shadorwan.[402] The term either refers to a dam or

[399] Graadt Van Roggen, "Notice Sur Les Anciens Travaux Hydrauliques Susiane," 183–84.
[400] If the Karun was diverted away from the Dariun canal head, irrigation would have been interrupted in the course of the construction of a Masruqan Canal from Shushtar to Ahwaz.
[401] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 274.
[402] khazraee, "Shadorvan, and the Difficulties of Shushtar Historical Studies"; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 271–73.

to a basin, but the numerous references to the Shadorwan of Shushtar found in the literature do not necessarily imply that a bridge existed at this location. The bridge of Shadorwan is a remarkable feature noted by all modern travelers passing through Shushtar. If a bridge had existed since the Sasanian period, then it is striking that neither it nor its ruins were mentioned in any of the early Islamic texts that mention the weir. Ya'qūbī stated that Roman captives built for Shapur I a qanṭara (*Ar*. bridge) across the Karun (Nahr Tustar).[403] This, however, is not confirmed by any other source, and is a stand-alone statement without any context. Even the notion that the bridge was located at Shushtar cannot be confirmed in the text; elsewhere, the author also mixes up the two waterways of the Masruqān and the Karun which further casts doubts on this peculiar statement.[404]

In contrast, there is evidence suggesting that the bridge is a later addition. In the account of the year 39 AH/659 CE, Dinwarī mentioned that 'Abdullah b. 'Abbās dispatched Abā l-Aswad ad-Dilī to pursue the Kharijite rebels. He found them at the Jisr of Shushtar, but they were able to hide under cover of darkness and escaped.[405] Miskawaih described a siege of Shushtar in the year 319/931, during which the pontoon (jirs) of Tustar across the Dujail was cut in order to prevent the besiegers from entering the city.[406] Muqaddasī and Ibn Baṭṭūṭa, who provide a detailed description of their observations at Shushtar in the 10th and 14th centuries, respectively, specifically mention that the city had a large pontoon bridge (jisr) in the direction of Dezful, the only passage over the waterways around the city. [407] Verkindern suggests that the reason for this silence may be that the bridge was ruined by the time the sources were written, but admits that the

[403] *Ya' Trḫ*, v1: 180.
[404] *Ya' Bld*, 361.
[405] *Dīn*, 205.
[406] *Msk*, 255.
[407] *Muq*, 409; *Baṭ*, v2:24.

evidence for this scenario is uncertain.[408] Curzon was the first person who propagated this idea. He attributed the destruction of the bridge to Ḥajjāj b. Yūsuf, without mentioning his source.[409] Almost certainly, his source was the local history of Shushtar, Taẕkirah-yi Šūštar, written in the 17th century, or the expanded version of it, Tuḥfat al-'ālam, written in the late 18th century. These histories gave various lengthy tales about the hydraulic monuments of Shushtar, including the story of Ḥajjāj's destruction of the bridge in his battle with the Kharijite rebel Šubayb. Like other tales in this book, the story is altogether fictitious, as Ḥajjāj fought with Šubayb at Ahwaz and fell into the river from a jisr.[410] The only reference in an early Islamic source about the destruction of a bridge in this area is in Balāḏurī's confused account of the battle between al-Ḥajjāj and Ibn al-Aš'aṯ.[411] He confuses the first battles between the two, at Shushtar and the decisive battle at a location called Maskin near Ahwaz in year 81 AH/700 CE. According to Balāḏurī, Ibn al-Aš'aṯ went to the "Maskin of Ahwaz which is near Tustar." There, he ordered a qanṭara and a Shadorwan to be destroyed so that he could cut himself off from Maskin. He added that the Shadorwan had been repaired, but the qanṭara was still in ruins. Verkindern notes that the story is problematic because it confuses the locations. He argues that it could explain, however, why the sources do not mention the bridge and only speak about the Shadorwan, because the former was in ruin but the latter was repaired.[412] I disagree with this argument. The mere mention of a Shadorwan does not mean that it was at Shushtar. The Shadorwan of Ahwaz was equally famous and was frequently noted and described by Islamic authors. If we accept that the bridge and weir in question were at

[408] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 274.
[409] Curzon, *Persia and the Persian Question.*, 2:374.
[410] See e.g., *Ḫal*, 172; Yāqūt al-Ḥamawī, *Yāq*, v2: 443.
[411] *Bal Fut*, v7:322–44.
[412] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 274.

Shushtar, there must have been references to the destruction of the Shadorwan by Ibn al-Aš'aṯ and its subsequent repair in other sources.

There is a tendency in the literature to presume that bridges were necessarily built over important river crossings during periods of economic prosperity and political stability.[413] The construction of bridges, however, has as much to do with hydrological regimes as it has to do with socioeconomic dynamics.[414] Note, for example, that in 'Askar, a permanent bridge was built after its heyday. In addition to problems of evidence, the assumption that the remains of a bridge that was in ruins in the 7th century survived the forces of the Karun to be repaired after the 14th century is not logical. The force and erosion rate of the Karun has significantly diminished the ruins of the Shadorwan in the past century, despite the construction of dams upstream and modern efforts to protect the ruins. It has been customary to attribute the ancient bridges of Khuzistan of unknown date to the Sasanians. Van Roggen, who documented the "Sasanian" bridges at Dezful, Pay-i Pul and Shushtar, underlined the difference in the quality and construction technique of the bridge of Shushtar when compared with the other two, and concluded that different architects, all during the reign of Shapur, must have built these structures. The more natural conclusion is that the bridges were built at different times. The Shadorwan bridge was probably built sometime between the 14th and 17th centuries; the irregularity of the plan supports the idea that it was subsequently added to an underlying structure; the heterogeneity of the shape and construction technique of different parts of the bridge testifies that it has gone through many phases of repair and restoration, until attempts were finally abandoned in the 19th century.

[413] It has even been proposed that a bridge existed in this location since the Achaemenid period."The Renovation and Restoration Plan of SHHS-Vol 7."
[414] Edgeworth, *Fluid Pasts*, 29–30; Harrison, *The Bridges of Medieval England Transport and Society, 400-1800*.

6.7.2 The Band-i Mizan[415]

There is no reference to the Band-i Mizan in medieval sources. The first text that attributes it to the Sasanian period is a lengthy tale in Tuḥfat al-ʻālam (late 18th c.). Modern scholarship and popular media have taken this attribution for granted. Furthermore, the widely-accepted story that the weir divides the flow of the Karun in a two to one proportion is unfounded. In the winter and spring, the water normally overflows the weir. The Band-i Mizan could control the flow in the Gargar during the low-water season if it was equipped with sluices. In the absence of sluice gates, the flow in the Gargar during low-water season is at present controlled by the base level at the Gargar Dam.

Given the absence of textual data, it is very difficult to speculate about the date of the construction of the Band-i Mizan. Muqaddasī stated that in the 10th century the city could be accessed only by the way of the bridge and gate of the Shadorwan. Ibn Baṭṭūṭa, to the contrary, noted that in the 14th century, there were other thoroughfares over the waterways of the city. A date near the 14th century is also supported by the appearance of new names for the Karun and the Gargar at this time, Du Dāngeh and Čāhār Dāngeh, which are tied to the tale of the origin of the weir. The Band-i Mizan, may have been built between the end of the 10th century and the beginning of the 14th century. This date seems reasonable in light of the hydrological changes that followed the avulsion of the Karun to the Masruqān, between the 10th-14th centuries. Because of a considerable elevation difference, the Karun tends to also migrate to the deeply incised bed of the Gargar at Shushtar. The increased incision of the Masruqān after the avulsion of the Karun

[415] Fig. 2.11-2.13, 2.20-2.22.

must have exacerbated this problem. A weir may have become necessary to prevent the Karun from leaving its bed and diverting into the Gargar at Shushtar.[416]

The unusual shape of the weir is probably the result of the substantial restoration project of the Qajar governor, Muḥammad ʻAli Dawlatšah. He finally succeeded in blocking the breach that was created in the Safavid period and had widened since then. While modern literature has highlighted the fundamental difference in the structure of the western and eastern arms of the weir, high-resolution aerial photos demonstrate that the two wings were originally similar, linear structures of approximately 12-14 m width. Part of the western wing has been considerably modified and looks as if it were an irregular structure. Najm al-Mulk expresses his astonishment at the achievement of Dawlatšah in fixing the breached weir, and adds that so much building material was used to fix the breach that the mortar had not been able to dry since the project was completed. The irregular part of the west arm of the weir most likely dates to these repairs.

6.7.3 The Gargar Dam, The Boleyti, The Gargar Bridge, The Watermills[417]

We know nothing about the history of the construction of the complex that is today known as the Watermills/Waterfalls Complex and is attributed to the Sasanian period. It is striking that even the local histories of Shushtar make no reference to these hydraulic structures. That the city had a gate at this location in the late 18th and the 19th century, however, suggests that a crossing existed then. A one-arch brick bridge connected the city to the eastern bank of the Gargar until the mid-1930s, when it was replaced by the current dam. So it is clear that the dam is a recent structure.

[416] Heyvaert et al. (2013, poster) categorizes the bifurcation at Shushtar as an example of avulsion-obstruction, where human action has prevented the migration of Karun to the Gargar.
[417] Fig. 2.12-2.13, 2.28-2.37.

As noted in the case of the Band-i Mizan, a bridge may have straddled the canal since the 14th century at least. Verkinderen proposed that the crossing over the Masruqān river in the vicinity of Shushtar, named Qanṭarat Fars, might refer to a predecessor of the Boleyti bridge.[418] It will be suggested below that a structure known as the Band-i Mahibazan is a better candidate for this crossing.

The literature has ignored the fact that water erosion in an incising regime causes the gradual recess of the Knick points toward the channel head.[419] Human effort may slow down the process to some degree[420]. The knick point, which is now at the Waterfalls complex, would have been originally located further south. It is logical to presume that considerable knick point recess may have happened since the Sasanian period, even though its rate has not been determined. The construction of the Gargar dam in the Qajar period would have achieved two goals: first, preventing knick point recess; we cannot be sure that this function was planned purposefully or not, but, there is no doubt that covering the surface of the slope with masonry has slowed down the process; second, controlling the flow of the Karun from diverting into the Gargar, thus replacing the function performed previously by the Band-i Mizan.

Numerous remains of watermills are found along the rivers in Khuzistan. There is no doubt that watermills have been part of the agricultural economy of Khuzistan at least since the Sasanian period. Many mill complexes may have been built along the course of the Gargar since its creation. Considering the northward migration of the Gargar knick point, however, it is very unlikely that

[418] Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 277–78.
[419] Knick point is a term in geomorphology to describe a location of a river or channel where there is a sharp change in channel slope, such as a waterfall.
[420] A classic example is the preservation efforts for reducing the retreat of the Niagara Falls.

the existing mills at the Waterfalls complex have existed since the Sasanian period. Strikingly, Mīr ʻAbd al-Laṭīf Šuštarī who described several mill sites along the Gargar, does not mention the mills at the Gargar gate. If we assume that silence about such a big mill system is not accidental, we could conclude that either these watermills were not built yet or that they were already in ruin in the 18th century. Unfortunately, the details of the dam project of the 19th century are unknown, including whether or not it involved the modification or building of subterranean tunnels and mills. Between the three tunnels, the two on the eastern bank of the Gargar, especially the Boleyti, which is designed for maximum flood discharge, could be more recent constructions. Also, the watermills on the northern and eastern side of the complex, which were better preserved and continued to function until modern times, are candidates for post-1930s additions to the mill system.

6.7.4 The Band-i Khak, The Pol-i Lashkar, The Pol-i Shah Ali, The Band-i Sharabdar[421]

Along the course of the Raqqat channel of the Dariun, remains of several hydraulic structures are found. The most important features are four weir and weir/bridges, from north to south: the weir (band) of Khak, the bridge and weir (polband-i) of Lashkar, the bridge (pol) of Shah ʻAli, and the weir (band) of Sharabdar. Similar to other waterworks at Shushtar, it is widely accepted that these structures were all built in the Sasanian period. There are several reasons to doubt this assumption.

The history of canal evolution on the Miyanab suggests that the present configuration of the Dariun canal system, where the water is divided between two main canals, one for irrigation and one for the drainage of the excess water to the Gargar, represents the last phase of a long

[421] Fig. 2.38-2.43.

process, dating probably to the medieval period. The functional relation of the two branches of the Dariun system downstream from the Band-i Khak is similar to the Karun and the Gargar: one feeds the irrigation canals, the other one drains the excess water and runs the mills during the high-water season by means of a system of weirs and water-lifting devices. The four weirs on the drainage channel of this system must have been built to maintain the base level in the irrigation canals during low-water seasons. The historic DEM suggests that the retreat of the knick point has also occurred in the Raqqat canal. There is no evidence supporting a Sasanian date for these structures. Some of these structures may have existed during Ibn Baṭṭūṭa's visit in the 14th century. When Najm al-Mulk visited Shushtar in 1882, five middle arches of the Lashkar bridge were destroyed: "People had made-up something [structure] of wood [between the two sides] out of need but floods keep washing it away, and the same is true for the Shah-'Ali bridge."

In 1884, when Madame Dieulafoy visited the town, the bridge was repaired (2.42). Excessive restoration in recent decades has damaged the authenticity of the monuments and all parts look the same. The middle part consisting of five restored arches, however, is visible in an old photograph of the bridge taken in 1979, demonstrating that a large part of the structure dates to the 19th century (Fig. 6.11). Following Najm al-Mulk's report, we can assume that what is preserved of the small bridge of Shah 'Ali was all rebuilt at the same time as Laskhar. The Band-i Khak is a heterogeneous structure made of three adjoining parts—a plan that suggests piecemeal and small-scale interventions to keep it up and running over time, with nothing that necessitates or even suggests large-scale investments. Najm al-Mulk reports on at least one of these phases of alteration: "The Miyanab canal ….goes until the Earthen Dam (i.e. the Band-i Khak); there, the

work for the sewage outlet has caused damage, and they have (recently) built the Band-i Khak."[422] In sum, much of the hydraulic structures that are preserved along the Raqqat channel of the Dariun system seems to date to the late medieval and early modern periods.

6.7.5 The 'Ayyār Weir and the Mandaean Sanctuary[423]

The site is one of the few hydraulic remains around Shushtar which is understood to date to the medieval period. It consisted of a weir as well as canals and basins cut in a rock outcrop. The weir was destroyed in the 17th or 18th century. Given that the weir is built on the lowest terrace of the Gargar, it makes sense that it was a relatively recent structure, perhaps a late medieval investment. The date of the construction of the complex cannot be further discussed without additional evidence. Yet the hydraulic function of the site, which is overshadowed by its local name, i.e. the Mandaean Sanctuary, needs to be discussed. The Lar project is the only study I am aware of which has drawn attention to the hydraulic function of the site. According to a local legend, Mandaeans used the basins for their rituals. Mandaeans, however, are not reported to use closed basins, especially next to a river. The fact that the followers of this religion lived and populated the nearby neighborhood and performed their rituals in the Gargar in this vicinity seems to have caused the confusion. It makes more sense to suggest that this system of canals and basins had an industrial function. Shushtar's main business was textile production, which involves several processes that require basins with access to water. Muqaddasī reports that qanats (subterranean channels connected to the river) brought water to the area north of the Shadorwan, where textiles were bleached. Features that seem to be the remains of a similar system are preserved on the

[422] *Naj*, 30.
[423] Fig. 2.31-2.33

imagery, and to some degree on the ground, north of Shushtar. It is very likely that what is known as the Mandaean Sanctuary had a similar production function. While it is possible that another industrial activity was going on in this area, textile manufacture is a good guess in light of the economic history of the city. Excavation and cleaning of the site, which is extremely disturbed at the moment, may unearth an industrial site of the Middle Ages similar to the watermills, probably on a smaller scale.

6.7.6 The Mahibazan[424]

It is widely accepted that the ruins of Mahibazan are the remains of a Sasanian weir. Three poorly preserved pillars of the monument stood over a ridge that once raised the water and created one of the main rapids on the Gargar[425]. This [naturally formed?] reservoir probably contributed to the identification of the ruins as a weir. As discussed in chapter 4, there is no evidence that any irrigation canal was ever fed from behind (north) this structure. Nor can we assume that a weir at this location could have had any impact on the base level of the river near the city because it is located on the lowest terrace of the Gargar, c. 20 m below the plain level in Shushtar. Furthermore, there is no reason that a weir would have had pillars c. 5 m high unless they were meant to support something that spanned the river. The poorly preserved spring of an arch on one of the pillars further supports this idea. The structure, therefore, was most likely a bridge or aqueduct.

Two relict linear features on the east bank of the Gargar, which run from the south toward this structure, may help explaining the function of Mahibazan (Fig. 6.6). The way these features cross over an undulating topography in a perfectly linear pattern as well as their orthogonal

[424] Fig. 2.44-2.47.
[425] Before a cut was created in the eastern side of the ridge; by nature or by humans.

orientation in relation to the dominant bed strata strongly suggests that they are hollow ways.[426] Therefore, the Mahibazan monument was most likely an old bridge. Alizadeh et al. proposed that these features must pre-date the post-Elamite incision of the wadis and may have begun to develop during the intensive Middle Elamite occupation of this area.

While this is possible, the hollow ways may rather date to the Islamic period, when the eastern plain was even more intensively occupied. Ṭabarī's account of the revolts of the Zanj leader 'Ali b. 'Abān in the years 262/876 and 265/879 suggest that the main land route between 'Askar Mukram and Shushtar crossed the Masruqān near Shushtar, by way of Qanṭarat al-Fars (*Ar*. the bridge toward Fars). According to Ṭabari, 'Ali b. 'Abān destroyed the bridge in 262/876 in order to prevent the governor's forces from attacking him. That the same bridge was used again three years later, however, suggests that it was subsequently repaired. [427] It is possible that the bridge eventually fell into disrepair after the Zanj revolts in the 9th century, as 10th century travelers do not mention any bridge over the Masruqān between Shushtar and 'Askar. Verkinderen suggested that Qanṭarat al-Fars may have stood near the present crossing over Masruqān, i.e. the Gargar bridge. Given that the bridge is said to have been be located in the "vicinity" of Shushtar, not in the city, and that the remains at Mahibazan seem to relate to a fallen bridge, the latter structure is a better candidate for Qanṭarat al-Fars. The bridge would have been next to the old settlement of Dastowa, which was apparently abandoned by the 9th century. If so, the bridge was far from an important settlement, which could explain why it was not repaired afterwards. According to this

[426] Alizadeh et al., "Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations," 76.
[427] *Ṭab*, vIII: 1909–10, 1933–38; Verkinderen, "Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period," 277–78.

scenario, the monument was built in the Sasanian period at the latest; this hypothesis, however, cannot be further tested without new data.

Another factor that may have contributed to the identification of the site as an ancient weir is presence of watermills in the vicinity. I was not able to locate the remains of these watermills on aerial photos or on the ground, which is not surprising given that the landscape is very disturbed. Yet it appears that the mills were not directly fed from behind the reservoir. Mīr ʻAbd al-Laṭīf and Selby both noted that the mills were at an elevation far above the river. Selby speculated that the mills functioned when all the water of the Karun flowed in the Gargar channel. Mīr ʻAbd al-Laṭīf stated that these mills were used when the mills of the city were all flooded. Floods would not affect this location given the height of the weir and the elevation of the mills.[428] Much of Selby's notes about this area cannot be easily matched with the present features on the ground. For example, he referred to an artificial dam north of Mahibazan that raised water to supply these mills, even though he stated that the flow of the Gargar alone could never run the mills.

Based on the analysis of the canals on the 1956 aerial photos, I suggest that the mills near Mahibazan were probably fed from the plain level and that any excess water drained into the Gargar. A few branches of the Dariun run towards and along the edge of the Gargar and seem to drain there in two locations at least, south and north of the Mahibazan. All of these channels are at least partly subterranean. [429] The best preserved feature ends south of Mahibazan; the one that ends to the north may correspond with the location that Selby noted. The mills at the Waterfalls complex

[428] *Tuḥ*, 65; Selby, "Account of the Ascent of the Karun and Dizful Rivers and the Ab-I-Gargar Canal, to Shuster," 241.

[429] Given the undulating topography of northern Khuzistan, it is very typical for the canals that go under the ground while crossing elevated topographic features. These subterranean channels are called *softeh* in local dialect; The modern literature considers all these subterranean sections as qanats which causes confusion and inaccuracy in their interpretation.

use drop-tower technology and penstock pipes.[430] It is likely that the same method was used here and that water was forced down from the level of the plain to the mills through subterranean channels. Therefore, the ruins of the structures across the ridge and the now-destroyed watermills at the site were probably unrelated and built at different times.

6.7.7 The Band-i Qir

The location of the village of the Band-i Qir at the confluence of the Karun and the Gargar has caused confusion in modern scholarship with respect to the location and function of the "lost" weir. The distance given by Najm al-Mulk corresponds with the remains of a structure of brick and bitumen, in one of the gullies on the western bank of the Gargar opposite area 1 of KS1622C (Fig. 6.12-6.13). This structure has been interpreted as the remains of a second bridge.[431] There is no doubt that this is the feature known locally, in the 18th and 19th century, as the Bitumen Dike. This structure was probably part of the infrastructure of 'Askar Mukram, built sometime after the 7th and before the 13th century. The building technique, a careless accumulation of bricks and mortar, does not suggest that the remains belonged to a masonry bridge. Furthermore, none of the textual references noted that the city had two masonry bridges. The local people obviously assumed that it was a weir. Najm al-Mulk reported that, at this location, there was a dam ca. 70-100 m long across the canal. He adds, however, that it was in ruins and only the foundations were visible under water when the water level was low.[432] We cannot tell how much of the structure was left when he observed it. Najm al-Mulk was a thorough and experienced engineer, and his

[430] Neely has documented this technology in the Deh Luran Plain. Neely, "Sasanian Period Drop-Tower Gristmills on the Deh Luran Plain, Southwestern Iran."
[431] Personal Communication with Abbas Moghaddam; Personal Communication with Loghman Ahmazadeh.
[432] *Naj*, 32.

observations are generally reliable. If there was indeed a weir, we need to think of a logical function for it. The Bohayr canal flows toward this location, but it cannot have been the raison d'être of a weir here. The canal connects to the Darreh Naft which in turn connects to the Gargar. Another possible reason for building a weir here might have been to raise the water level for the industrial area, KS1622B. In this case, the weir must be post 10th century because no obstacle is reported in the way of boats travelling between Shushtar and Ahwaz via 'Askar Mukram.

Mr. Ahmadzadeh suggests that this structure may represent the pillars of one of the pontoon bridges of the city mentioned in the sources.[433] This hypothesis may provide a better explanation: As noted above, area 1 of KS1622C may be the remains of a watch post over a strategic crossing, a suggestion supported by the route of one of the large hollow ways. With the evidence at our disposal, however, these two identification remain speculative.

6.8 The Irrigated Landscape of the Miyanab Plain beyond Political Dynamics

In this final section, I summarize the patterns of settlement and irrigation in the Miyanab, with a particular focus on developments from Late Antiquity through the Middle Ages. The goal here is to discuss the range of factors that appear to have shaped the development of the irrigated landscape of the Miyanab, and to balance the socio-political discourse that dominates the study of irrigation in Khuzistan.

The Miyanab plain is formed by a relatively small alluvial fan, confined between four active folds. It is located on a major land route that has connected the highlands of Fars to the

[433] Personal communication. Apr 15, 2015.

lowlands of Susiana and the Mesopotamian plains at least since the Chalcolithic period.[434] These environmental and geographical factors have shaped the most resilient aspects of human habitation on the plain over the longue durée. The historical structure of the landscape has gradually changed through the combination of environmental dynamics, most importantly changes in the hydrological regimes of the water courses, and the sociopolitical factors, which include but are not limited to forms of political control. In the course of a wide range of sociopolitical changes, man's continuous efforts at fan-head management has made the Miyanab an exceptionally resilient irrigated landscape.

In general, the most ancient and long-lived population centers in Khuzistan, including Shushtar, are to be found on the fan heads of permanent rivers. At least since the 1st century CE, Sostrate is mentioned as one of the major cities in Elymais.[435] If Sostrate is the same as Shushtar,[436] the city may have been relocated northward, possibly during the first century of Sasanian rule. The extensive ruins at Dastowa may represent Pliny's Sostrate. The reasons for this relocation were perhaps both environmental and socio-political. On the Miyanab, a braided pattern of surface channels of the alluvial fan was gradually replaced by a system of man-made canals along the old streams. While settlement density constantly increased throughout the first millennium CE, the structure of settlement and irrigation underwent little change. This process, however, involved active and constant management of the alluvial fan through the construction of permanent and temporary weirs and dams. The relocation of the center of the plain seems to relate to the gradual northward incision of the fan-head and to man's search for an optimal location for the construction

[434] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 53.
[435] *Pliny Natural History*, vi.136.
[436] Potts, *The Archaeology of Elam*, 412.

of the headworks. Shushtar is the last large, habitable location on the alluvial fan of the Miyanab, and its geomorphology provides exceptional advantages for hydraulic management. Nevertheless, it is possible that this re-location was equally motivated by the Sasanian re-settlement of Christian deportees from Syria in the heartland of the empire, including Khuzistan. The influx of a new population would have provided both the need and the workforce for the expansion of an old urban center into a new zone. The hydro-topographic advantages of the new location seems to be the main reason for its growth and endurance.

The incentives for hydraulic projects in Khuzistan, in general, and in the Miyanab in particular, are normally sought only in irrigation needs, i.e. the capture of extra water for the system. While this must have been an important factor in the design of canal networks, the need for flood control, drainage, and industrial processing has been largely ignored. In addition to the water needed for the processing of the agricultural purposes, the large textile industry for which Shushtar became famous required significant quantities of water. Water facilities must have been similarly crucial across the agricultural plains of Khuzistan up to the present time, as testified by numerous ruins of watermills along rivers and canals. Sasanian investment probably did not result in a significant transformation of the structure of irrigation on the Miyanab through the construction of a large canal from Shushtar to Ahwaz, but was perhaps concentrated on securing the base level for irrigation in summer and fall through the construction of a large weir, i.e. the Shadorwan. The Sasanians additionally built infrastructure for flood control that could have at the same time supplied the city's grain processing and textile industry. The only existing headwork in Shushtar that could be reliably dated to the Sasanian period is the "weir" of the Shadorwan. The

Gargar canal may have been formed by the integration of several smaller-scale canal systems through a combination of human modification and natural processes.

Settlement data for the plain does not suggest any decline in irrigation and population density after the Islamic conquest. Shushtar seems to have retained its status as a center of textile production and trade as well as of agricultural production; nevertheless, its status as the administrative and economic center of the plain was undermined by the emergence and growth of a new urban center: ʻAskar Mukram. Moghaddam argues that the increase in the number of small settlements on the plain in the Islamic period is due to a pattern of rural growth, in contrast to the Sasanian period when population was concentrated in the large urban centers where water courses provided a basis for agricultural intensification.[437] When looking at the status of Shushtar alone, such an image may seem plausible; some Sasanian metropolises such as Susa and Shushtar declined. Nevertheless, looking at regional socio-economic dynamics, this theory is unlikely to be correct.

Wheatley argued that: "The settlement pattern of Khuzistan remained unchanged and basically retained the Sasanian system. Nor did the Arabs contribute many new foundations to the urban system. Even their premier addition, the newly built 'Askar Mukram, merely embodied the site values and virtually duplicated the location of the old, Persian city of Rustam Kawāḏ. Moreover, the shifting of metropolis from Susa to al-Ahwaz had virtually no effect on the structure of the urban hierarchy."[438]

[437] Moghaddam, *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*, 53, 55.
[438] Wheatley, *The Places Where Men Pray Together*, 143.

It was already noted that ‘Askar Mukram was most likely a new foundation and that its emergence was part of a new program of economic expansion into the undeveloped areas between Shushtar and Ahwaz. The newly developed zone probably formed the core of a new administrative division, the kūra of ‘Askar Mukram. In contrast to Wheatley’s hypothesis, it appears that the shift of the focus of investment to ‘Ahwaz was part of a larger program of investment in the socio-economic expansion of the fluvial plains to the south. The change in the status of Shushtar must be understood in relation to intensified production and exchange between the three urban centers of Ram Hurmuz, Ahwaz and ‘Askar Mukram. This development, which is reflected in the unprecedented expansion of settlement along the northern face of the Kupal anticline and in the agricultural intensification of the Masruqān region, contributed to the already flourishing economic base of Ram Hurmuz and Ahwaz.

Like those of the Sasanian period, early Islamic developments were probably motivated by sociopolitical, economic, and environmental forces. On the one hand, the influx of Muslim settlers probably encouraged settlement outside the old population centers. This trend, nonetheless, did not result in the total decline and abandonment of old cities, such as Shushtar and Susa, because of their robust production infrastructure and social base. On the other hand, the large demographic shifts initiated by the Islamic conquest coincided with large-scale changes in regional hydrological regimes. Channel shifts on fluvial plains frequently open up new attractive locations for settlement and agriculture. Human intervention and management of channel shifts and crevasse splays continuously expanded the large megafans of lower Khuzistan. A major shift in the course of the Karun south of Ahwaz is dated by the Belgo-Iranian team to approximately 700 CE (Fig. 6.14). This would have created new areas for agricultural development south of Ahwaz. Such

environmental conditions would have been optimal for Muslim settlers who sought investment outside the contested centers. Muqaddasī was informed by a resident of Ahwaz that the old population of Khuzistan, i.e. the Ḫuzī, lived in the cities north of Ahwaz; the city itself was populated by immigrants from Basra and Fars.[439] While the population may have been more mixed than stated, this statement indicates the possible contribution of demographic dynamics to the reorientation of the economy of Khuzistan.

The large size of the southern alluvial fans may also have been an important contributing factor (Map 6.18). The irrigated area on the Miyanab plain has been estimated at c. 24,000 ha. My estimate based on the levees visible on Digital Terrain Model is that this figure should be increased to 40,000 ha, for the irrigated area between ʻAskar and Ahwaz, and 80,000 ha for the irrigated plain south of Ahwaz. If water availability were not an issue, larger areas would provide better conditions for economic exploitation and integration, especially if monoculture were practiced. To this, one needs to add the easier access to water transportation for southern cities closer to the sea.

Global and regional socio-political and economic trends were certainly another important factor. The sudden expansion of settlement, north of the Kupal, along the land route that connected Wasīt, ʻAskar, and Ram Hurmuz suggests closer economic integration between Khuzistan and Iraq, and probably Fars. Because the route linking these areas had existed since prehistory, the expansion of settlement must be explained by reasons other than local highland-lowland traffic. I propose to seek the reason behind new settlement in this corridor in the opportunities offered by the increasing economic integration of the Islamic world. Future research needs to investigate the local resources available for the unprecedented expansion of ʻAskar Mukram and its hinterland. It

[439] *Muq*, 403. This dichotomy has remained a durable aspect of demographic and economic history of Khuzistan.

is not hard to think of economic incentives available in the irrigated zone south of ‘Askar. But, the expansion of settlements into the non-irrigable area east of the city and their relatively long occupation needs to be explained. A systematic research plan needs to be conducted before we are able to understand the hydraulic infrastructure which supported and sustained development in this zone for at least five centuries. A major lacuna in our knowledge is an understanding of water supply infrastructure in Khuzistan in the medieval period. Other resources requiring investigation include pasture land and mineral sources. In addition, the remains of hollow ways underline the possible role of dry farming and pastoralism in the economy of later periods, which is a neglected topic.

The findings of this study suggest that urban and economic recess is not observed in the landscape until the 11th centuries. These changes occurred too late to be explained by the political consequences of the Islamic conquest. While the Seljuq invasion has been reckoned as the cause of decline, the historical and numismatic data suggests that contributing factors were in play in Khuzistan in the 10th century while the effects became most evident after the 1000 CE. Several factors may have worked in tandem to bring about the economic slowdown of the region, mainly increasing political decentralization and allying of tax-farming with military payment and responsibility (*Iqta’*). The few short periods of stability and infrastructure restoration may have not been enough to reverse the negative impacts of more than a century of war in the region, and the Seljuqs may have taken over an already broken agricultural basis.[440]

[440]Lambton, “The Evolution of the Iqṭā’ in Medieval Iran,” 42. Pyne, “The Impact of the Seljuq Invasion on Khuzestan.” Pyne argues that the agricultural sector was more immediately and severely affected by these factors than the textile manufacturing (p. 277).

The timing of evident recess in Khuzistan is in line with a widespread economic recession that is observed in the Islamic World in the 11th century, from the Eastern Mediterranean to Central Asia. The causes are still unknown, and the topic of heated debates. Environmental change and the disintegration of the Caliphate have been frequently proposed as potential factors. Whatever the cause may have been, positive feedback appear to have had a detrimental effect on the economy of some regions, including Khuzistan.[441] The impact of global recession seem to have been more rapid and severe on the cities in the lower Khuzistan plains, where the economy was more oriented toward trade with the global market and where irrigation infrastructure was more expensive to maintain. This may explain why Ahwaz had a faster demise than ʻAskar Mukram. In comparison, old urban and economic centers of the northern plain such as Shushtar and Susa were able to maintain their economic base until the modern times.

Continuous change in the hydrological regime of the fluvial plains of Khuzistan appears to have played a fundamental role in the trajectory of large urban centers and their rural hinterlands. The continuous degrading regime of the upper segments of the rivers of Khuzistan combined with the patterns of aggradation and channel migration in the lower plains posed a challenge for water management, especially at a community level.[442] Eventually, irrigation agriculture gradually retreated to the northern alluvial plains. There, the problem of a continuous drop in water level seems to have been coped with, to some degree, by the construction of canal intakes further upstream and by the replacement of open canal heads with subterranean channels that tapped the

[441] Pyne suggests that the negative impact of the disruption in global trade on the economy of Khuzistan began in the 10th century, with the wars between the Byzantines and the Caliphates. Pyne, "The Impact of the Seljuq Invasion on Khuzestan," 84.
[442] Pyne argues that the increasing prominence of nomadic pastoralism from the 10th century onward probably caused environmental degradation, which in turn contributed to the changing flow patterns, mainly more frequent and destructive floods. Ibid., 271.

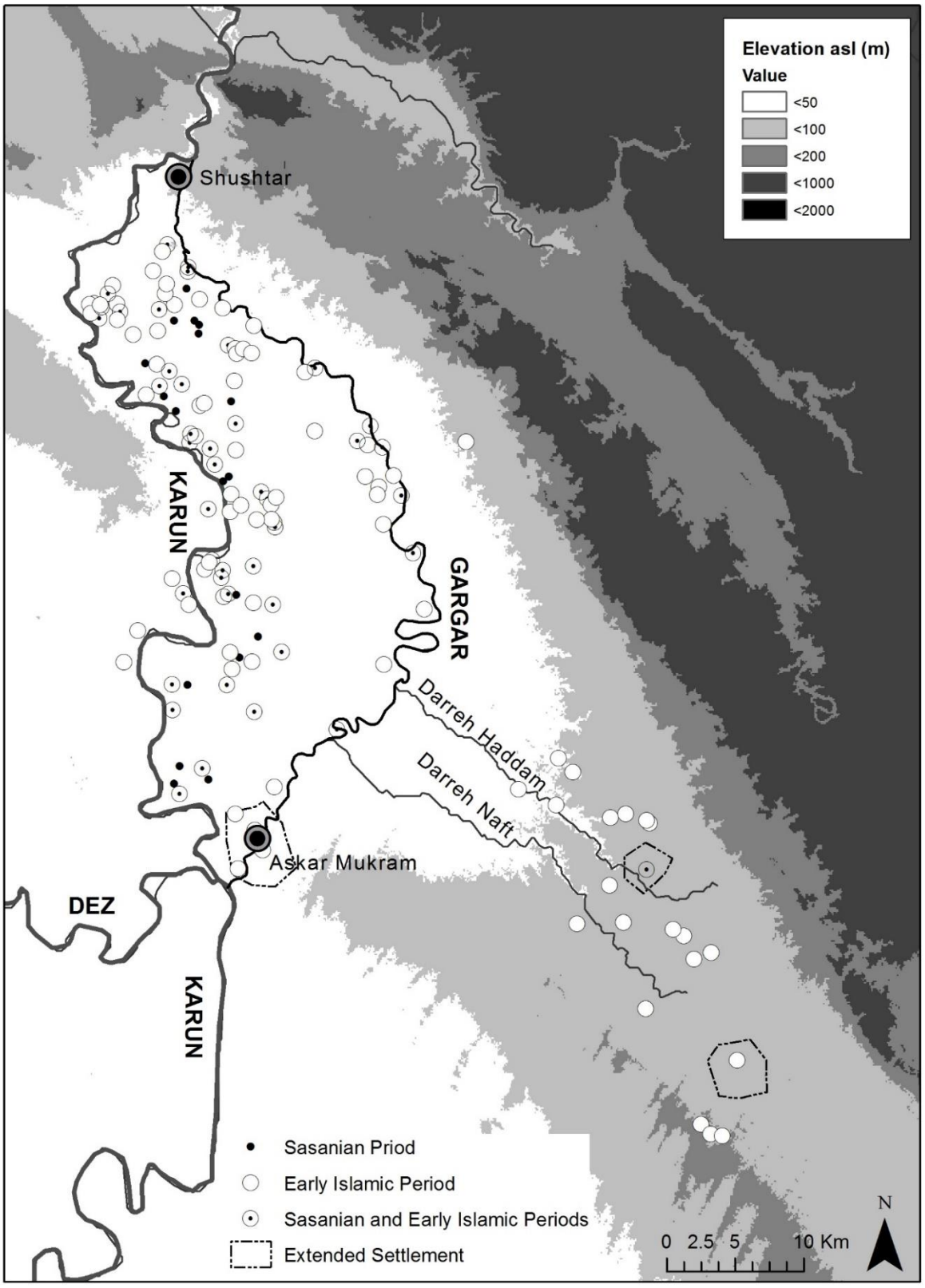
rivers at the new base level. A decrease in the area of irrigation agriculture was a major outcome of this process. Much of the previously irrigated land on the lower plains were inhabited, in the late medieval period, by Arab, Lor, and Bakhtiyari tribes whose economic base comprised herding, limited dry-farming, and the pillaging of the sedentary population. Irrigation agriculture was occasionally practiced again on the lower plains through the initiative of some charismatic tribal leaders. These instances were in general short-lived because of broader geopolitical instability and because of the magnitude of the rivers' responses to even small-scale human modification.[443]

Finally, the sociopolitical disintegration that dominated the landscape of Iran for most of the middle and late Islamic period prevented a systematic restoration of the hydraulic infrastructure of Khuzistan. It is important to note that following the demise of the 'Abbasids in the 10th and 11th century, Khuzistan was increasingly separated from the centers of political control on the Iranian Plateau. Therefore, even during periods of economic revival on the plateau, such as under the Safavid rule, Khuzistan was never completely reintegrated into the economic system until the 20th century. When powerful rulers were able to exert some degree of authority over the northern cities of Dezful and Shushtar, the hydraulic infrastructure was restored and repaired. Many of the preserved hydraulic monuments of Shushtar may reflect such investments in the Middle Ages. In the long term, the advantageous geographical location of Shushtar and the endurance of its hydraulic base provided the conditions for remarkable resilience in the irrigated landscape of the Miyanab. It is documented that in the Qajar period, the central government was aware of the exceptional economic potential and strategic importance of Khuzistan, and aimed at a large-scale program of hydraulic infrastructure restoration and agricultural revival. These plans, nonetheless,

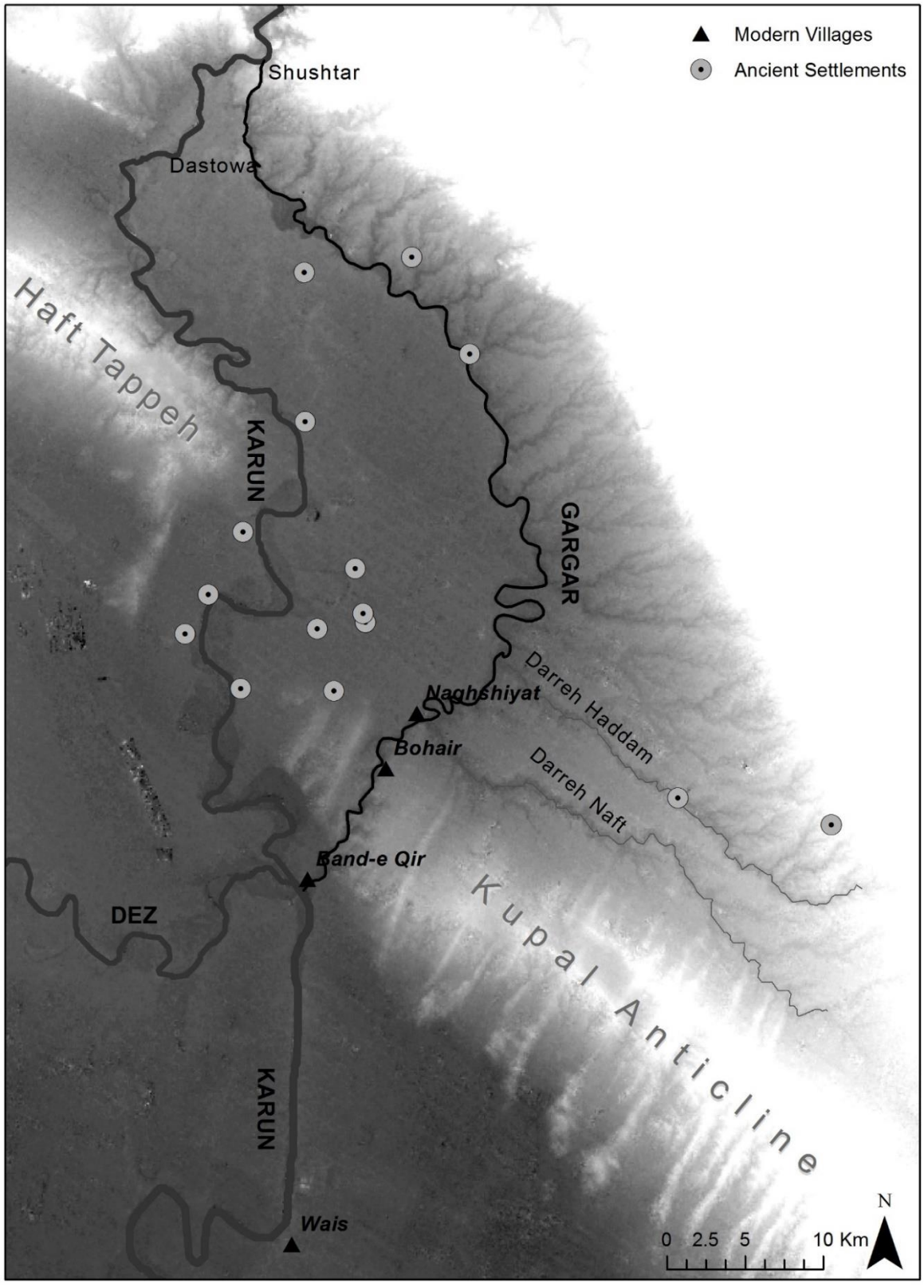
[443] See e.g., Kasrawi, *Tārīẖ-i Pānṣad sāli-yi Ḫuzistān*, 157–80.

never materialized due to adverse economic and political conditions at the time. It was not until the 1960s that Khuzistan once again became the focus of investment by the central government and large-scale modernization projects aimed at the restoration and intensification of the agricultural capacity of the province.

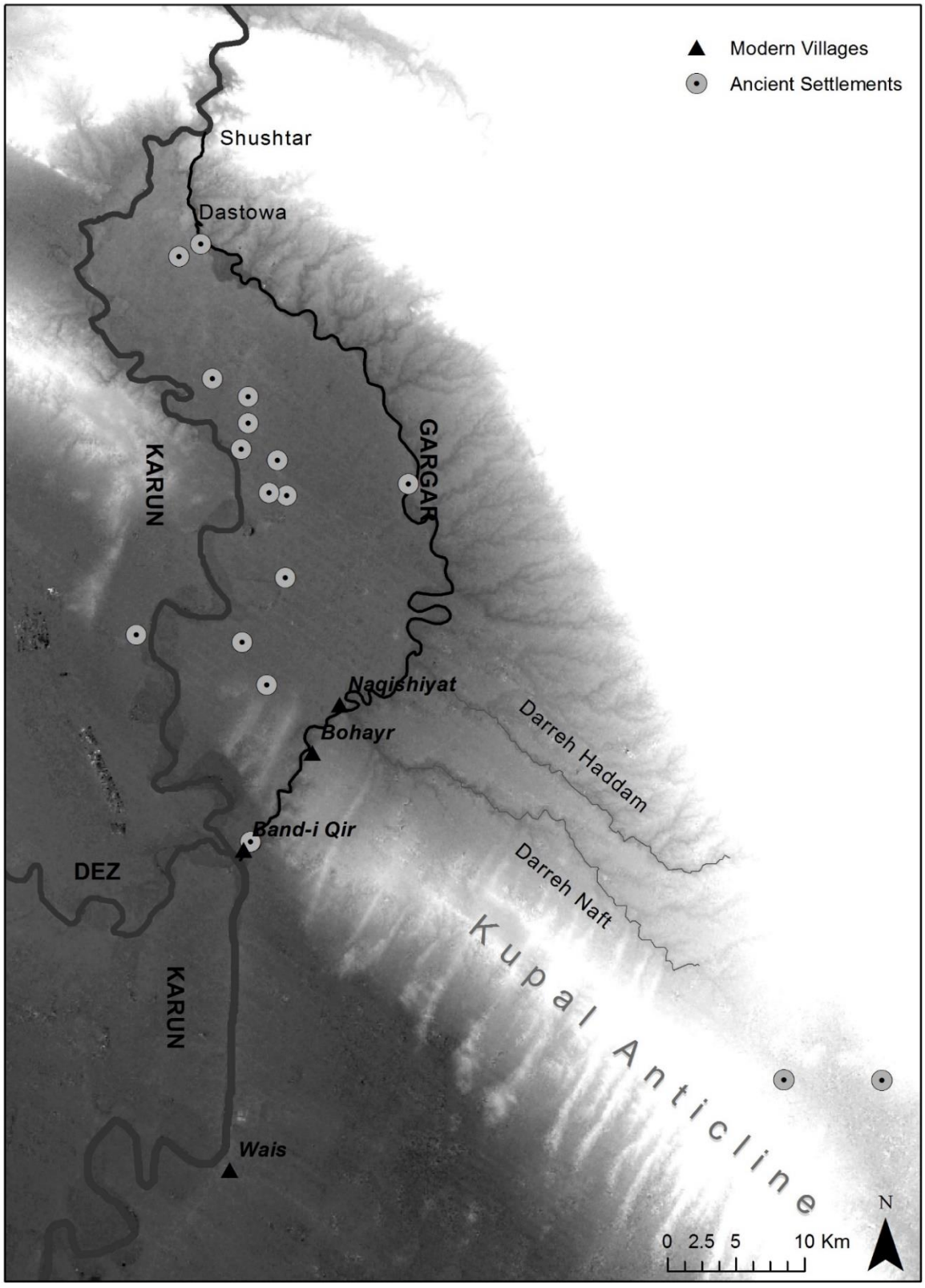
Map 6.1 Sasanian and Islamic settlements.



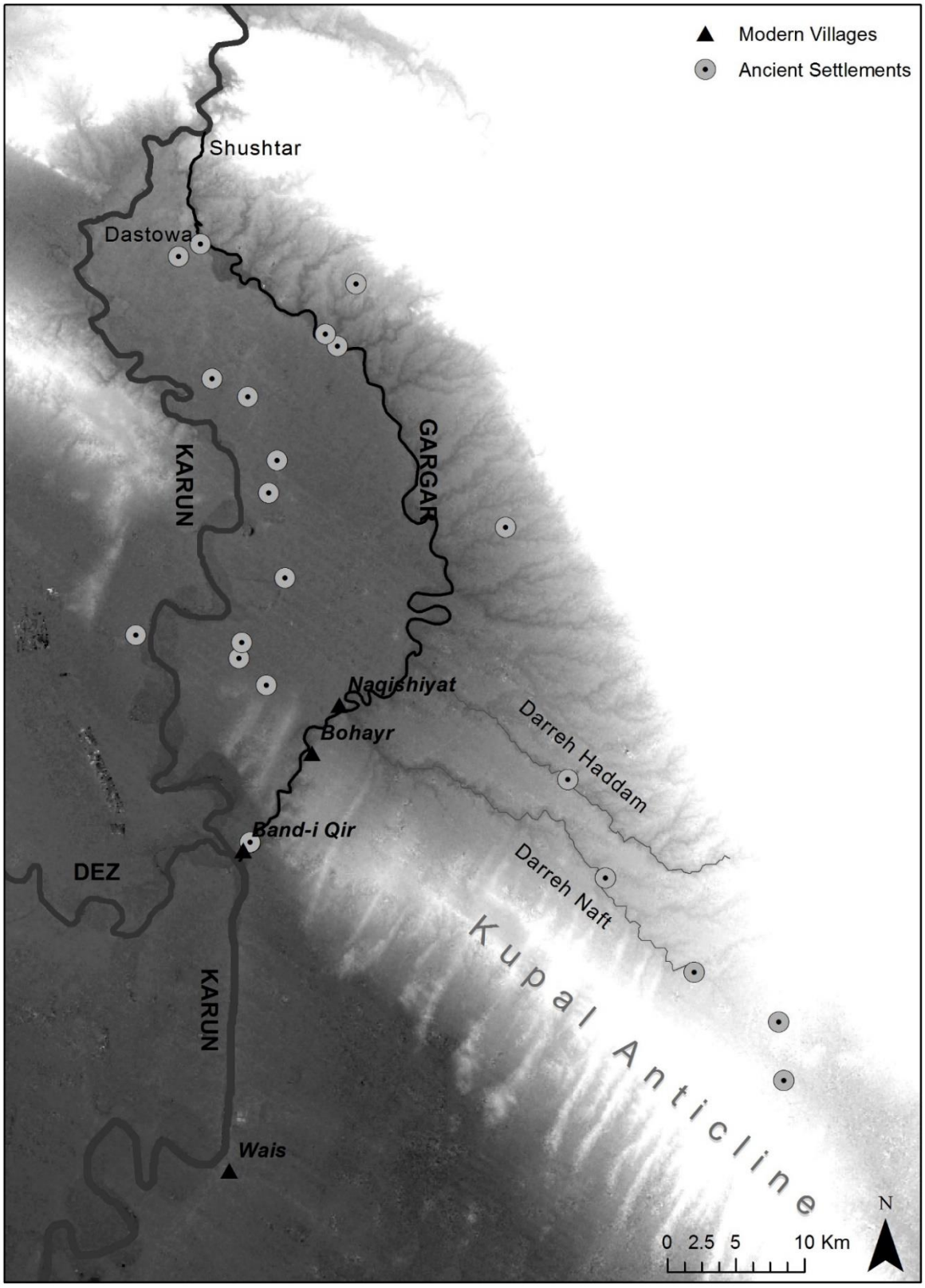
Map 6.2 Pre-Elamite settlements.



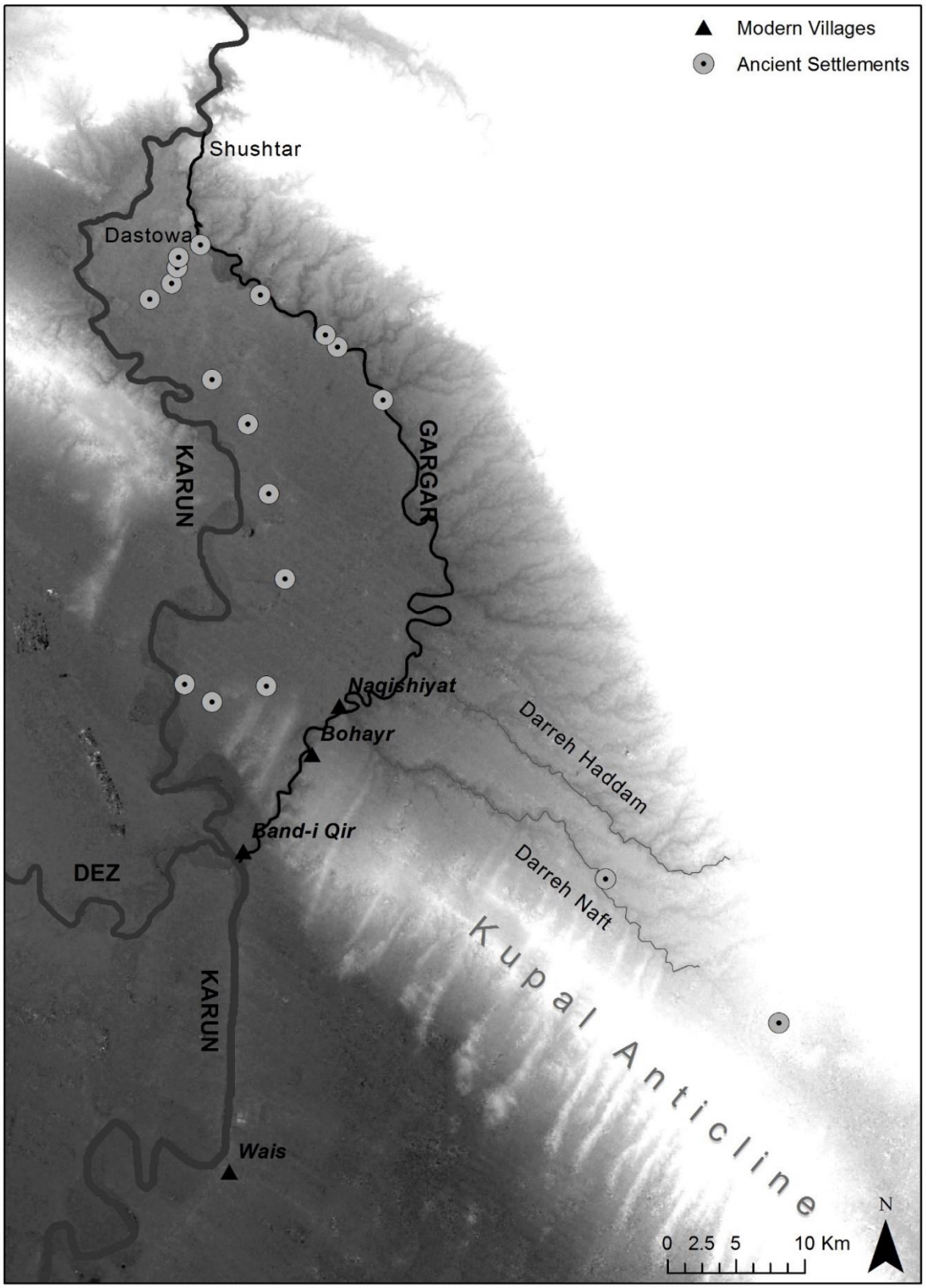
Map 6.3 Old Elamite settlements.



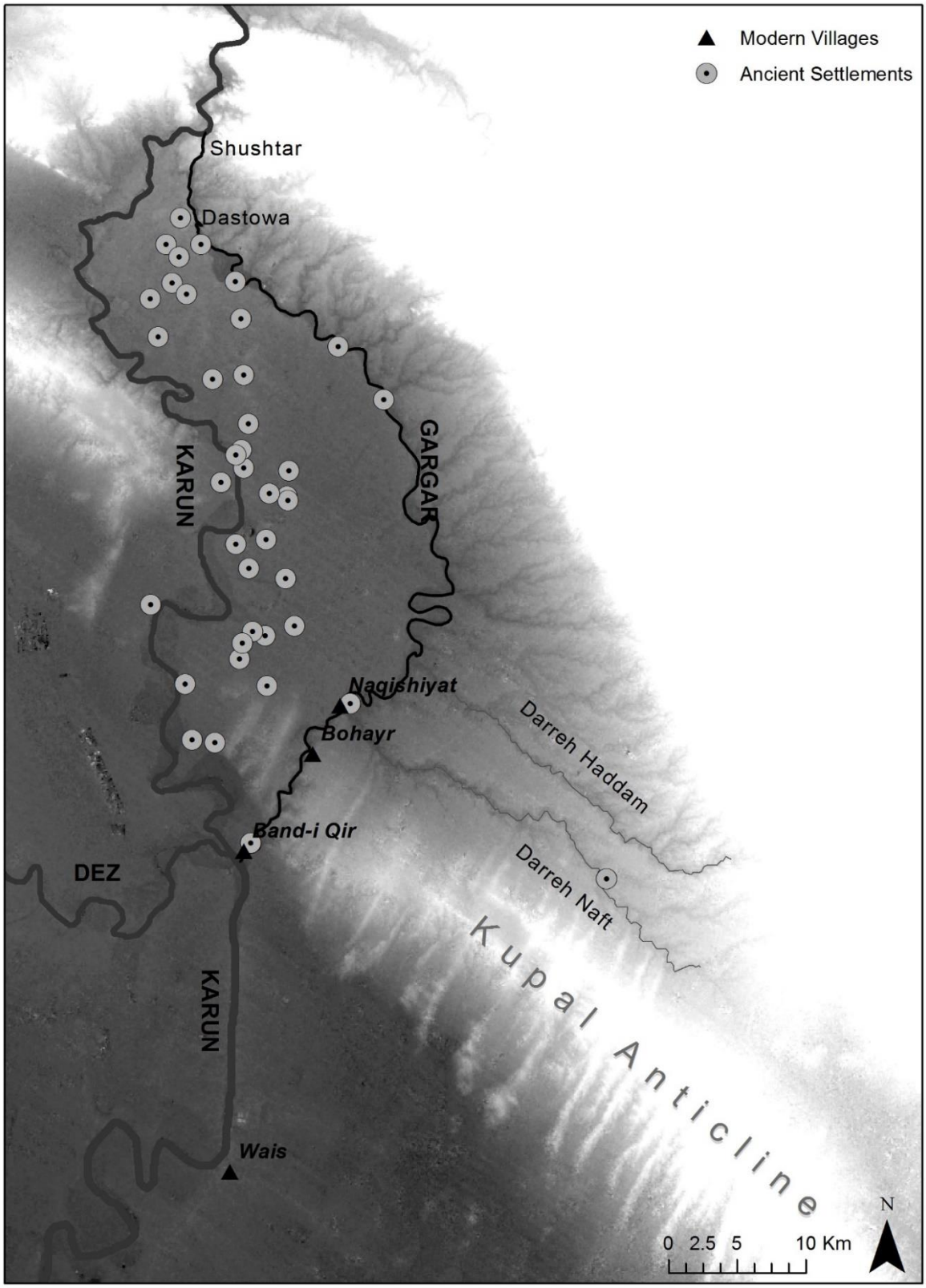
Map 6.4 Middle Elamite settlements.



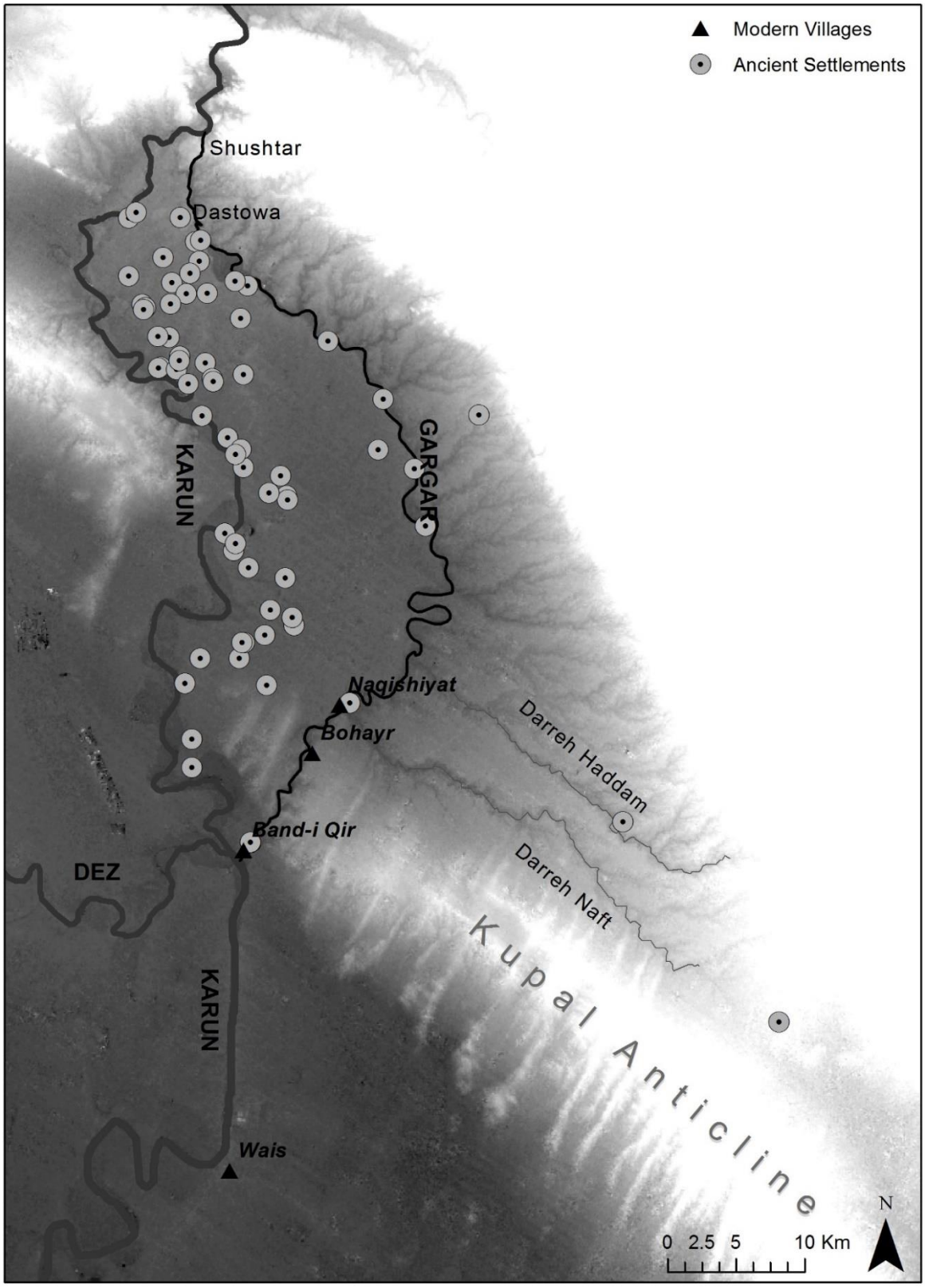
Map 6.5 Neo-Elamite settlements.



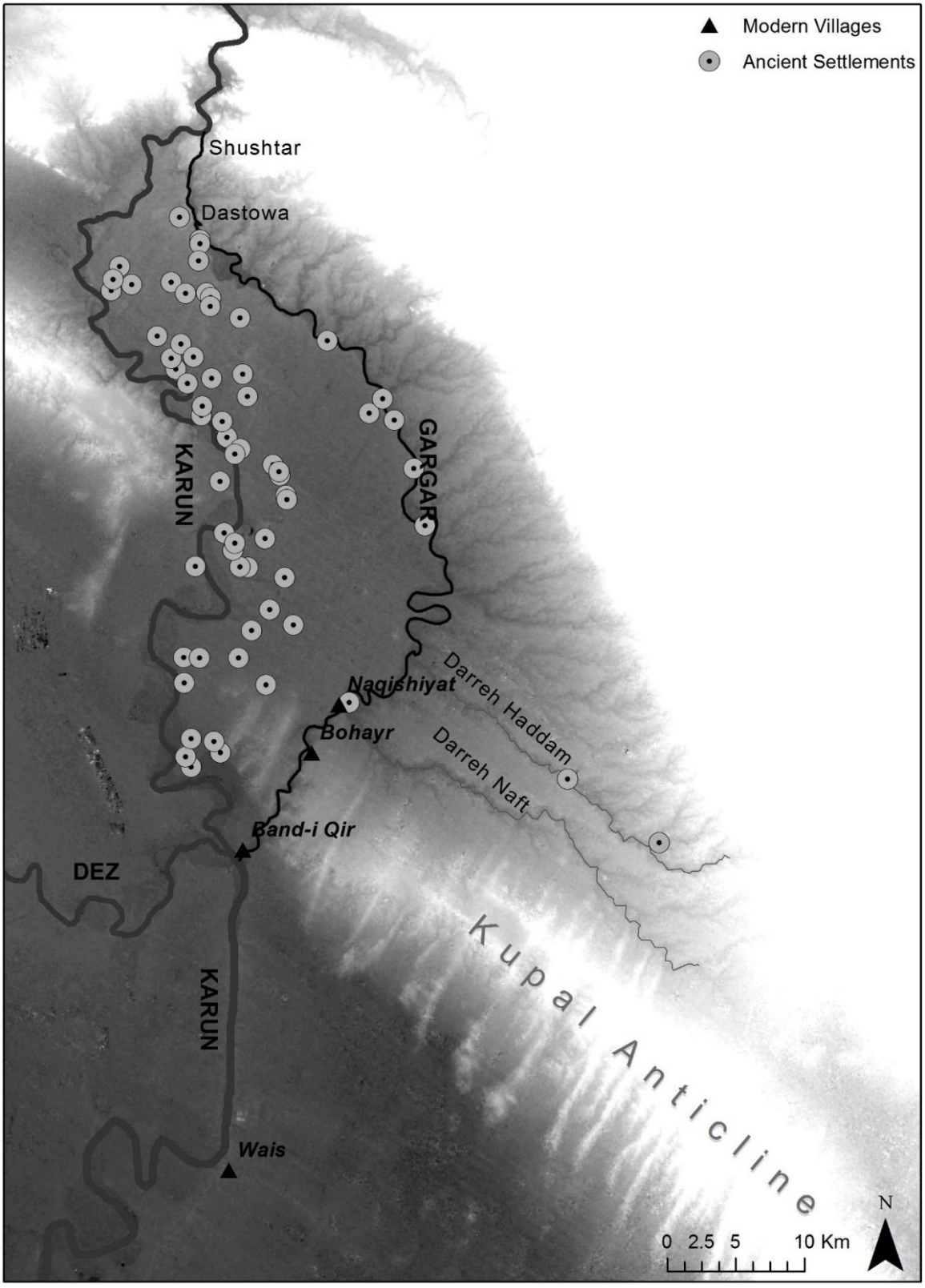
Map 6.6 Achaemenid settlements.



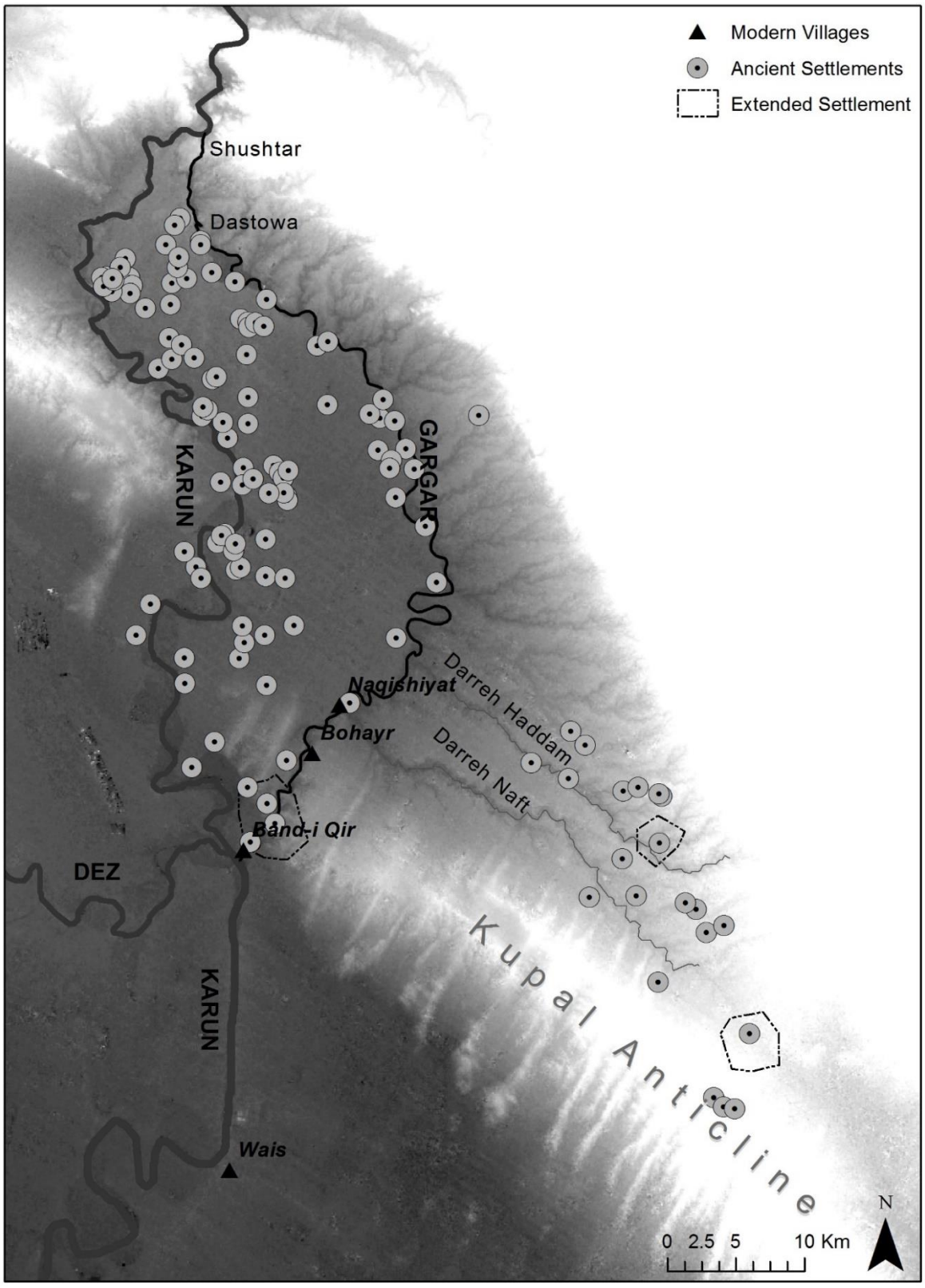
Map 6.7 Parthian settlements.



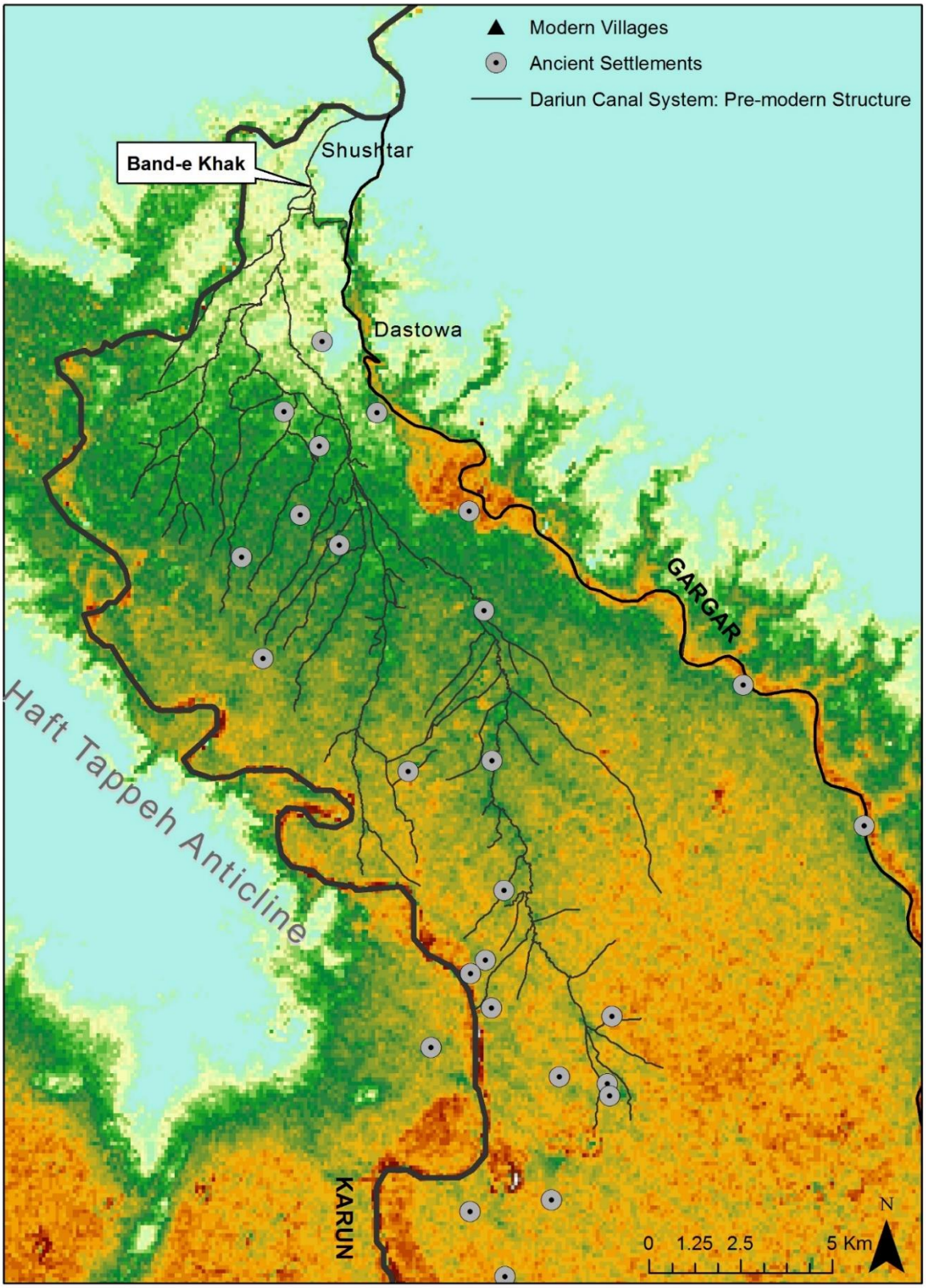
Map 6.8 Sasanian settlements.



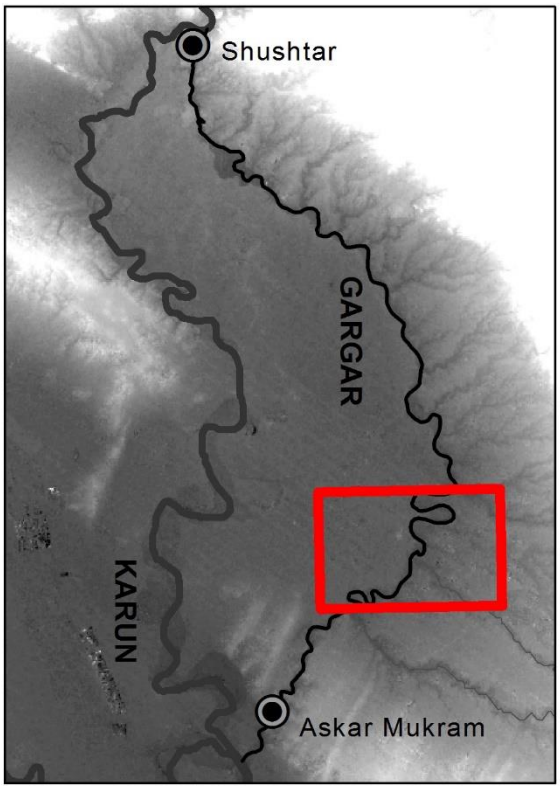
Map 6.9 Early Islamic settlements.

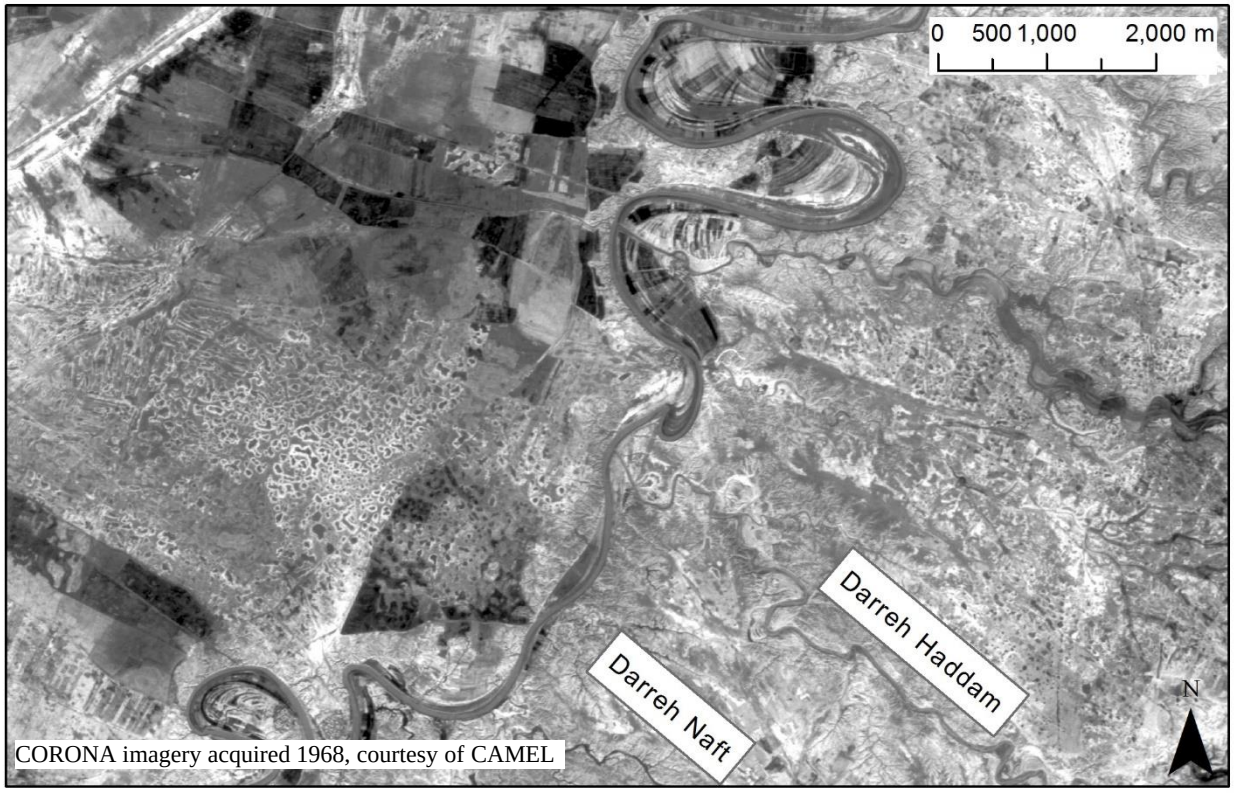


Map 6.10 Pre-modern canals of the Dariun in relation to the sites of the Achaemenid period.

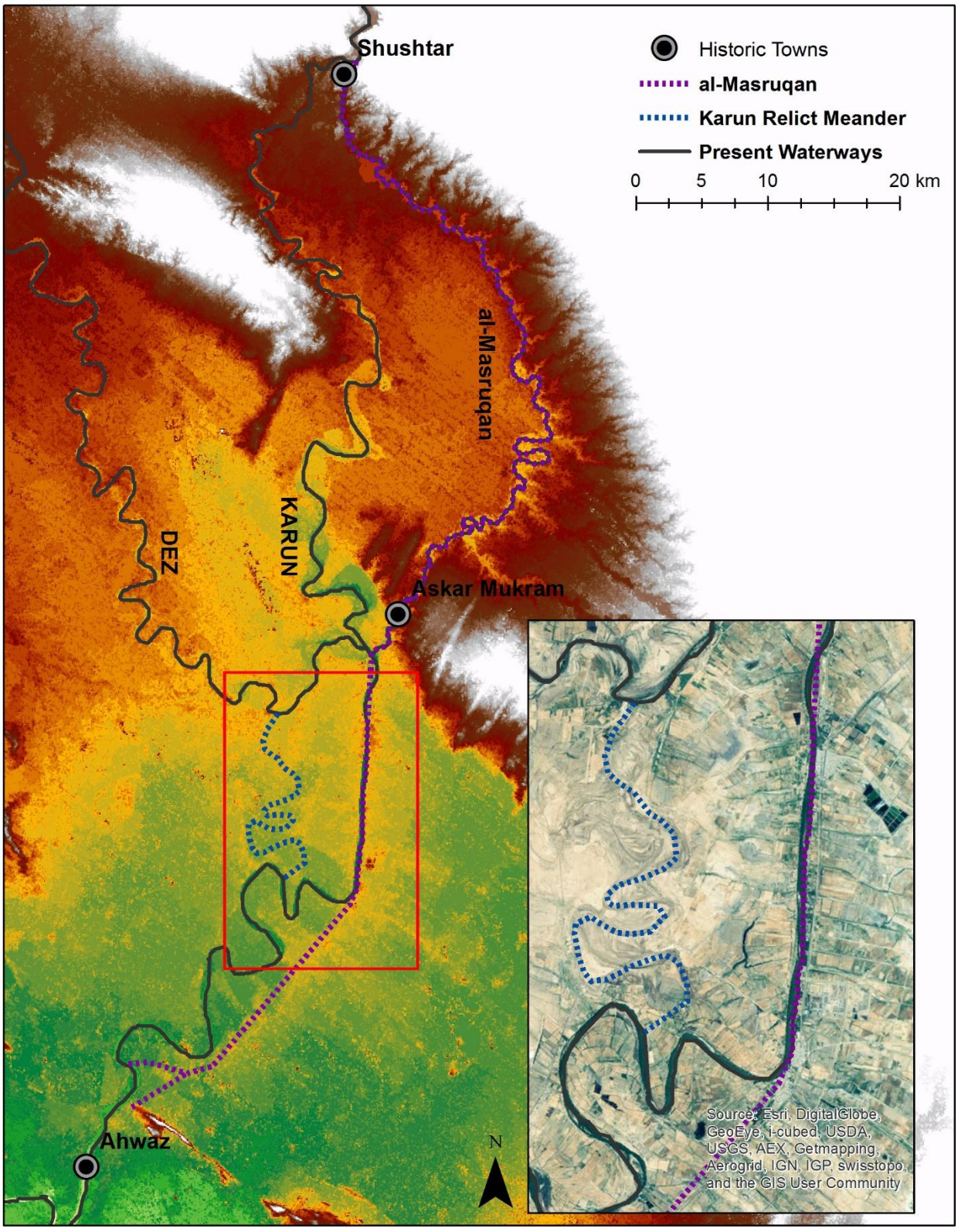


Map 6.11 Soil signature on both banks of the Gargar, suggesting water logging.

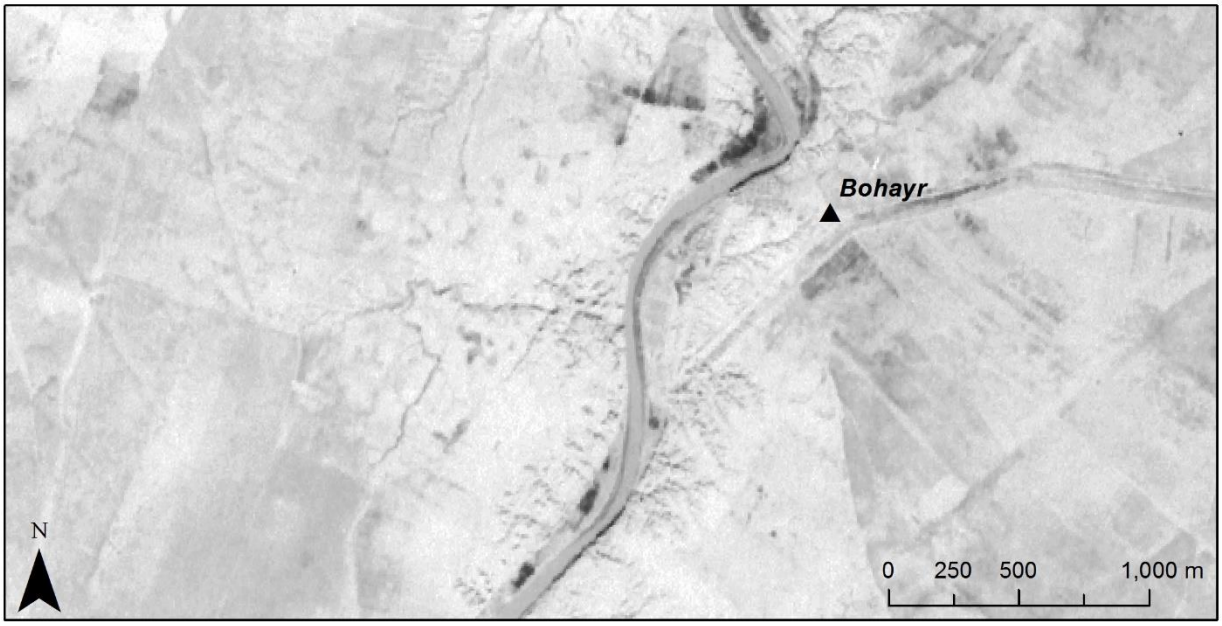


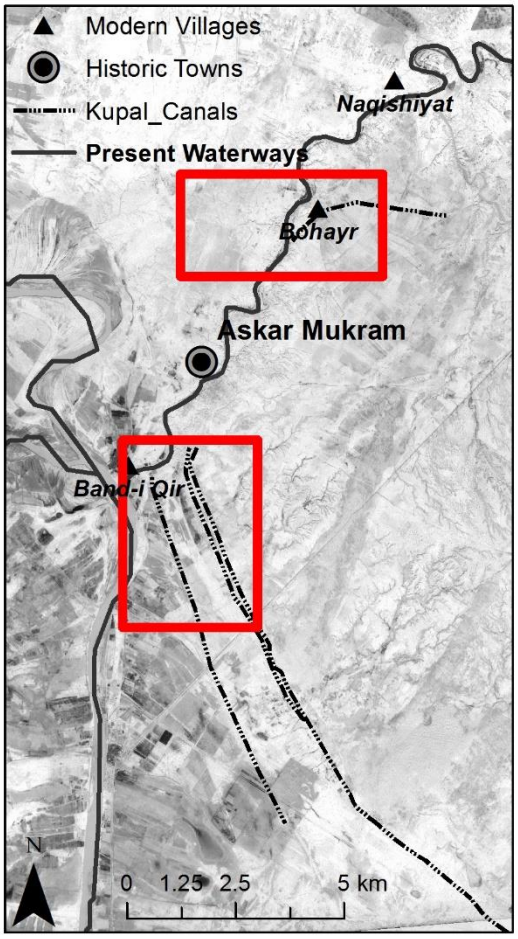


Map 6.12 The course of the Early Islamic Masruqan and the Karun prior to avulsion. (SRTM imagery courtesy of CAMEL).

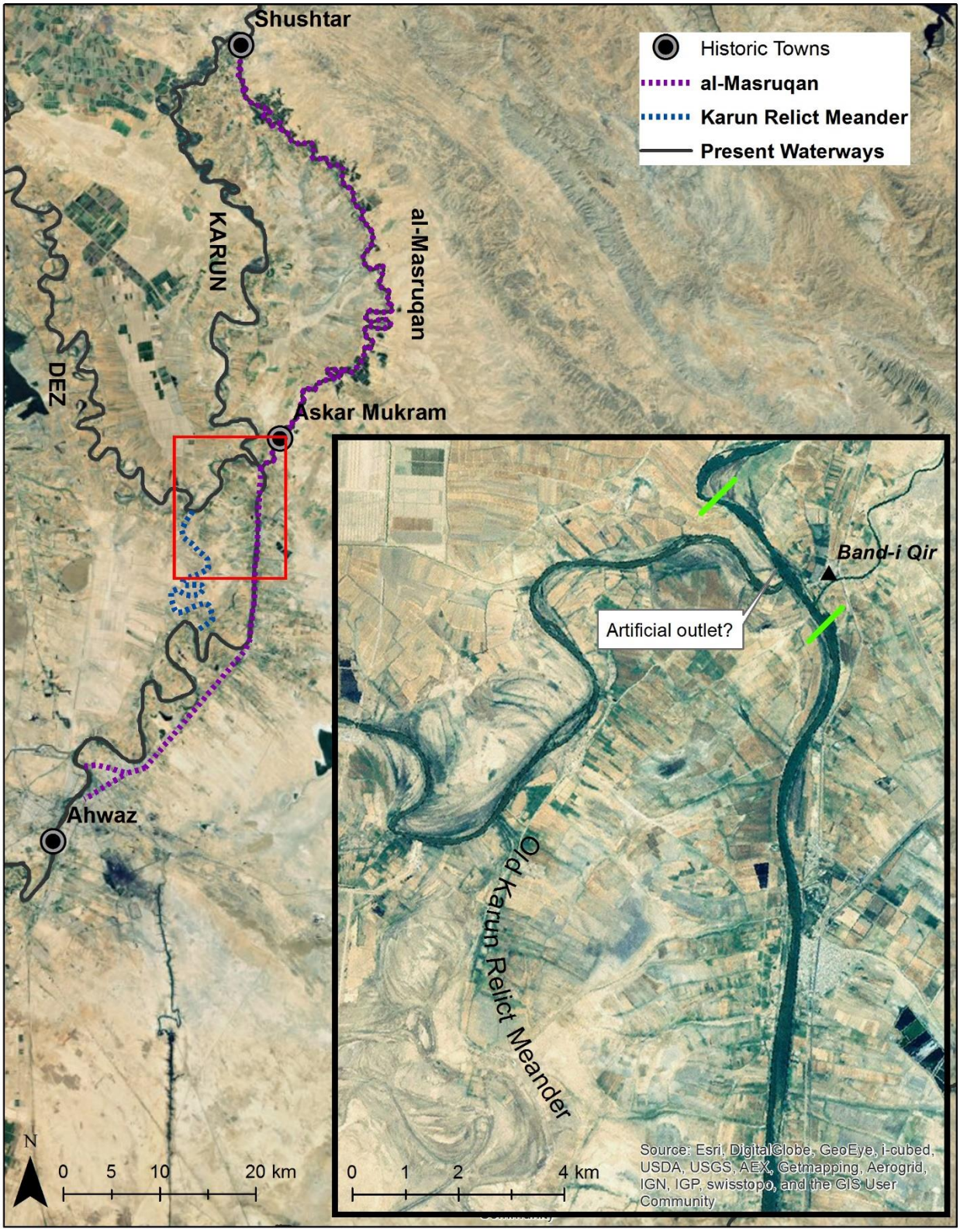


Map 6.13 Four enigmatic relict canals north and south of the Kupal anticline. (CORONA imagery, acquired 1968, courtesy of the CORONA Atlas of the Middle East)

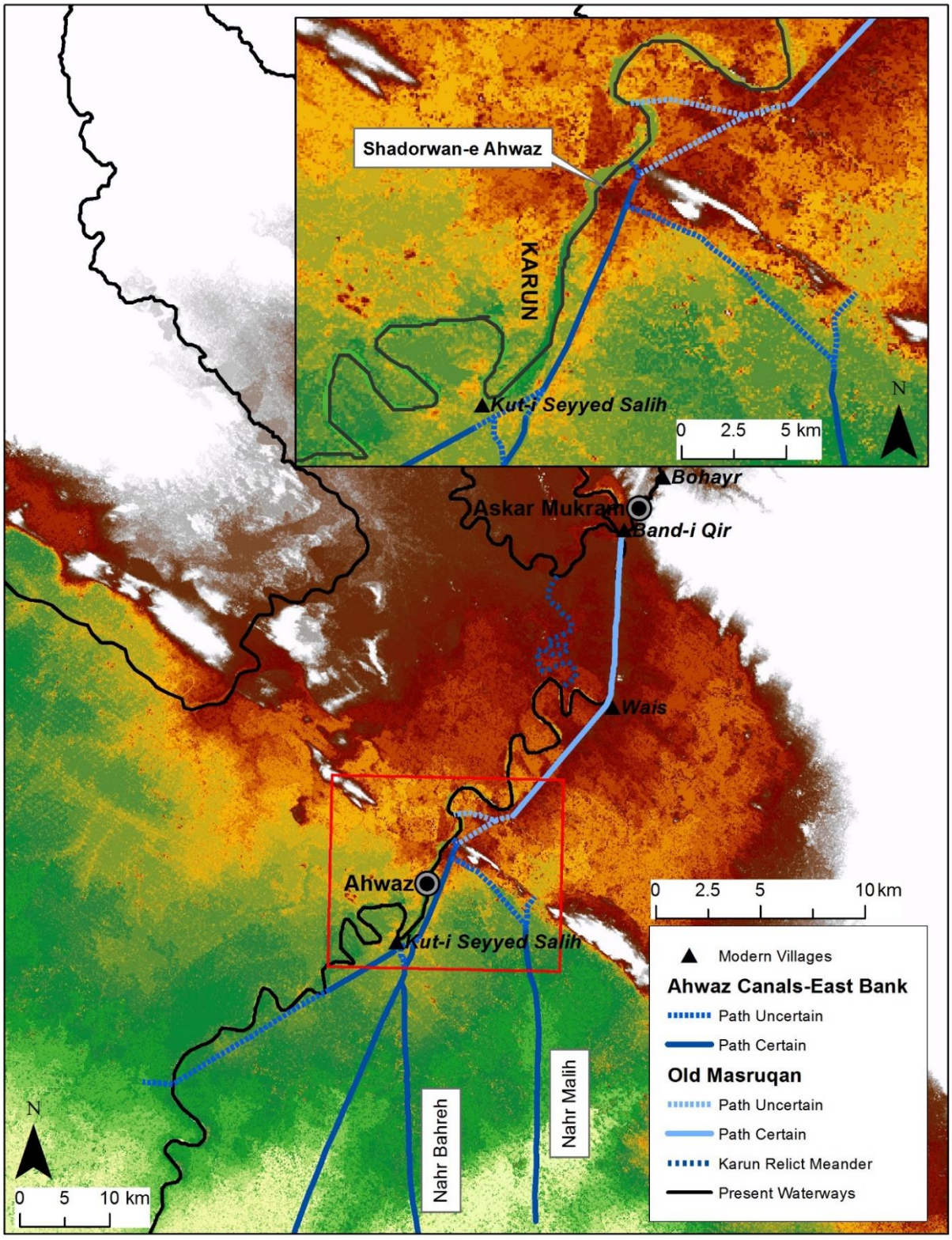




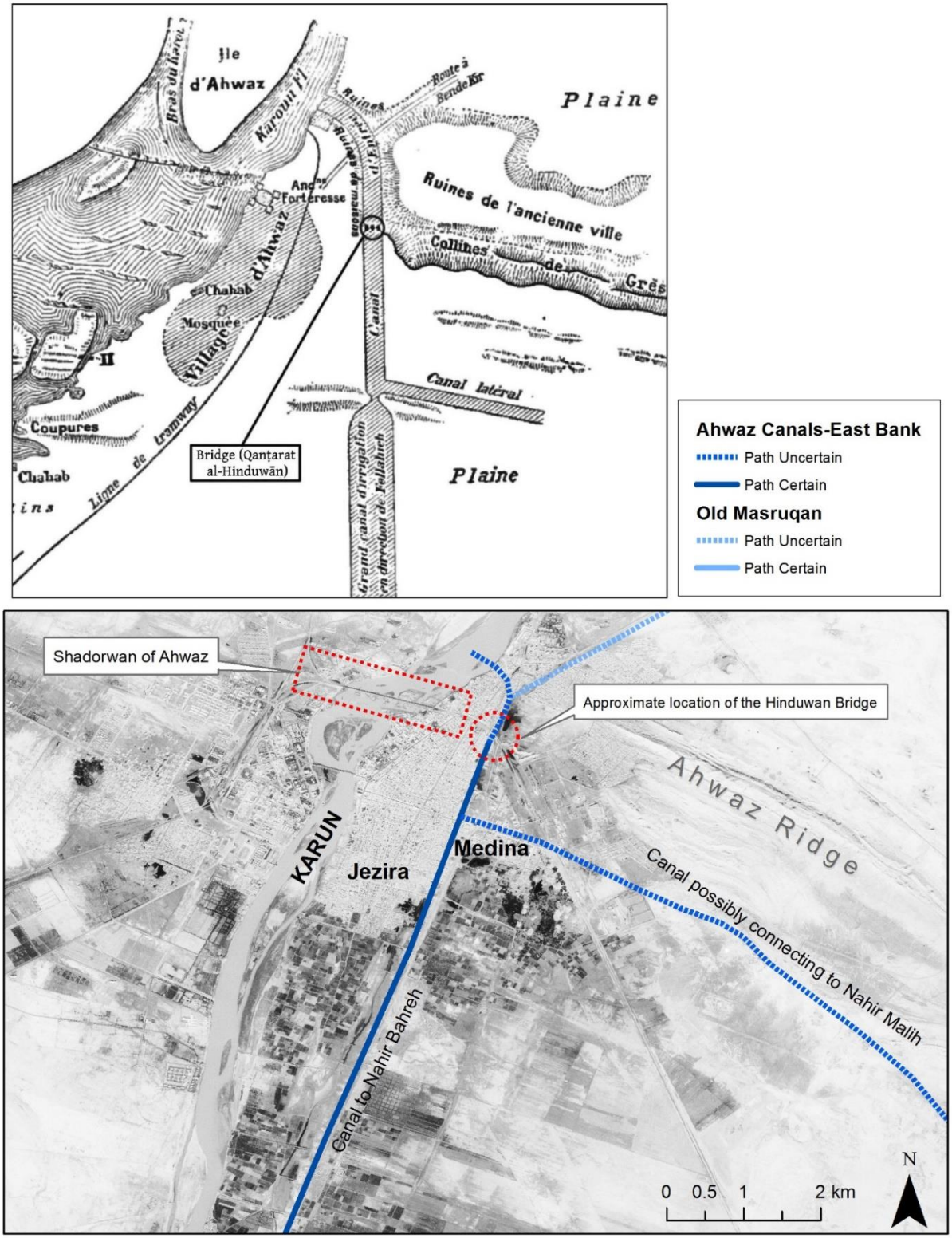
Map 6.14. Possibility of human-induced river migration through a new or an enlarged outlet of the old Masruqan canal.



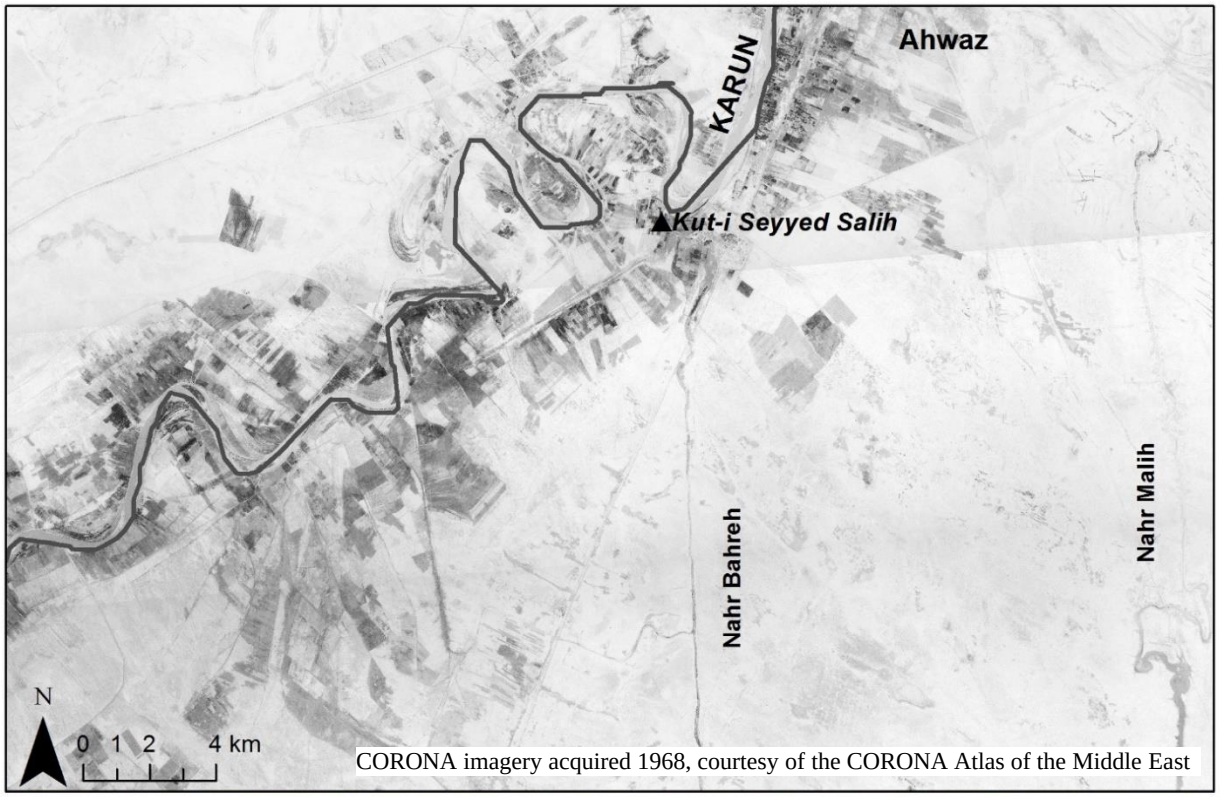
Map 6.15. The Masruqan canal and the canals of Ahwaz (on the east bank of the Karun). Dotted lines represent canal segments that certainly existed, but their path has been obliterated. The relation of the two systems may be the reason for the contradicting accounts regarding the end of the Masruqan. (SRTM imagery courtesy of CAMEL)



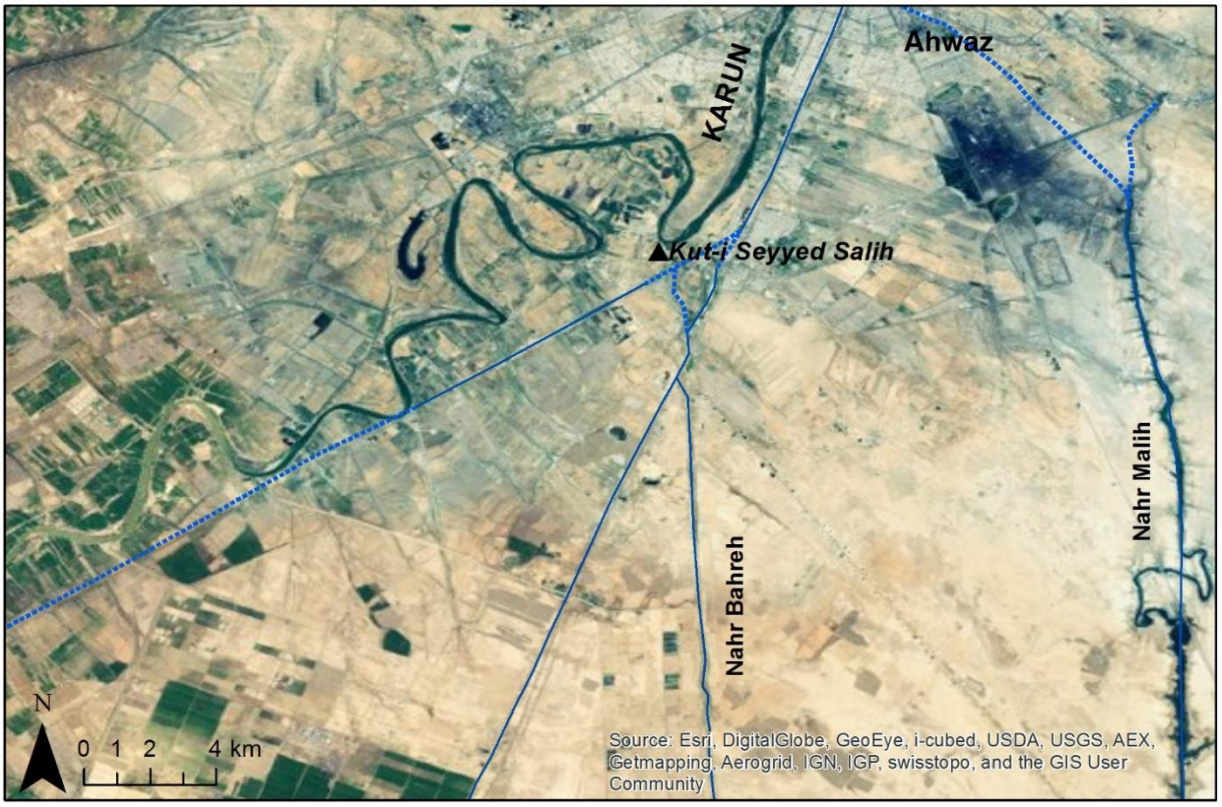
Map 6.16. Top: Graadt Van Roggen's map of ancient Ahwaz and its hydraulic remains, as well as the location of the bridge of Ahwaz (after Verkinderen 2015). Bottom: the elements of the hydraulic infrastructure of Ahwaz overlaid on the CORONA imagery (acquired 1968, courtesy of the CORONA Atlas of the Middle East).



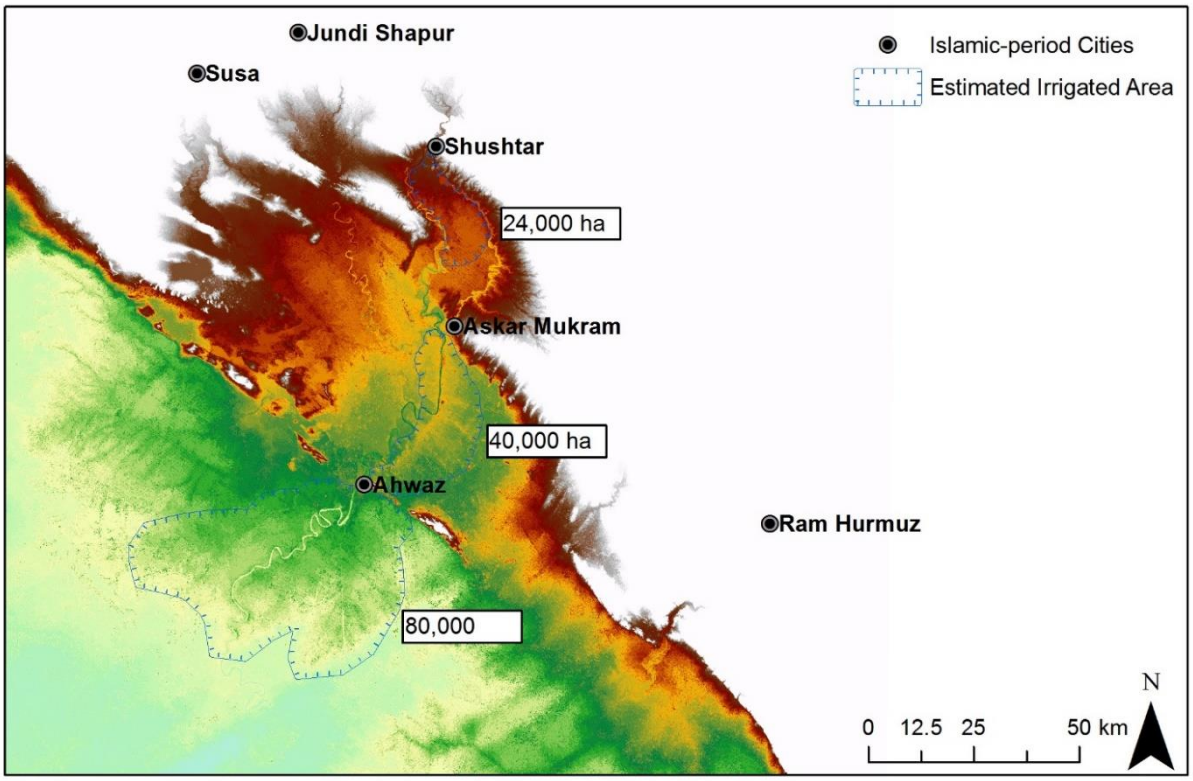
Map 6.17. The configuration of the old canals of Ahwaz south of the city. Nahr Bahreh and Nahr Malih both end in the marshes.



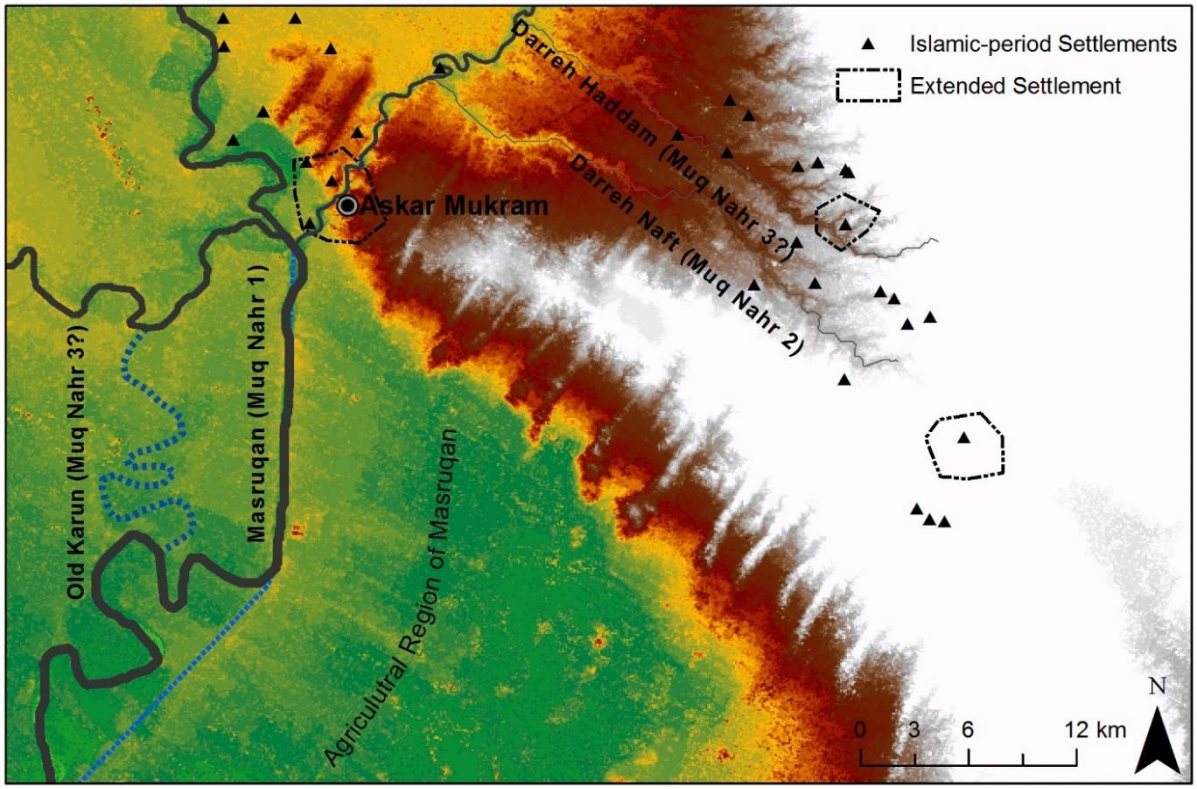
CORONA imagery acquired 1968, courtesy of the CORONA Atlas of the Middle East



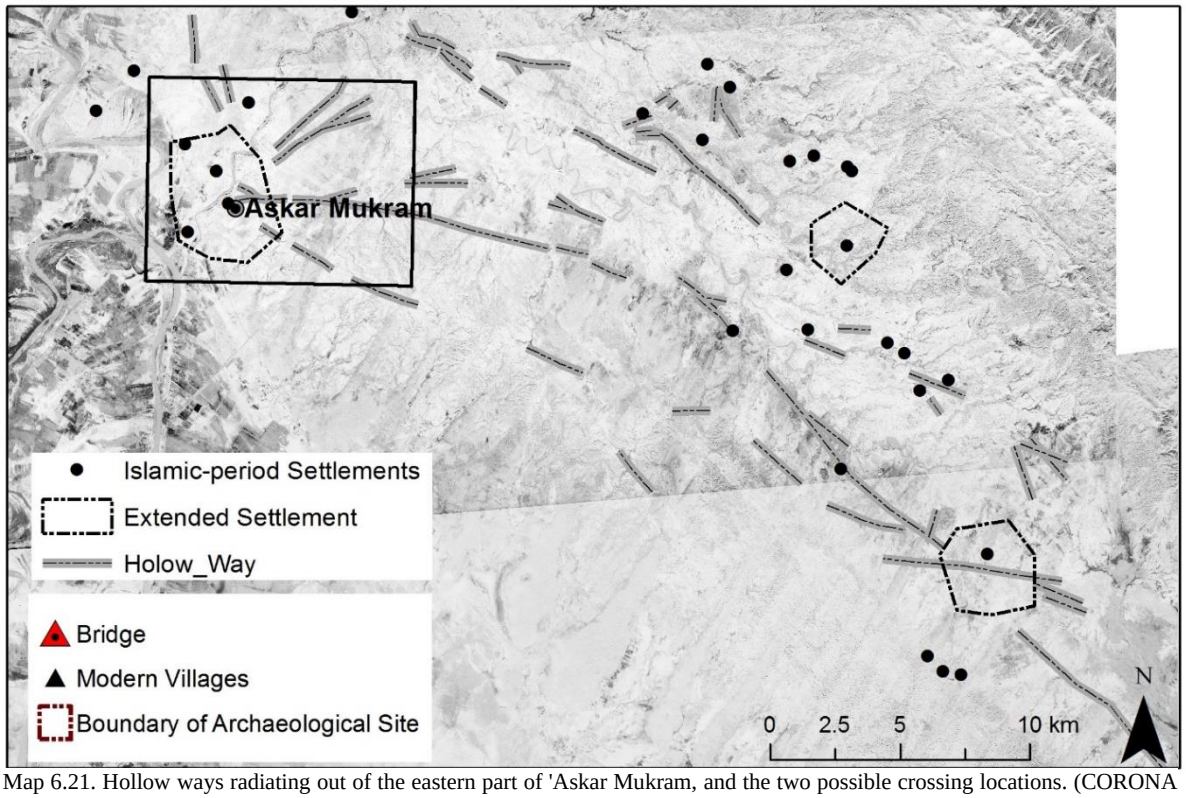
Map 6.18. Estimated areas of maximum irrigation agriculture. (SRTM imagery courtesy of CAMEL)



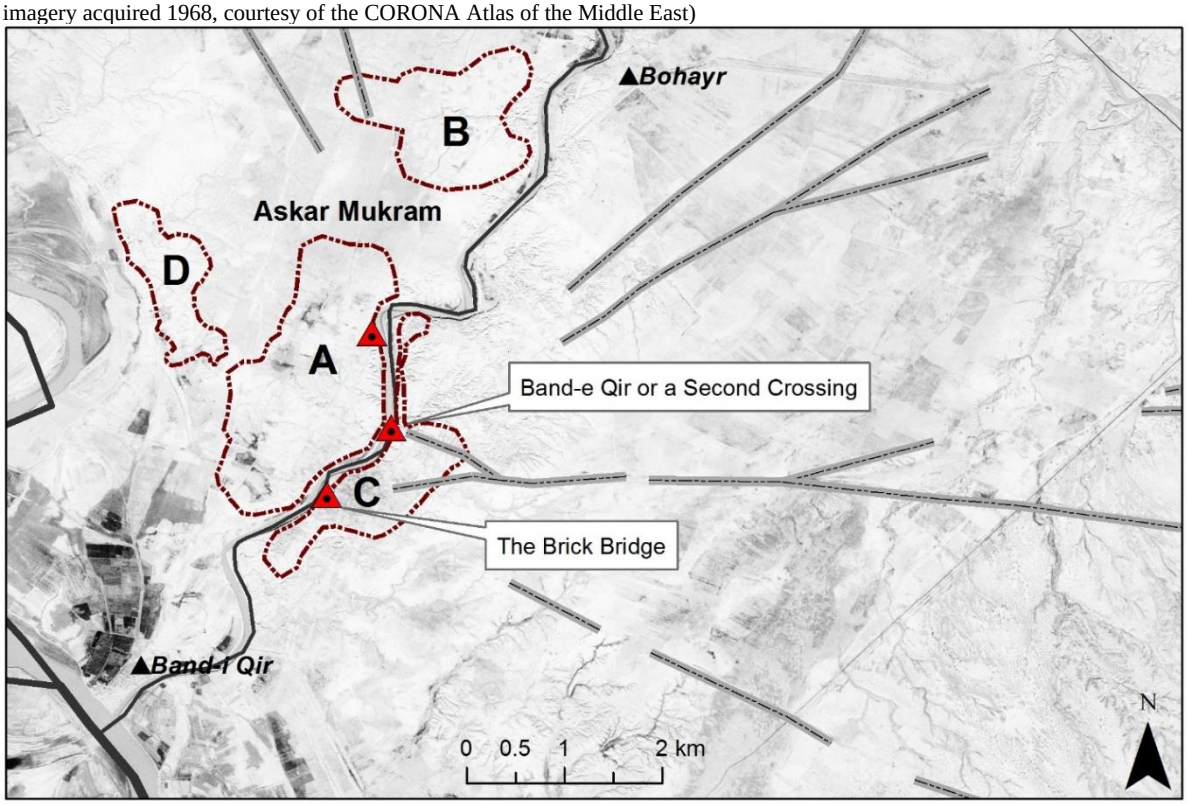
Map 6.19. Approximate Boundary of the Kura of 'Askar Mukram. (SRTM imagery courtesy of CAMEL)



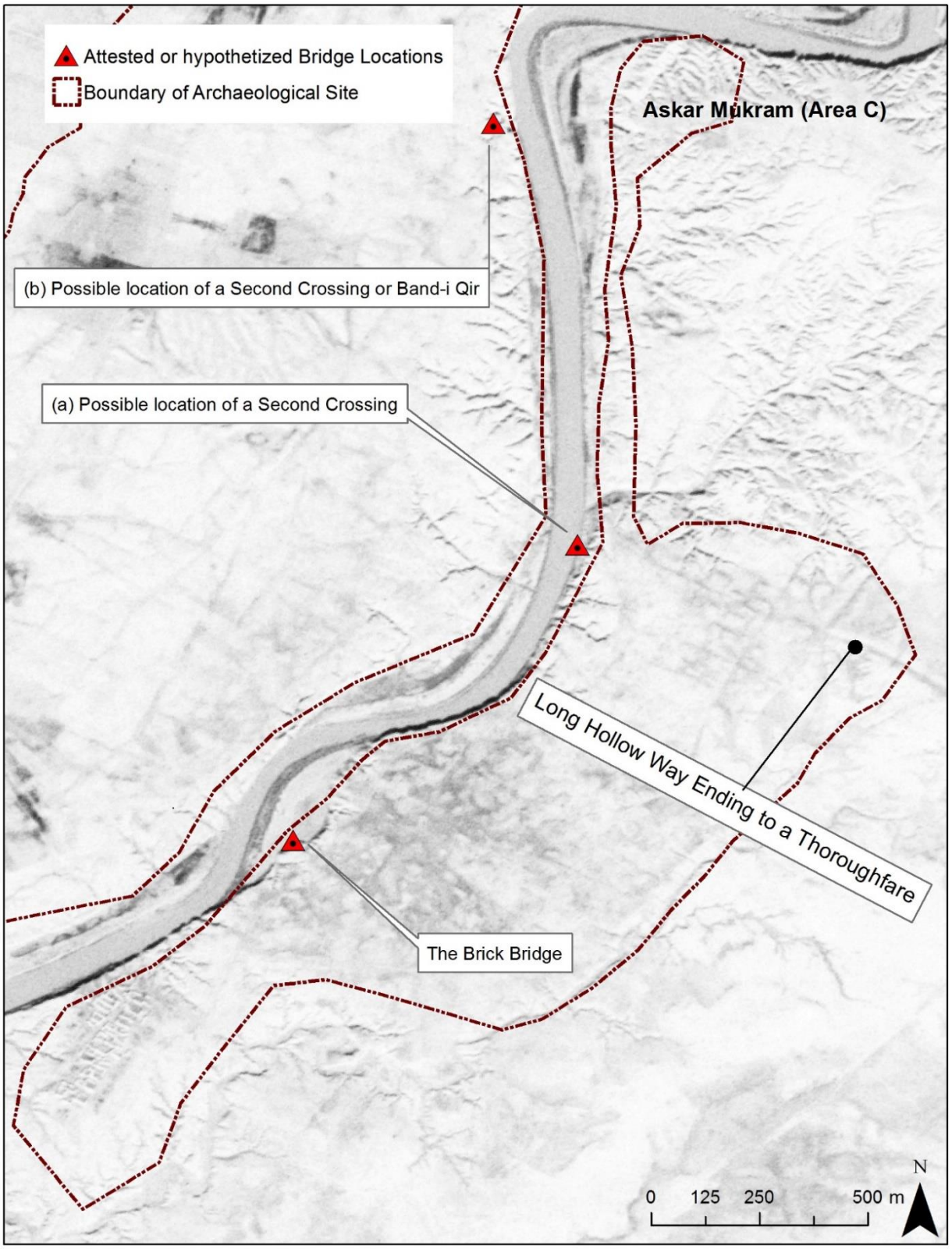
Map 6.20. Some of the hollow ways around the Islamic sites of the Kupal area (CORONA imagery acquired 1968, courtesy of the CORONA Atlas of the Middle East)



Map 6.21. Hollow ways radiating out of the eastern part of 'Askar Mukram, and the two possible crossing locations. (CORONA imagery acquired 1968, courtesy of the CORONA Atlas of the Middle East)



Map 6.22. Locations of the possible crossings over the Gargar, at ‘Askar Mukram. (CORONA imagery acquired 1968, courtesy of the CORONA Atlas of the Middle East)



Map 6.23. Historic DEM created from aerial photos (1956), and the historic hydraulic sites of Shushtar.

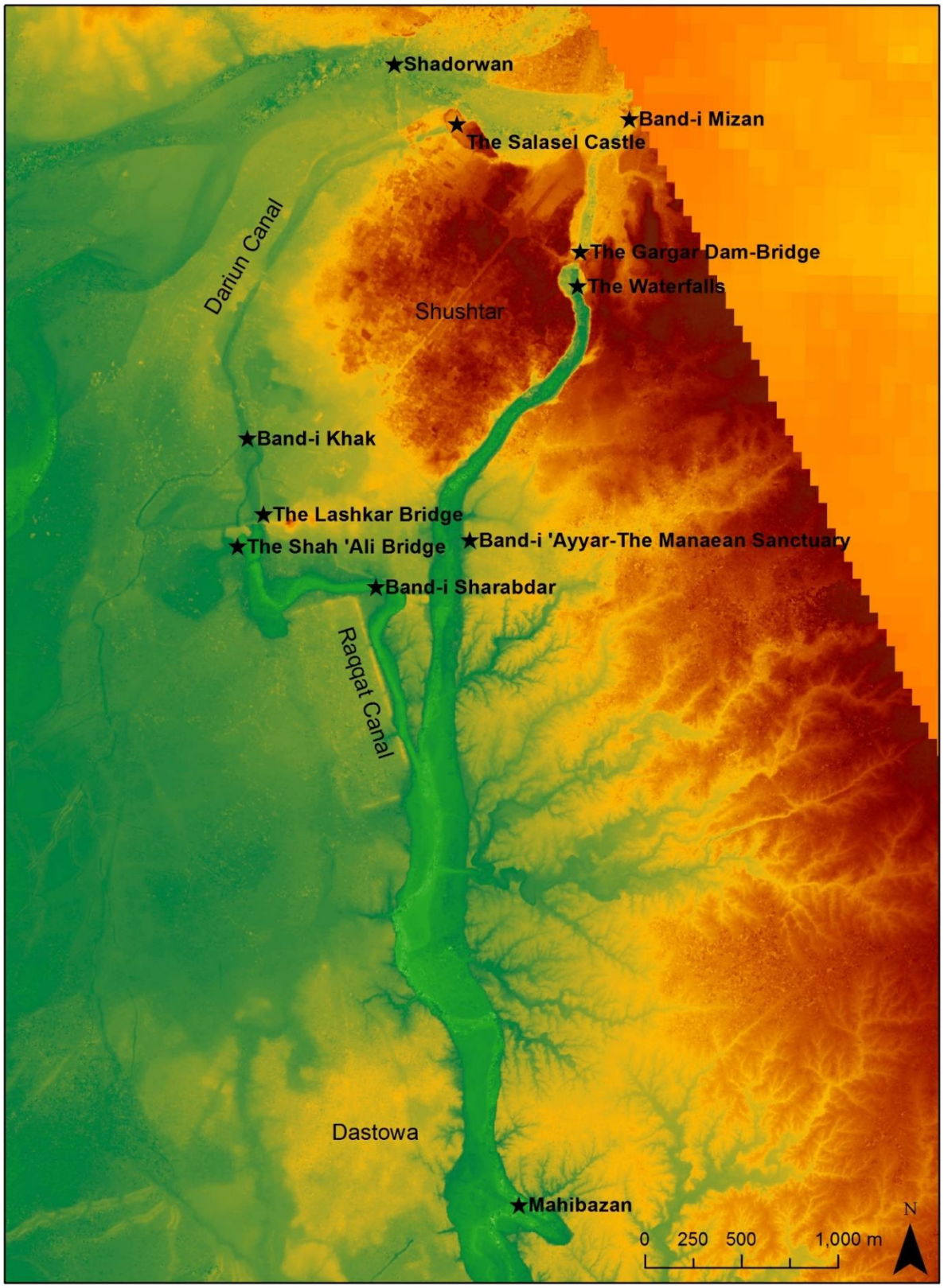


Figure 6.1 The Derreh Haddam and Darreh Naft join the Gargar at an obstruse angle.

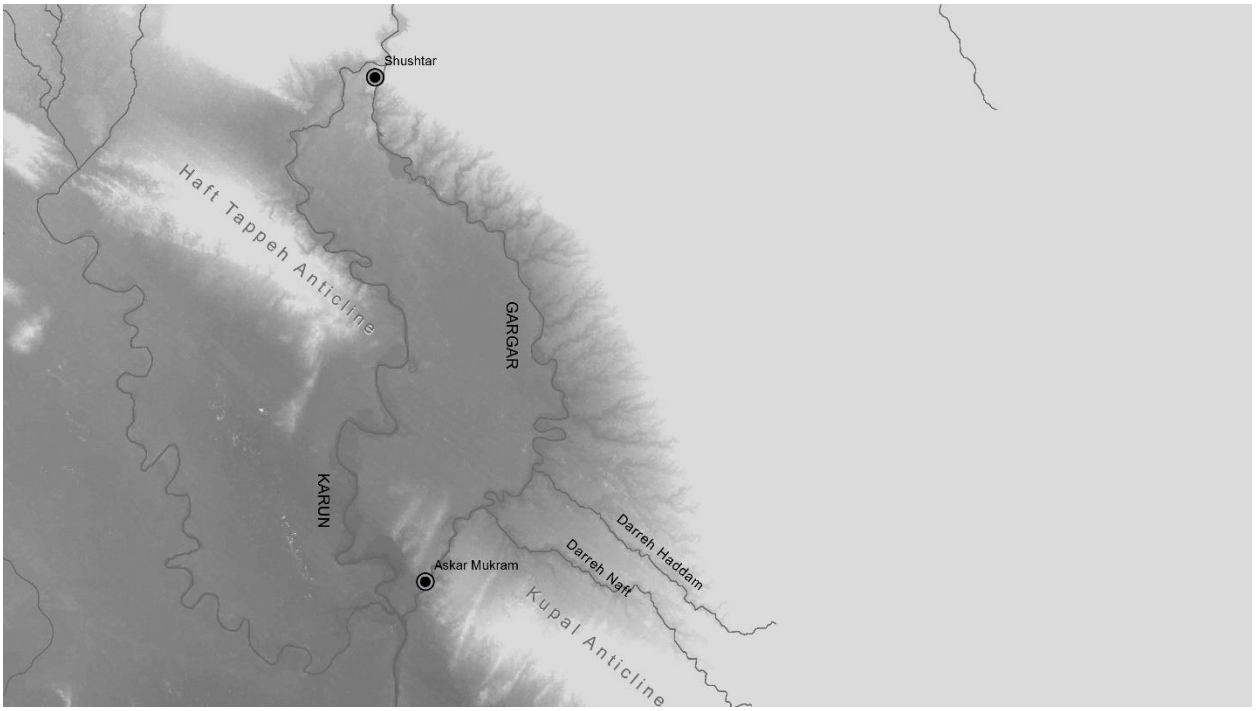
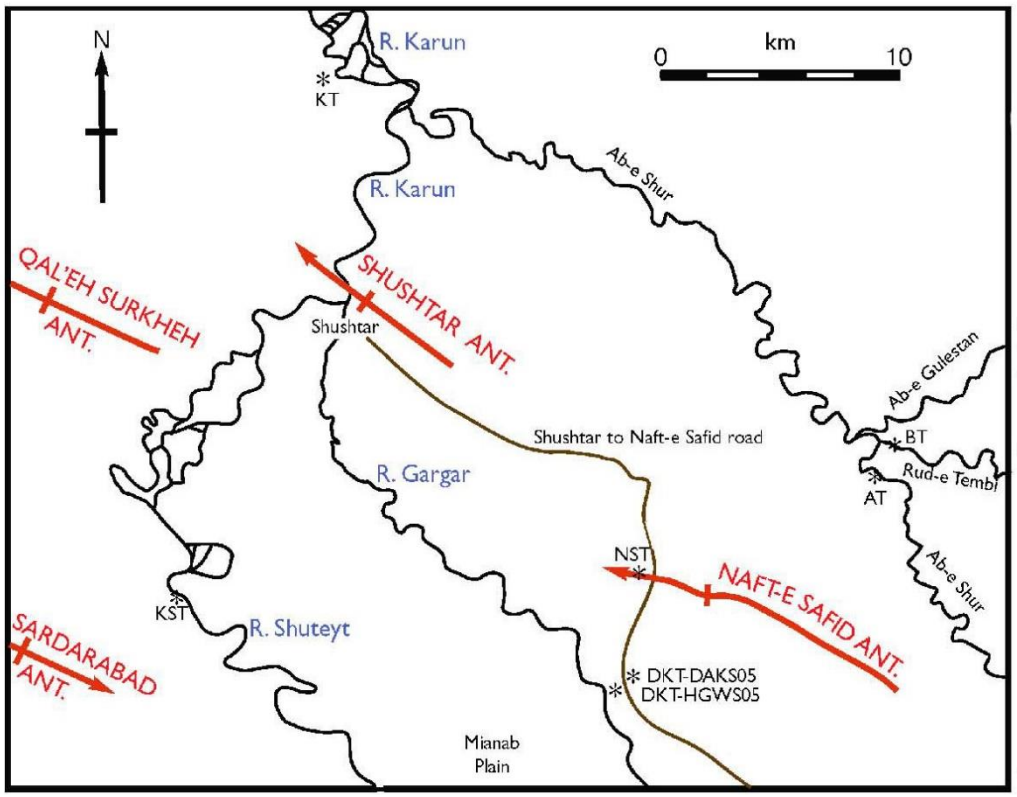


Figure 6.2 The anticlines and terraces of the Karun River basin. (After Woodbridge 2012:127, Fig 4.14)



Red line indicates axis of anticline, with arrow for direction of plunge. The Qal'eh Surkheh Anticline plunges towards the NW. For each anticline, the fore-limb is to the SW of the anticlinal axis and the back-limb is to the NE of the anticlinal axis. Brown line is Shushtar to Naft-e Safid road.
*AT Abgah terrace
*BT Batvand terrace
*DKT-DAKS05 Dar Khazineh terrace location DAKS05
*DKT-HGWS05 Dar Khazineh terrace location HGWS05
*KST Kabutarkhan-e Sufla terrace
*KT Kushkak terrace
*NST Naft-e Safid terrace

Figure 6.3 The Bohayr canal, near the Bohayr village, view from east to west.

Figure 6.4 Verkinderen's reconstruction of the Masruqan, consisting of two main branches. Asterisk shows the suggested location for Qantarat Arbuk (After Verkinderen:2009: 290, Fig 38).

Figure 6.5 (Right) Ibn Hawqal map of Khuzistan. Note that the Masruqan turns back to the Karun in a sharp angle, north of Ahwaz, at the Shadorwan-i Ahwaz. Guide to Arabic captions: 1) Nahr Tustar (Karun); 2) Tustar (Shushtar); 3) Nahr al-Masruqan; 4) ʿAskar Mukram; 5) Shadorwan (at Ahwaz); 6) Hurmuz (Ahwaz).

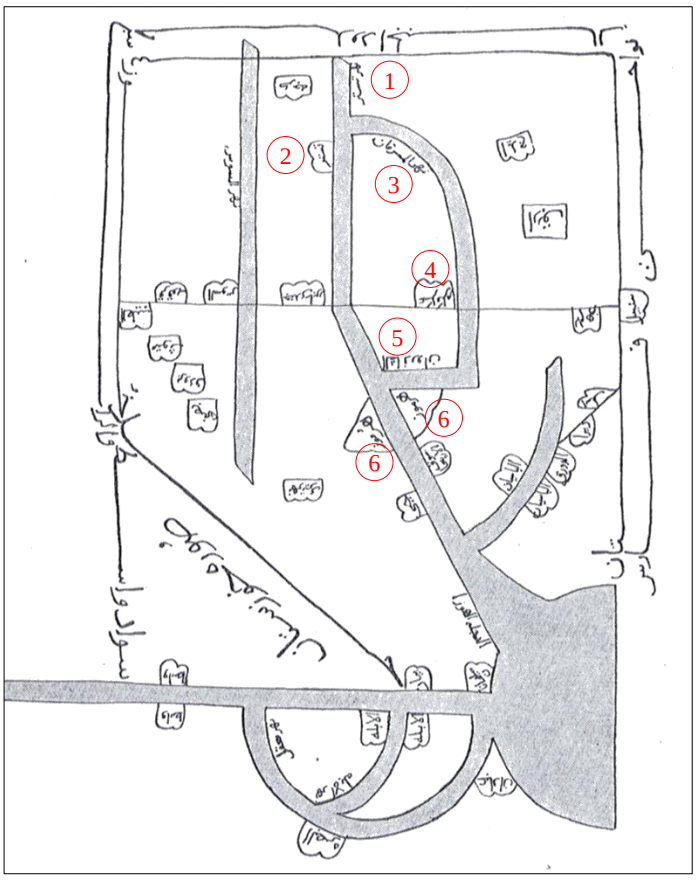


Figure 6.6 (Below) the Mahibazan. The linear feature radiating from the site, on the eastern bank of the Gargar appear to be hollow ways. (See also Fig. 4.2)

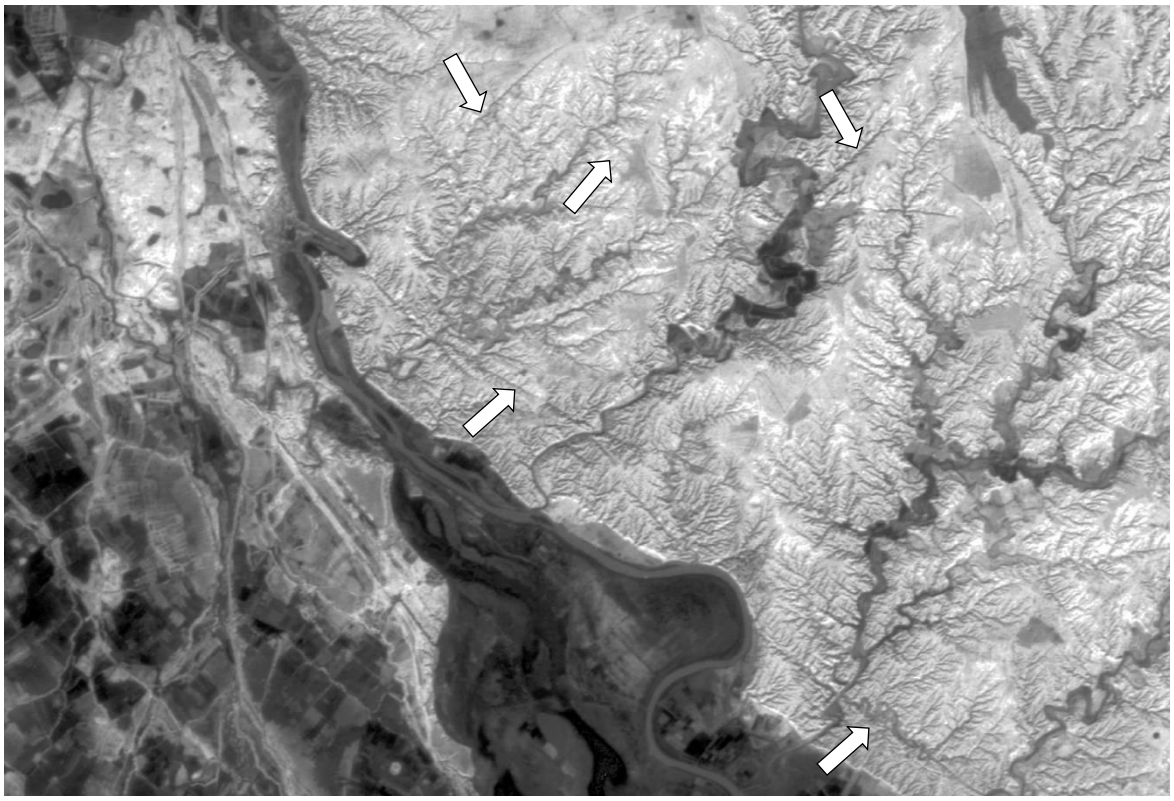


Figure 6.7 The relict irrigation system of Ahwaz, showing the Lower Karun (K1, K2, K3, K4) and Karkheh (Kh1, Kh2, Kh3) branches, with the locations of the most important bareholes and archaeological sites for dating purposes. (After Verkinderen 2015:138, Fig. 20)

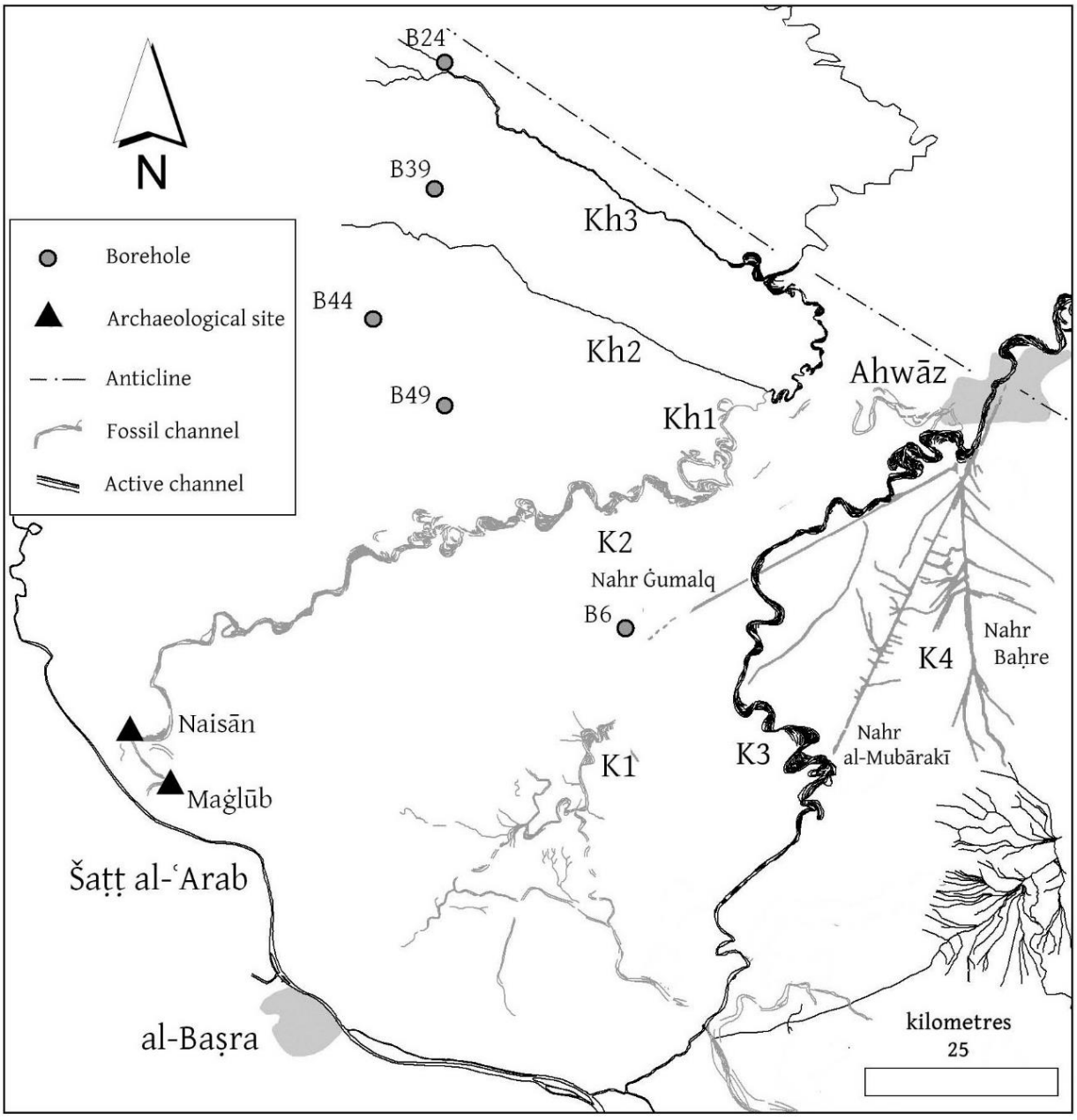


Figure 6.8 Moghaddam's identification of qanat systems in association with Islamic sites. Rectangular area corresponds with the extent shown on CORONA imagery (bellow).

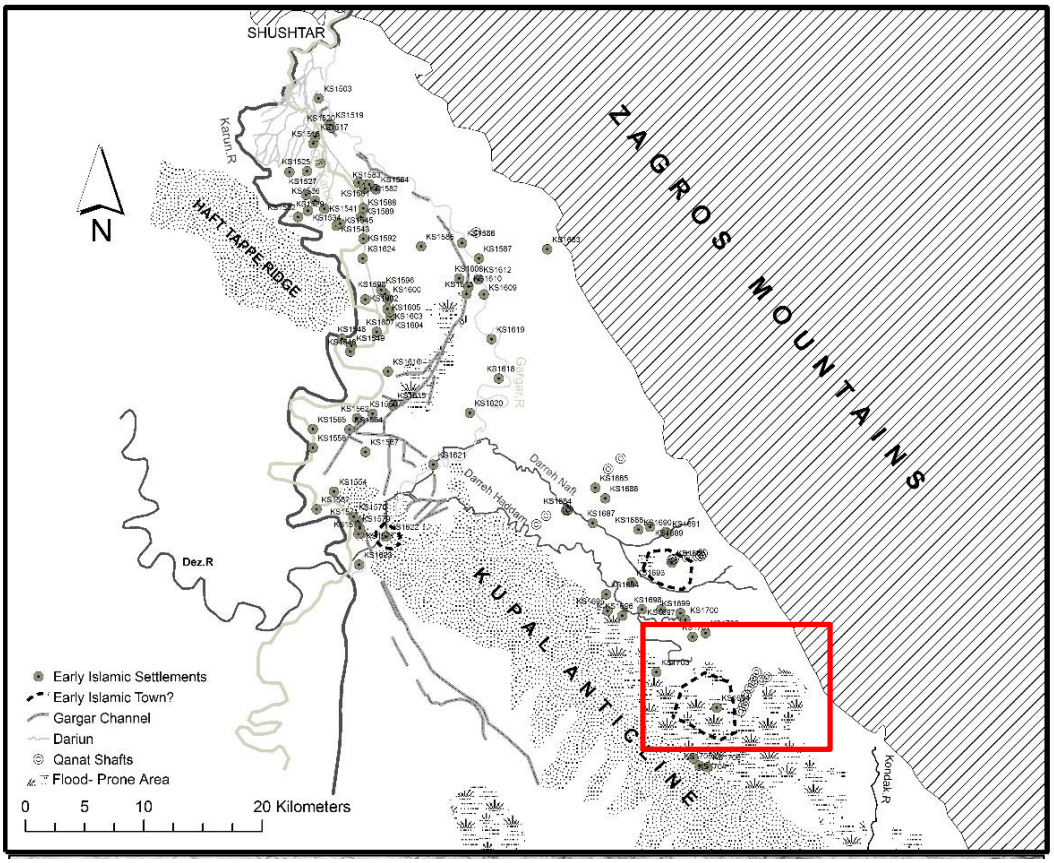
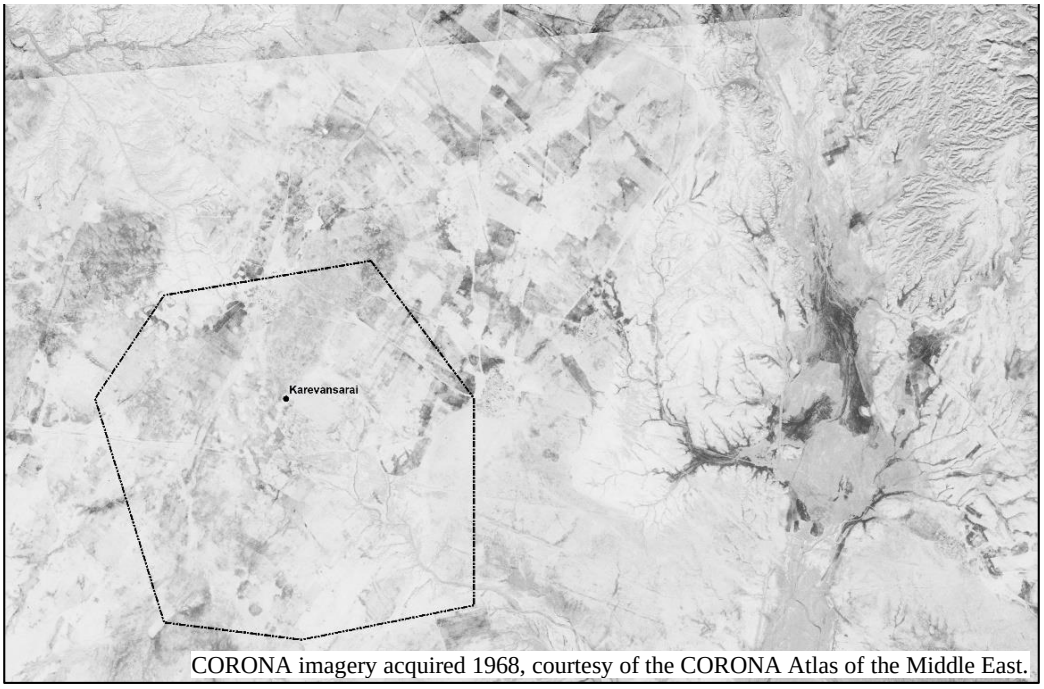


Figure 6.9 The study of historic imagery does not show any trace of qanat systems in the locations marked by Moghaddam, as in this picture, north of the site of Karevansara.



CORONA imagery acquired 1968, courtesy of the CORONA Atlas of the Middle East.

Figure 6.10 The Band-i Mizan; entire structure was probably of similar width, the difference in the width of the middle part seem to be from the extensive repairs of the Qajar period, and most likely indicates the location of the breach from the time of Nadir.

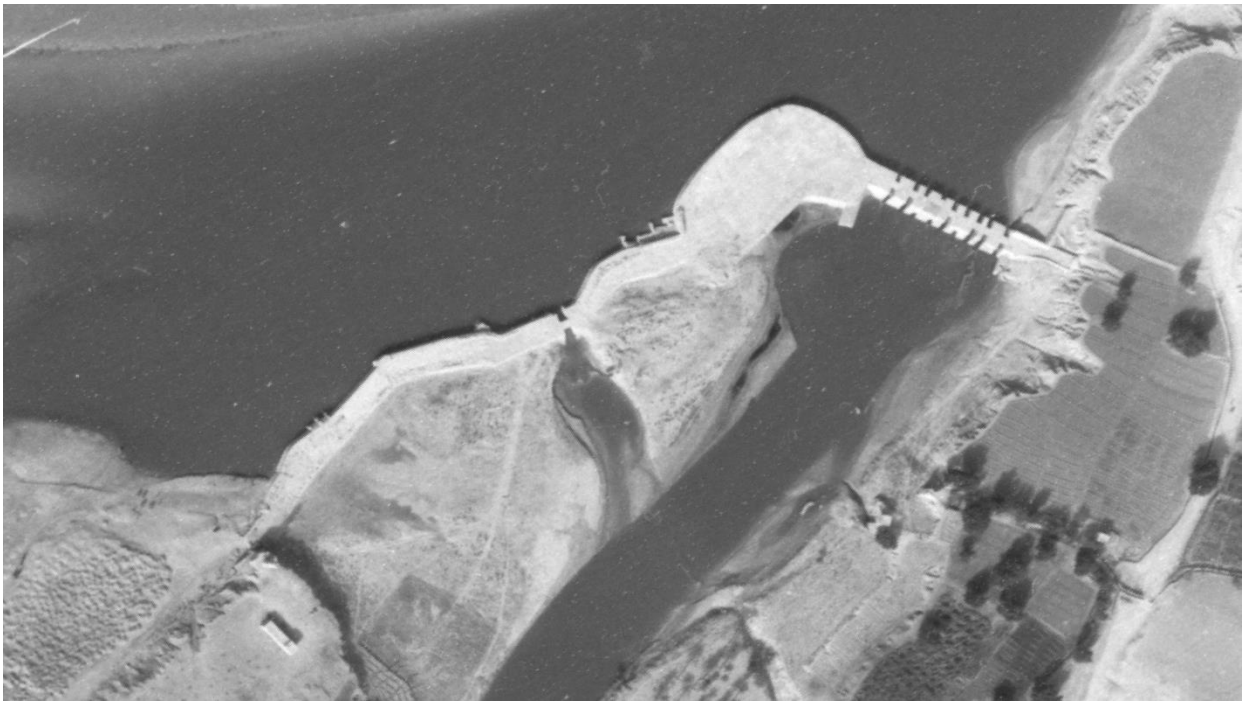
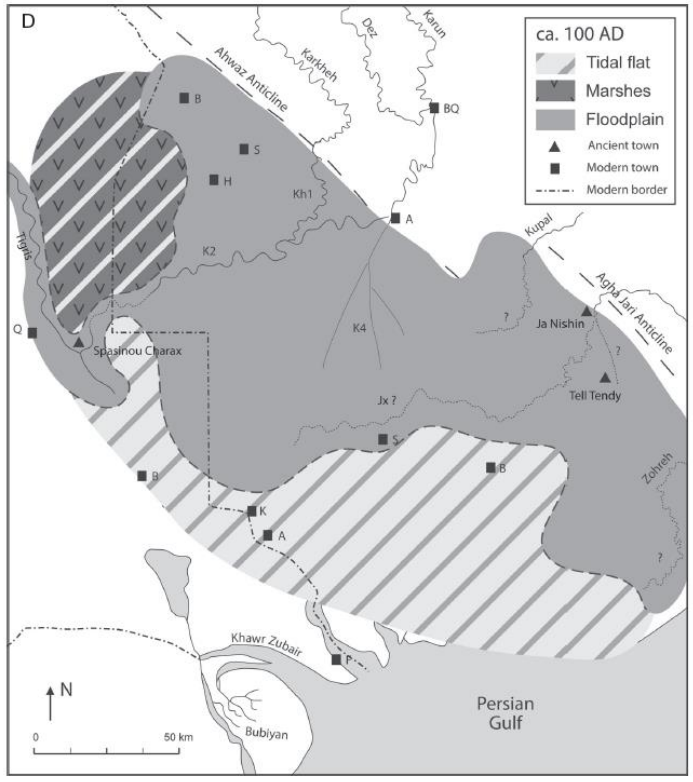


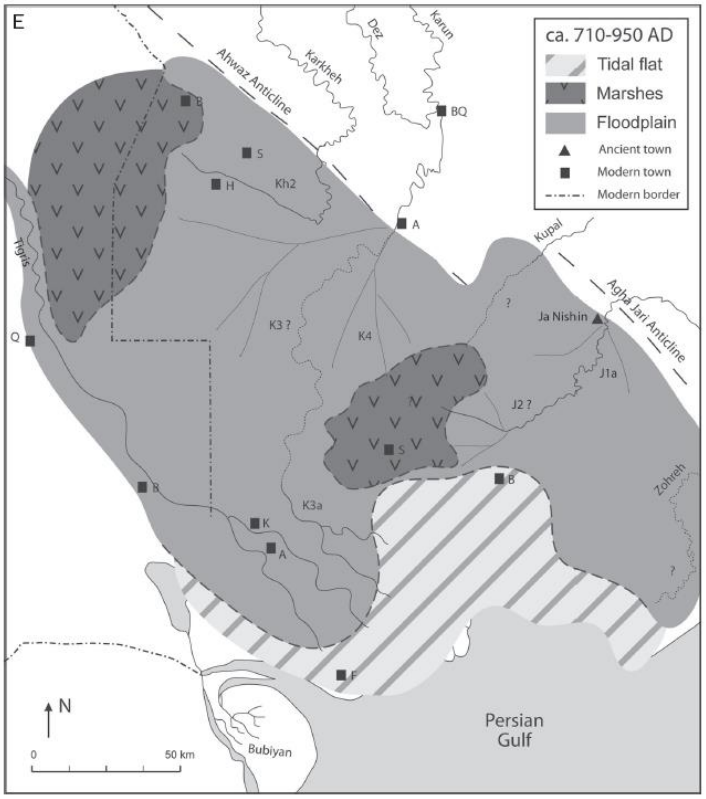
Figure 6.11 The Lashkar bridge, during a flood in 1979; the five middle arches that were built between 1982 and 1984 are visible.

Figure 6.12 The remains of a masonry brick structure, at 'Askar Mukram, which probably corresponds to the Band-i Qir (Photo courtesy of Loghman Ahmadzadeh).

Figure 6.13 Bitumen used in the construction of the structure (Photo courtesy of Loghman Ahmadzadeh).

Figure 6.14 The avulsion of the Karun, dated to the Early Islamic period (After Heyvaert et al. 2013).





Chapter 7
Conclusion

This dissertation presents a long term perspective on the history of settlement and irrigation on the Miyanab plain, in Khuzistan, Iran. Insights from archaeology, texts, and remote sensing were combined in order to assess the impact of various factors contributing to changes in the irrigated landscape, particularly, political dynamics. The Miyanab is situated in the northeastern part of the Susiana, between two watercourses: the Karun to the west, and the Gargar to the east. The historic city of Shushtar, which is the administrative and economic center of the plain, preserves remains of several historic hydraulic structures which were inscribed as a World Heritage Site in 2009. An extensive network of relict canals was relatively well preserved on the plain until the early 2000s. Despite a wealth of archaeological data, especially on water history, the Miyanab was not systematically studied until 2001. In the wake of a large-scale agricultural modernization project, Abbas Moghaddam from the ICAR undertook the first systematic survey of the plain, in 2001 and 2002, followed by a survey of the plains on the eastern side of the Gargar canal, in 2004 and 2005. The data collected in these surveys provided the basis for this study.

The present research continues the tradition of regional archaeological research on settlement and irrigation dynamics in Susiana, with the following differences: first, this research makes extensive use of remote sensing and GIS, which enables landscape study of areas that are heavily damaged by modern development. Second, this study places a particular emphasis on relict canal systems as a distinct category of archaeological data. Canal systems have been first analyzed internally, independent of the settlement pattern proxy. Subsequently, information obtained from canal analysis has been combined with the settlement data. Third, the study does not focus

primarily on pre-Islamic developments. While examining the long durée water history, I attempt to closely investigate the transition of the region from Late Antiquity to the Middle Ages, as far as the evidence allows. The results of the study were discussed in detail in chapter 6. Below, a summary of these findings is presented, along with their broader implications and shortcomings as well as directions for future research.

7.1 Summary of the Results

The findings of this thesis suggest that the impact of political dynamics, especially the rise and fall of the Sasanian Empire, on the irrigated landscape of the Miyanab was less conspicuous than has been previously argued. Since at least the Achaemenid period, the canal systems of the Miyanab appear to have been expanding gradually, perhaps on the patterns of natural streams that originally flowed closer to the ground, on the Karun fan at Shushtar. The fact that the Dariun was the only source of irrigation water on the plain has been overlooked, apparently because of the assumption that Sasanian irrigation investment must be reflected in a monumental landscape features such as the Gargar. I suggested that the Sasanian projects in Miyanab were probably focused on the improvement and capacity expansion of the Dariun system at Shushtar.

The Gargar does not seem to have had any role in the irrigation of the Miyanab, nor does it seem to have been formed in the course of a short-term imperial project. This study corroborates the existing hypothesis that the Gargar, at least the segment between Shushtar and ‘Askar, was dug in the Sasanian period. Investment in this canal, however, appears to have been part of a strategy for distributing and controlling the excess flow of the Karun and perhaps using it for purposes other than irrigation, i.e. running mills and navigation. Several landscape features along the course of the Gargar suggest that a predecessor to this channel may have been formed in the course of a

long period of human-water interaction, and the canal may have incorporated previously existing natural and artificial channels.

The Islamic conquest does not seem to have changed the pattern of settlements and irrigation on the plain. Many sites continued to be inhabited. In addition, new sites began to fill in the Late Antique landscape in the Islamic period. A significant expansion of settlement and urban growth is observed in the southern area of the plain and outside the Miyanab along the northern face of the Kupal anticline. I argued that the city of ‘Askar Mukram was a newly founded settlement and did not replace a Sasanian city, Rustam Kawad, as widely-assumed. Its foundation was related to new or intensified economic activity in the buffer area between the two pre-Islamic urban centers of Shushtar and Ahwaz. The state of our knowledge does not permit to determine the significance of the lower Masruqān canal, between ‘Askar and Ahwaz, for irrigation agriculture in the Sasanian period. It may have existed and been used prior to the Islamic period, but the existence of a large agricultural area without a substantial settlement at its head would be surprising. Therefore, it is possible that the lower course of the Masruqān was formed or changed in the Islamic period in the course of the expansion of irrigation activity to the south of ‘Askar. If this were the case, the avulsion of the Karun to the bed of the Masruqān may have resulted from intensified canal expansion in this area rather than a lack of investment, as has been previously argued.

Around the 11th century, regional economic contraction seem to have occurred in Khuzistan. Similar trends are observed in the economy of Islamic territories from Eastern the Mediterranean to Central Asia. The pace and causes of this process are poorly understood. The effects, in Khuzistan, seem to have been felt from south to north. Ahwaz was affected before

'Askar. Shushtar survived and resumed its position as an administrative and economic center in northern Khuzistan, albeit as a less important town in a shrinking economy. The longevity of the agricultural and economic base of Shushtar was at least in part due to the resilience of its irrigation infrastructure. It is, however, wrong to presume that the Late Antique system continued to operate with little or no new investment until modern times. It appears that several historic hydraulic monuments in Shushtar were built in the Middle and Late Islamic period. Excessive focus on imperial investment has overshadowed the longevity of the entanglement of human action and water that is preserved, albeit in bits and pieces, across the irrigated landscape of the Miyanab.

7.2 Broader Intellectual Concerns

7.2.1 Dynamism of Archaeological Landscapes of Irrigation

Archaeological landscapes are very complex "palimpsests"; landscape layers are progressively superimposed over one another, and the inherited landscape comprises a wide range of features dating to different periods.[444] It is, nonetheless, not uncommon for palimpsest landscapes to be misunderstood as static throughout centuries or millennia.[445] This study sheds light on the complexity of landscape superposition and dynamics in an area in which the pre-modern archaeological landscape was once considered to be more or less representative of the Late Antique period.

Irrigation landscapes, especially when continuously used, are particularly difficult to deconstruct. Each generation changes the canal systems to fit its needs, removing some parts and

[444] Wilkinson, Archaeological Landscapes of the Near East, 7–8.
[445] Edgeworth, *Fluid Pasts*, 11–18.

integrating parts of the old system into a new design.[446] By utilizing a relational analysis of canal systems, this study provides evidence for continuous human involvement in the modification of irrigation landscapes throughout the history of occupation on the plain. As demonstrated here, unless there is strong case for a break in human activity in a certain period, it is difficult to associate inherited landscapes with one phase of human occupation, leaving all previous and subsequent developments out of the equation.

Fluvial landscapes are naturally highly unstable. In addition, the unintended consequences of even small-scale human interventions can be enormous. Shifting river channels and changing sedimentation regimes tend to quickly obliterate the evidence of past human-water interactions creating the illusion of an unchanged "natural" or "artificial" landscape.[447] This study sheds light on the wide range of human activities and natural processes which seem to have worked in tandem in the formation of a canal that has been frequently considered the result of a short-term, planned project. In order to even begin to deconstruct the full range of factors contributing to the formation of the Gargar, an extensive geoarchaeological research project is required. Nevertheless, this study illuminates the complicated nature of the problem and creates a framework for a more comprehensive research approach.

7.2.2 Organic Development vs. Imposed Engineering of Irrigation

Wilkinson identified two classic types of *signature landscapes* where the parts are sufficiently physically engraved into the land to remain visible to the present day: those imposed

[446] Adams, "Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain," 26–27.
[447] Edgeworth, *Fluid Pasts*, 11–48.

by the heavy weight of the imperial power and those that persisted for a sufficient length of time to leave a permanent record.[448] This study suggests that there may be a very fine line between the two. The Miyanab is an excellent case of a signature landscape where the situation is not either-or. The idea of large-scale Sasanian imperial investment in Shushtar, which is transmitted by Islamic textual sources, has led archaeologists and historians to look mainly for the evidence of imposed landscape engineering. This study, however, demonstrates the strong continuity in irrigation strategies and practices on the plain. Canal systems seem to have grown gradually in the course of increasingly more complex actions of humans in channel straightening and expansion, building on the natural hydrology of an alluvial fan. Considerable investment in canal system expansion appears to pre-date the Sasanian period. Sasanian irrigation projects were probably focused on the re-engineering of the historical canal head at Shushtar. This study demonstrates that imperial investments may not necessarily result in the structural transformation of the landscape. They may instead work to enhance the durability of already existing infrastructure, making it extremely difficult to associate the persistence of landscape elements with a specific pattern of human-landscape interaction only.

7.2.3 The Muslim Conquest and the Fate of the Sasanian Irrigation Systems

This study makes a significant contribution to our understanding of the dynamics of irrigation agriculture in Khuzistan during the transition from Late Antiquity to the Islamic period. This is the first systematic archaeological investigation in Khuzistan that has focused on investigating such developments in these centuries. A main conclusion of this research is that the

[448] Wilkinson, *Archaeological Landscapes of the Near East*, 7.

impact of the fall of Sasanian state on irrigation agriculture in the region may have been less pronounced than previously thought. Irrigation agriculture in the Miyanab does not seem to have changed notably. In addition, the establishment of a new administrative province, ʻAskar Mukram, points to new or increased agricultural investment in the buffer zone between the two cities of Shushtar and Ahwaz. It is possible that the post-conquest irrigation projects contributed to the formation of the 10th-century Masruqān, and to the subsequent avulsion of the Karun.

7.2.4 Limits of the Continuity-Decline Discourse

Investigation into aspects of "continuity" and "decline" is a classic archaeological topic. This paradigm has been particularly pivotal in shaping the archaeology of Late Antiquity and the Islamic periods in the Near East.[449] These concepts, however, are very subjective and their applicability to archaeological findings is determined by the researcher's *definition*, as well as by the *resolution* and *scale* of research. With a growing body of archaeological data from Late Antique-Islamic sites, especially across the Eastern Mediterranean, fewer cases seem to fall in one category, either continuity or decline. A deeper understanding of social change during this transitional period reflects the gradual modifications to and regional variations of the built environment, from the scale of monuments to landscapes.

This research also contributes to a richer and more nuanced sense of the debates on continuity and decline, in particular, in the transition period following the Islamic conquest. The scale of the study makes a difference in the definition of decline and continuity. For example, the structure of irrigation on the plain presents strong continuity at a broad scale. High resolution

[449] Walmsley, *Early Islamic Syria*, 15–45.

analysis of the canal heads, however, begins to reveal the complex dynamism of the system. It becomes possible to see the long process of human-water interaction, with the same system expanding and contracting to its maximum and minimum capacity, in response to socio-political and environmental factors. Whereas looking only at textual sources, it may appear that the status of Shushtar declined after the conquest, expanding the scope of the study suggests that the city assumed a different role reflecting changes in the regional economy. The concepts of continuity and decline, without such details, seem too broad to describe the range of dynamics reflected in the way the landscape was inhabited and used.

7.2.5 Regional Histories vs. Universal Explanations

This research contributes to a demonstration of the limits of universal explanations. The trajectory of the Miyanab diverges from the widely-accepted rhetoric of Sasanian imperial expansion vs. post-conquest decline. It must be noted that the Miyanab data were previously interpreted within the framework of imperial discourse. Only upon close examination, did important nuances and variations began to emerge. The overall regional continuity, along with moderate reorientation in land use and a peak in canal building around a new Islamic city suggested here parallel the findings of recent research in Northern Mesopotamia.[450] These high-resolution regional studies can shed light on the diversity of local responses to large scale socio-political changes, the causes of such variations, and their manifestation in the built environment. In addition, they may well contribute to a reconsideration of the theoretical framework, e.g. with regard to the

[450] Wilkinson and Rayne, "Hydraulic Landscapes and Imperial Power in the Near East"; Rayne, "Imperial Irrigated Landscapes in the Balikh Valley."

invariably perceived negative impact of the Islamic conquest on the irrigated landscapes of the Near East.

7.2.6 Interdisciplinary, Multi-scalar & Multi-period Investigations of Riverscapes

The approach and findings of this study falls in line with what Matt Edgeworth calls the "archaeology of flow"; in order to engage with rivers as an intermingling of natural and cultural dimensions, the perspectives of archaeology and history have to be combined with those of hydrology and geomorphology.[451] The limitations of this study do not permit a comprehensive reconstruction of the past history of river flow in the area. Yet, this study illustrates the complexity of the question of the formation of the Gargar with regard to cultural and natural forces, and demonstrates that only an interdisciplinary approach has the potential to offer a reliable answer.

Rivers can be studied at many different scales of analysis. Advances in computer-based technologies facilitate the study of water histories from the scale of individual monuments to that of entire watersheds. GIS applications allow us to zoom in and out and see the flowing rivers at various scales with the touch of a button.[452] Computer visualization and modeling presents new opportunities for the interpretation of the landscape, especially with regard to topography. The findings of this research highlight the power of such an approach: moving back and forth between the analysis of monuments, canal networks, archaeological landscapes, landforms and streams sheds light on the past histories of each in a way that cannot be achieved without a multi-target multidisciplinary approach.

[451] Edgeworth, *Fluid Pasts*, 18.
[452] Ibid., 65.

Continuity of flow in riverscapes demands multi-period investigation. It is usually impossible to isolate one phase of human-water interaction without understanding preceding and subsequent developments. Each phase tends to mask earlier landscapes and shapes the trajectory of developments leading to the next phase.[453] This study highlights the extent of post-Antiquity modifications of landscapes that can be understood only through a long durée approach. Given the simplicity and uniformity of building materials and techniques, textual sources are crucial in understanding past landscape developments in the area. Inevitably, some periods are better documented than others. Expanding the chronological scope of the study enables researchers to make a judgment about the impact of data availability on the assessment of human-water history. In the case of the Miyanab, information is available on the early Medieval and early modern periods and nearly none for about 700 years in between. There is no reason to assume that the landscape underwent no change during this "dark age".

7.2.7 Irrigation and the Structure of Authority

One of the goals of this study was to assess whether the physical properties of canal systems can yield information on the structure of authority in a society, mainly with regard to Sasanian centralized control, as frequently assumed in the literature. As argued by Hunt, it is important to distinguish between the "construction" and the "operation" of an irrigation system.[454] The Sasanian state may have played an important role in the construction of the Gargar canal and at least one monumental weir on the Karun, but there is no clue is no clue, aside from legends of

[453] Ibid., 100–101.
[454] Hunt, "Size and the Structure of Authority in Canal Irrigation Systems."

captive Roman army engineers preserved by Ṭabari and others, as to how centrally (if at all) the task of construction was managed. It is also possible that the state funded the project without centrally implementing it on the ground. Even if the entire course of the 10th-century Masruqān dates the Sasanian period, the evidence suggests a prolonged and complicated developmental history, involving a combination of smaller scale projects rather than a short-term, massive undertaking. The evidence from the Miyanab thus places Sasanian water history more naturally within the long durée tradition of human-water interaction, rather than suggesting it represents a phase of unparalleled domination of nature by imperial power.

There is even less evidence available about the "operation" of irrigation tasks. Whether the Sasanians managed irrigation more centrally than either their predecessors or successors cannot be determined. Yet, the strong continuity in irrigation between the Parthian and Middle Islamic periods suggests that central governments had little to do with the management of operational tasks. The expansion of Islamic sites into the buffer area between Shushtar and Ahwaz further supports the idea that local communities owned and operated irrigation infrastructure. According to Islamic historiography, the Muslim army was prohibited from confiscating the properties of local agricultural communities and interrupting their production which was crucial to sustaining the emerging Islamic state.[455]

If the state was not involved in the operation of irrigation, how were tasks managed? According to Hunt's model, the size of the irrigation system of the Miyanab, c. 24,000 ha, necessitates authority over operations. There is no textual indication that the daily operation of the

[455] See e.g., al- Balādurī, *Bal Fut*, 377.

system involved authorities beyond those of the local inhabitants, but at least in the pre-modern period, the local community seems to have lacked the means to carry out major maintenance. These projects were undertaken only when a powerful governor was appointed who was able to secure funding, from central government or other sources, and bring in building masters. The king was involved in such maintenance project only in one case: Nadir Shah. This case, however, cannot serve as an example of the direct involvement of central government because Nadir had not established a centralized bureaucratic system, and operated like an autocrat in most matters.

Jürgen Paul disagrees with Adams' categorization of irrigation systems (tribal, imperial, mixed) and argues that community participation around the economic and socio-political power of local elites played a significant role in the history of irrigation systems on the Iranian Plateau. Paul argues that only in exceptional cases were the financial and human demands of irrigation systems beyond the capabilities of local elites and provincial rulers.[456] The findings of this research support Paul's argument and highlight the possible role of the elites (local or non-local) in the construction and maintenance of irrigation infrastructure. Many of the hydraulic structures that are preserved in Shushtar and are traditionally attributed to the Sasanian kings were probably built after Antiquity, especially in the middle and late Islamic period, when the political horizon of Iran was fragmented for the most part. After the demise of 'Abbasid power, Khuzistan was never strongly integrated with the central power, even at times of increasing political consolidation on the plateau. Therefore, it seems likely local elites played a fundamental role in the construction and maintenance of irrigation infrastructure throughout the medieval period just as they did in pre-

[456] Paul, *Herrscher, Gemeinwesen, Vermittler*; Adams, "Historic Patterns of Mesopotamian Irrigation Agriculture."

modern times. Greek inscriptions from Susa that attribute major canal building projects to an Arsacid-appointed official indicate the longevity of this model in the water history of Khuzistan.

7.2.8 The Canal as a Distinct Category of Archaeological Data

The present research makes a significant methodological contribution to the study of relict canal systems. This study demonstrates that the relative dating of canal evolution is possible based on the internal analysis of the system and does not need to be tied to settlement pattern data. In addition, detailed mapping and comprehensive study of canal systems can yield new information about the "features" of the system and the "functions" they perform.[457] Once a reliable macro-picture of canal history is achieved, other categories of information such as settlement data and geologically dated canal segments can be more safely integrated in order to date an irrigation system.

Data availability is crucial to the ability of a researcher to undertake a detailed hydraulic study of past irrigation systems. The analyses carried out in this research were possible because of the availability of high-resolution aerial imagery. This study demonstrates the capacity of the large datasets of historic aerial photographs that were systematically acquired in the Middle East beginning in the 1950s. Aerial photos did not prove particularly helpful for the identification of archaeological sites and ancient tracks. They are, however, very powerful tools for canal identification and analysis. Given the scale of development across much of the Middle East, historic aerial imagery is one of the best sources available for Near Eastern landscape archaeology.

[457] Terms borrowed from Rost 2012.

7.3 Limitations and Future Research

This study necessarily had its limitations. Some of these shortcomings motivate my future research projects. Others relate to and prompt suggestions for future research in the field. Geographical limitation is the first consideration. Until recently, the model of expansion and decline based on research in lower Mesopotamia had been considered applicable to the core areas of Near Eastern empires in Iraq and southwestern Iran. The Miyanab presents a different trajectory in a relatively small area in Khuzistan. It is not clear whether the trajectory proposed for the Miyanab is an exception or whether it represents a pattern that was more widespread. Even though earlier studies, by Wenke, Alizadeh, Gasche and Paymani, and Neely seem to corroborate the findings of this research with regard to the patterns of occupation between the Parthian and Early Islamic periods, disagreements about the dating criteria used undermines the validity of cross-regional comparisons.[458] I aim to expand the scope of this study, first to Susiana and then to other areas in Khuzistan. In the meantime, systematic excavation at sites from later historical periods is necessary for building a reliable local ceramic chronology that can guide future archaeological research and enable reexamination of previously collected data.

This research did not have the means to answer the question of the history of the Gargar, and the extent of the contribution of human and natural forces in its development. Such a complicated puzzle of human-water interaction can never be unraveled with insights gained from

[458] Wenke, "Imperial Investments and Agricultural Developements in Parthian and Sassanian Khuzestan"; Alizadeh, "Elymaean Occupation of Lower Khuzestan During the Seleucid and Parthian Periods: A Proposal"; Gasche and Paymani, "Repères Archéologiques Dans Le Bas Khuzestan"; Neely, "Sasanian and Early Islamic Water-Control and Irrigation Systems on the Deh Luran Plain, Iran." Interestingly, no such disagreement has been expressed about the dating of Adams' survey in Susiana, probably because the findings of that research are in line with the established paradigm.

one or two disciplines only. The findings of this research, nevertheless, illustrates the complexity of this question and propose a framework for future interdisciplinary research involving social and environmental sciences. Instead of searching for a simple answer to the problem, the evolution of the Gargar should become a subject of interdisciplinary collaboration. Further research may begin to reveal a more complicated picture without offering a definite answer, similar to the case of the Dargom canal in the Zeravshan valley of Central Asia.[459] Even so, the search will contribute as much to the knowledge of past human-environment interaction as does the answer.

Compared to the social dimensions, the physical properties of canal systems are not very well studied in Near Eastern archaeology. This systematic study of canal system evolution on the Miyanab contributed to a more nuanced understanding of the features and functions of irrigation, the range of modifications that are carried out throughout the life time of a canal system, and the cycles of expansion and contraction of a system. It cannot be determined whether similar properties and transformations can be observed in other canal systems in the Mesopotamian plains and/or on the Iranian plateau. More high-resolution hydraulic analyses of Near Eastern canal systems are needed to allow for meaningful regional comparisons. Furthermore, as a result of limited information on the physical dimensions of irrigation, we know very little about technological developments, for example in terms of tracing and management of water sources as well as the diffusion and expansion of existing technologies with limited application. It is reasonable to expect changes throughout the historical periods when large-scale canal irrigation was widely used. The power of computer technology and remote sensing data should be harnessed to illuminate general

[459] Stride, Rondelli, and Mantellini, "Canals versus Horses"; Malatesta et al., "Dating the Irrigation System of the Samarkand Oasis."

patterns of canal building, regional variations in the practice of irrigation as well as technological changes through time. These are some of the main questions which I intend to address in my future study of water history in Khuzistan.

It is reasonable to assume that some changes in the physical properties of canals correspond to changes in dominant cultivars. Despite the fact that Khuzistan has a prominent position in discussions of the Sasanian and Islamic economy, there is little information on the types of cultivars, their relevant importance in the political and regional economy, and the changes in the significance of these crops from one period to the other. Some information can be obtained from textual sources, mainly for the Early Islamic period. Some of the changes in the canal systems, for example, the regularly-spaced canal system along the Gargar, can be associated with commercial cultivars. The date of these canals and the types of cash crops which may have been cultivated can only be speculated. With the current state of knowledge, assumptions about the agricultural orientation of Khuzistan in the Sasanian period and its heritage in the Islamic period remain speculative. In the absence of economic records, only archaeobotanical research can yield reliable information on the past agricultural practices.

The medieval period is a dark age in the water history of Khuzistan. Several hydraulic structures near major urban centers of the Late Antique and Medieval periods are found in this region which have not been studied comprehensively. Most of these monuments are attributed to the Sasanian period without any supporting evidence. As suggested for the Miyanab, many of them may have been built in the medieval period. While landscape archaeological and textual data can shed some light on this poorly understood phase of human-water interaction, it is crucial to conduct

a systematic program of architectural survey and examination of hydraulic monuments, along with excavation and geo-chronological dating of building materials.

Environment is a major factor shaping water history, and climate change is frequently cited as a reason for widespread changes in settlement and irrigation patterns, especially during periods of contraction. Study of past human-environment interaction in Khuzistan is, nevertheless, severely hindered by the near absence of environmental data. Recent geoarchaeological research by the Belgo-Iranian team in southern Khuzistan has made a significant contribution to our understanding of the dynamics of river shifts, but regional data on past hydrological regimes, temperature and precipitation, and water table change is very limited. Without further investment in environmental research, a fundamental factor of the human-water interaction will continue to be missing.

Finally, the findings of this research highlights the significant potential of the study area for investigations into the urban and economic history of Khuzistan in the Early Islamic period. The only urban center established in Khuzistan after the conquest, ‘Askar Mukram, is located in a relatively well-preserved part of the archaeological landscape. In the future, I aim to focus on a detailed survey and spatial analysis of its urban landscape. In addition, I plan to investigate the local resources available for the economic growth of the city and the satellite of sites that were founded in its hinterland. It is particularly important to explore the roles of pastoralism, dry-farming and mining because much of the developed area was not suitable for irrigation agriculture. A systematic research plan needs to be put in place in order to understand the hydraulic infrastructure which supported and sustained development in this zone for at least five centuries.

The Miyanab is a fertile agricultural plain in an area ruled by major political powers of the Near East in the first millennium BCE and CE. It is, therefore, a very relevant case for the study of the classic topic of irrigation and political dynamics. An important contribution of this research lies in its "deconstructionist" approach. It sheds light on a range of problems involved in understanding the trajectory of water history and agricultural economy in the area, beyond the dynamics of political history. It highlights the dimensions that are poorly understood and some of the assumptions that need to be corrected. This thesis did not answer all the questions that it posed, but it offered a framework for the broader project that needs to be carried out, and makes a contribution in that direction. I have begun to piece together a research mosaic covering the history of human-water interaction in Khuzistan with the elements that were available to me within the limitations of this thesis, and I hope that future research in the field will contribute to fill in the picture.

APPENDIX A
Ware Catalogue, Miyanab 2014 Survey

The working typology of MAP 2014 is presented in this chapter. Despite the fact that an extensive typology guide for the Miyanab plain has been published, for the reasons that will be presented below, it was felt that an updated typology, particularly for the Seleucid through the Islamic periods was required.[460] The dating the assemblages in the present catalogue is based on the ware and type descriptions, given below.

The report of the 2001 survey does not provide a site by site sherd catalogue: the main sherd types have been categorized and presented based on their presumed dating. Certain problems were observed in using this typology for dating the 2014 collection. To begin with, the catalogue is organized according to the periods and forms, rather than wares. Therefore, the immediate information provided by a sherd, that is the ware and its appearance, is of little use when working with the catalogue. One would need to assume a date before looking for parallels. This problem becomes more acute for the historical periods where considerable overlap is observed in wares and forms that are found in different periods. In addition, since the basis of dating individual assemblages is not offered in the 2005 report, it is not possible to reassess the dating of the sites following the reevaluation of certain ceramic types.

Therefore, the underlying strategy of the present typology is to combine qualitative study of wares with the comparative study of datable diagnostics. This was driven by the disturbed nature of the surface assemblages on the plain as well as the extent of our knowledge of the local ceramic

[460] Moghaddam, Barrasīʹhā-Yi Bāstānʹshinākhtī-I Miyānāb, Shūshtar.

chronology. In this catalogue, ware types are listed in two categories, glazed and unglazed. The most common vessel forms for each ware are cited, along with published comparanda. Vessel forms (cups, bowls, basins, plates, jars, pitchers, goblets, flasks, pots, storage jars/pithoi) follow the Susa excavation reports.[461] This study had to rely on ware descriptions for two reasons: first, on small levelled or disturbed sites the assemblages consisted mainly or solely of non-diagnostic common wares; second, at extensive sites such as Negini and Herad intensive levelling and plowing has reduced assemblages almost entirely to body sherds.

In the present typology, excavated material from Khuzistan, in particular Susa constitutes the main point of reference. Comparison with survey publications and remote areas was avoided. The Miyanab 2001 survey catalogue was also used, with caution. From the 2001 catalogue, ideally only types that were reliably matched with excavated material were used. In some cases, however, sherds that did not have comparanda but were strongly related to a datable group (based on form, fabric, and decoration) were used for comparison. Such cases are marked in the site catalogue as N.C. (No comparison). If the comparison made between a 2001 dated types and the publication records seemed questionable, it was marked Q.C. (Questionable comparison).

It is possible to divide the pottery in the 2001 report into three categories, based on their usability and reliability: first, prehistoric up to Elamite; second, Achaemenid to Parthian; third, Sasanian and Islamic. Very few sites from the first group were recorded in the 2001 survey. Therefore, the examples provided in the catalogue are often insufficient to work with. However,

[461] For example in de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite"; de Miroschedji, "Observations Dans Les Couches Neo-Elamites Au Nord-Ouest Du Tell de La Ville Royale à Suse."

enough excavation and survey reports of sites of this period from Khuzistan are available to fill the gap. The Miyanab catalogue is most useful for the second period. Several sites dated to the Achaemenid to Parthian period were recorded in the 2001 survey. Diagnostics recovered at these sites are extensively presented in the catalogue. In addition, test trenches at Tappeh Darugheh and Tappeh Meshval further enrich our knowledge of the local ceramic chronology on the Miyanab from the Achaemenid to Parthian period. For the third phase, the catalogue is of limited use. On one hand, in spite of excavations carried in Susa, the ceramic chronology of Khuzistan in the Sasanian-Early Islamic period is still poorly understood. On the other hand, the 2001 catalogue provides increasingly fewer comparanda for types from the late Sasanian period onwards. In the section on Islamic material in the Miyanab catalogue, sherds collected at 'Askar Mukram are illustrated. But, very few types have been compared and dated. The present catalogue places more emphasis on describing the wares of these periods, and on explaining the usability and uncertainties in working with these types. A major concern of the present typology has been to identify long-lived wares/types. For this purpose, tables showing the evolution of ceramic types at Susa were the primary source of information.[462] In such case, which indeed are very frequent, a qualitative assessment of the assemblage has been made, as to whether an assemblage favors one or another period.

[462] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 204–209.

Plain Ware

1. General Elamite Ware (GEW)

Generally buff to red-brown, often beige slip, coarse, temper frequent grit and straw.

All the Elamite pottery is classified under one ware type, with a coarse yellowish to light reddish appearance. Paste, in general, varies from red-brown to a yellowish/greenish buff. The surface slip varies from red-brown to buff. Temper is mixed, mineral and vegetal. In general, the trend from the Old Elamite to the Neo-Elamite period is an increase in the proportion of the red-brown group. Further, The Middle Elamite period presents the highest proportion of finer vessels, compared to the Old and Neo-Elamite pottery. As the pottery of this period is well known and very well described in various publications, in this catalogue, only a general description of the fabric of the pottery is provided, absent in the Miyanab 2005 catalogue, along with the ceramic types that were recovered in this survey. It is important to note that the fabric descriptions are not definite and Miyanab assemblages show much overlap.

GEW1. Old Elamite

Standard paste color is buff, with shades varying from orange/yellow on one side and brown/gray on the other. Temper is grit mixed with straw, proportionally more straw for larger vessels. Small vessels may only have grit temper. No finishing on the surface. Occasionally a shade different from the paste occur on the surface, but, it is hard to determine if it is from wet-hand smoothing or the result of firing. Sherds with darker and more reddish/brownish paste are also found on the Miyanab. The surface is relatively coarse combined with wheel marks on the base and lower body, in smaller vessels.

GEW2. Middle Elamite

Standard paste color is pale brown. Most vessels are slipped, and carefully smoothed. Yellowish/buff is the standard slip color. Fine ware (about 30% of the Susa assemblage), ranges from brown to buff. Vegetal temper is rare or absent. Mineral temper is very fine to invisible. Slip color varies from brown to yellowish buff. Forms are bowls or goblets. Common ware (about 30% of the Susa assemblage), ranges from red-brown to buff (sometimes greenish/yellowish). Vegetal temper is fine and generally abundant. Mineral temper consists of fine white particles, sometimes crushed pottery. Slip color ranges from brown to yellow buff. The coarse ware is often greenish buff, and the temper is vegetal mixed with mineral and crushed pottery. No surface treatment, except occasional hand-smoothing, is found on vessels. Large jars and pithoi are made in this fabric.

GEW3. Neo-Elamite

Following the general trend in the Elamite pottery, the pottery of the Neo-Elamite period is generally a coarse ware, and the standard color is red-brown, in spite of the beige slip. Fine ware is similar to that of the Middle Elamite period, but, is rare. Common ware (half to two-thirds of the Susa assemblage in earlier and later layers) is red-brown, or less frequently buff. Abundant mineral temper is mixed with some vegetal temper. Vessels are generally covered with a beige slip, which can appear pink when applied as a thin layer. But, the finishing is coarse, often wet-

hand smoothed. The coarse ware is similar to the red-brown common ware, with abundant mineral temper and a gritty surface, sometimes mixed with straw.[463]

Common Types

T1. Bowls[464]

T2. Basins [465]

T3. Goblets[466]

T4. Small jars[467]

T5. Medium jars[468]

T6. Large storage jars & pithoi[469]

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[463] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite"; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."

[464] Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 77; de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite", Fig 10: 1-4, 9-11, Fig 11, Fig 17, Fig 29:2-9, Fig 33: 1-11; de Miroschedji, "Observations Dans Les Couches Neo-Elamites Au Nord-Ouest Du Tell de La Ville Royale à Suse", Fig 48:1-2, Fig 49:1-4, Fig 51:1-7, ; de Miroschedji, "Prospections Archaologiques Au Khuzistan En 1977", Fig 58:1-3; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 11:7-8.

[465] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite," Fig 18–20; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 11:11.

[466] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite," Fig 10:5–8, 14–15, Fig 12, 22, 41, 42; de Miroschedji, "Observations Dans Les Couches Neo-Elamites Au Nord-Ouest Du Tell de La Ville Royale à Suse," Fig 48:6–9, Fig 49:5–8, Fig 50:1, Fig 51:8–10; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 8, 10:8–20, 12; Carter and Stolper, *Elam*, 256–61.

[467] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite", Fig 13:1-5, Fig 23: 1-9; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."

[468] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite", Fig 13: 6-13, Fig 14, Fig 15:1-3, Fig 23: 9-11, Fig 24, 25, 36, 37; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 78; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."

[469] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite", Fig 15, 26, , 38; de Miroschedji, "Observations Dans Les Couches Neo-Elamites Au Nord-Ouest Du Tell de La Ville Royale à Suse", Fig 52:4, Fig 53:5; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 79; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 6:7-17, Fig 7, Fig 10:2-7, Fig 11:1-3.

T7. Amphorae [470]

TU. Unidentified sherds of GEW fabric

When either the sherd is not diagnostic, or a reliable match in the excavation reports is not found.

2. Achaemenid Fine Ware (AFW)

AFW1. Fine red ware

The only Achaemenid fine ware retrieved in the survey (one diagnostic sherd) is the fine red ware. It is a fine and dense fabric, red brown (5YR 7/7) or orange (2.5YR 5/8). The surface is of the same color as the paste, softly polished creating a soapy surface. This ware is alien to the Achaemenid pottery tradition at Susa (only four such sherds were recovered) but well attested elsewhere, particularly at Chogha Mish (unpublished). Few sherds of this type have been recovered from survey and test trenches on the Miyanab. Common forms are bowls and small jars.[471]

3. Achaemenid/Seleucid Common Ware (ASW)

A relatively fine common ware, usually slipped and burnished, beige or light red color, fine mix temper.

Common ware of the Achaemenid and Seleucid period is made of a compact, well levigated clay; it is burnished and often carefully slipped. Both vegetal and mineral temper, in various

[470] de Miroschedji, "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les Niveaux Elamite", Fig 35, ; de Miroschedji, "Observations Dans Les Couches Neo-Elamites Au Nord-Ouest Du Tell de La Ville Royale à Suse", Fig 53; Gasche, "La Poterie Elamite Du Deuxieme Millennaire Avant J.-C."

[471] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 19; Few examples seem related: Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar* Fig 137: 20, Fig 138:9.

proportions, are used. But, the appearance remains relatively fine. Many forms are common in both periods. For this reason, common ware of the two periods are defined as two sub-groups of ASW. Certain vessel forms continue to be produced in the Parthian period, which are included under PCW ware.

ASW1. Common ware of the Achaemenid period, ranging from relatively fine ware to relatively coarse ware. The clay is fine and dense, contains mineral temper often invisible or hardly visible with naked eye. In some cases, fine vegetal temper is added. For the finer ware (average thickness 5 mm), the color of the paste varies from yellowish beige, pale brown, sometimes, brown-red. Surface is generally beige slipped and smoothly polished. For the majority of vessels (average thickness 7-8 mm), color varies from yellowish beige to red-brown (the most common color), and slip is yellowish-beige or reddish beige. The general color of the type is usually pale brown-red. Surface is polished. Sometimes, bands of red, red-brown, red-gray paint decorates the slipped body, in particularly on or under the rim. This ware was used for the production of almost all vessel types of the Achaemenid period.

ASW2. Most common fabric of the Seleucid pottery excavated at Susa. The general color of this type is usually buff. Color of the paste is pale brown-red to beige (the most common color). Temper is vegetal, sometimes mixed with broken pottery, or very fine grits. Surface is wet-hand smoothed, and covered with a yellowish-buff or buff slip.[472]

[472] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 19–22, 40–41.

ASW3. A few sherds recovered from the survey have a gray paste and a thick orange slip. This ware appears to correspond with a rare fabric described in the 2005 catalogue[473].

Common Types

T1. Cups

Simple hemispheric cups, cups with slightly incurving or everted rim, or cups with everted body are found in both Achaemenid and Seleucid layers at Susa. According to Boucharlat, these types are long-lived, therefore, ware type becomes an important factor in dating.[474]

T2. Sinuous/Boat-shape bowls

Deep or shallow bowls with prominently carinated body are diagnostic of the Achaemenid period. [475]

T3. Fish Plates

Diagnostic of Seleucid and early Parthian period. Finer vessels of ASW2 ware are datable to the Seleucid period. Larger vessels, often glazed, continued to be made in the Parthian period. No example of this type is illustrated in the Miyanab 2005 catalogue.[476]

T4. Bowl with upright rim and sharp carination

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[473] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, 145.
[474] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 29:7-11; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 205, Table 18, Fig 55, Fig 58:6-10, Fig 66:4; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 7:1-6; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 45:1-6.
[475] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 7; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 74; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 13, 14, Fig 137:4-7, Fig 139:5-7.
[476] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 19, Fig 59:11-12; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 19: 5-6, Fig 25:5-7.

A bowl with upright or slightly out-slanting rim (most common form) which has a sharp carination or a ridge some 2 cm under the lip. This vessel form has a long history of evolution from the Achaemenid to the Parthian period. With Achaemenid types, there is more variation in the rim form, and more distance between the lip and carination. Sometimes carination is reduced to a ridge under the rim. [477]

T5. Goblets

Goblets are a common type of fine ware in the Achaemenid and Seleucid period, but they were also made as a common ware in the Achaemenid period (ASW1).[478]

T6. Bowl with sharp carinated flaring rim

This type is datable to the Seleucid and Parthian period; however, glazed vessels are more common; only one plain example has been illustrated in the 2005 catalogue. [479]

T7. Bowl with sharp carinated in-turned rim

Similar to T6, this type is only found in a glazed form. It is datable to the Seleucid period.[480]

T8. Bowls with soft carination and flaring rim

[477] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 30:1-2; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 20, Fig 57:13, Fig 58:11-14; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 9:14, Fig 20: 7, 9, 10.
[478] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 6, 27; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 13:9-16; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 136:1, 11, Fig 137:21, 22, Fig 138:2-14.
[479] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 22: 2.
[480] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 20.

Shallow bowls and plates with flaring rims and (often) a carinated body are part of the inventory of the common ware of the Achaemenid period (ASW1 fabric). This is a long-lived form that continued through the Seleucid and Parthian period, usually, as a glazed form.[481]

T9. Bowl with blunt or incurved pointed rim

A rare type, datable to the Achaemenid period, more common as a glazed type.[482]

T10. Bowl with channeled rim

A very long-lived type, found in a variety of forms from the Achaemenid to the Islamic period (later types are often glazed). In some of the types in this group, the rim is flat and the groove is hardly noticeable or even absent. Given the similarity of the form through time, the fabric is an important factor in dating these vessels.[483]

T11. Simple bowls

Simple hemispheric, convex, or slightly everted bowls are the typical form for fine and egg-shell ware of the Achaemenid and Seleucid periods. But, this type is also made in ASW1 fabric, a diagnostic of the Achaemenid period. While several examples, retrieved from survey and excavation, are illustrated in the Miyanab 2005 catalogue, this type was rare at Susa.[484]

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[481] Ibid., Table 19,20; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 8-11; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 14: 2, 4, 6, 8, 15-22.

[482] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 7:16.

[483] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 29: 14-17; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 19, Fig 55: 1, 24, Fig 57: 7, 66, 70-72; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 20:6; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 137:8.

[484] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar* Fig 15:9, 13-18, 20, Fig 136, 10, 13, 16.

T12. Deep bowl with triangular rim

A type well represented in the Susa excavations. The triangular rim is usually flat on top, in the Achaemenid period, and slanting in the Seleucid period.[485]

T13. Small Jars, flasks and pitchers

A relatively fine type among the common ware of the Achaemenid period (ASW1). Short necked vessels have simple out-curving or rolled rims; the tall neck types may have simple up-right or out-curving rims, or an upright rim with a sharp carination. [486]

T14. Big jars and pots

A coarse type in the common ware of the Achaemenid period (ASW1), includes flasks with rolled rim, neckless jars as well as neckless or short-necked pots.[487]

T15. High necked jars and pitchers

The Achaemenid pitchers (ASW1) also include high necked jars and pitchers with squared, sometimes, rounded rim. Often one or more ridges decorate the neck under the rim, and/or right above the shoulder. Seleucid high necked jars (ASW2) are usually found in two rim forms, rolled or sharply carinated.[488]

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[485] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 207, Table 21, Fig 57: 14, 17, 18, Fig 58: 15-21; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 21: 6, 7; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 46: 7-8.

[486] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", FIg 15; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 16: 8-10, 22-26, Fig 17:1-2, Fig 140: 3, 6.

[487] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 15; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*. Fig 16: 8-10, 22-26, Fig 17:1-2, Fig 140: 3, 6.

[488] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 55: 12, 15, Fig 56: 7, 10, 12-18, 20; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 16, 20:5, 8.

T16. Small pots

A rare type of the Achaemenid period. Only one example found in the survey.[489]

T17. Basins

The main type of basin of ASW fabric in Susa publication is a deep basin with bevelled and ridged rim, most common in the Seleucid period; however late Achaemenid or early Parthian date is not unlikely.[490]

TU. Unidentified sherds of ASW fabric

When either the sherd is not diagnostic, or a reliable match in the excavation reports is not found.

4. Achaemenid/Seleucid Coarse Ware (ASC)

A coarse ware, often mix tempered, yellow/beige standard color, no surface treatment or wet smoothed.

Similar to common ware, Achaemenid and Seleucid Coarse ware share several characteristics and have been therefore grouped together. Achaemenid coarse ware can be tempered with grit only (ASC1), or with grit and straw (ASC2). But, Seleucid Coarse ware is always mix tempered (ASC3) and very similar to the mixed temper Achaemenid fabric.

[489] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 12.
[490] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 207, Table 21, Fig 57:12, Fig 59: 17-19.

ASC1, with mineral temper only, datable to the Achaemenid period. The fabric is red-brown, surface is pale red-brown. Temper is mineral, including white particles. Surface is reddish and very rough.

- **ASC2**. Datable to the Achaemenid period. Tempered with abundant broken straw, up to 6 mm, which give the surface a characteristic crude appearance. Fabric is greenish-beige to brown-beige, yellowish beige is the standard color. Surface has no treatment and is of the same color as the paste. This type is relatively common at Susa assemblage (ca. 30%). A few vessels may have large gray mineral inclusions mixed with vegetal temper. The color is in such cases, yellowish beige to pale brown, and sherds are thicker than those tempered with straw only. This form is very similar to the Elamite pottery, particularly, GEW3.
- **ASC3.** Datable to the Seleucid period. Fabric is comparable to the coarse ware with vegetal temper, but, most often mixed with crushed pottery, as well as, sometimes, fine particles of black or dark gray. Color ranges from very pale brown-red to greenish beige, standard color is beige. A major difference with the Achaemenid type is that the surface is wet smoothed and covered with a beige slip.[491]

Common Types

T1. Basins

[491] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 26, 27, 41.

Achaemenid forms include hammer-head basins as well as deep hemispheric bowls with various rim forms. The common Seleucid form is a basin with triangular rim and a groove under the rim. At Susa, this latter form is also found in early Parthian layers.[492]

T2. Neckless Jars

Datable to the Achaemenid period, with collared or channeled rim.[493]

T3. High necked jars

Achaemenid forms have squared or, sometimes, rolled rim. Often one or more ridges decorate the neck under the rim, and/or right above the shoulder. Seleucid high necked jars become simpler, often having an oval or rectangular rolled rim.[494]

T4. *Pots*

One example with flaring rim found on the survey. Possibly datable to the Achaemenid period. Form matches a flared rim vessel common of the Achaemenid repertoire.

TU. Unidentified sherds of ASC fabric

When either the sherd is not diagnostic, or a reliable match in the excavation reports is not found.

[492] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 10, 11:3-6, Fig 20:11, Fig 21:4-7, Fig 23:1-3.
[493] Ibid., Fig 15:3, 4.
[494] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 55: 12, 15, Fig 56: 7, 10, 12-18, 20; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 16, 20:2-3.

5. Parthian Common Ware (PCW)

A common ware of buff or pinkish/orange buff to light brown color, tempered with abundant visible grit of multiple colors; sometimes, wet smoothed.

A marked difference vis-à-vis the Seleucid period is observable in the Parthian period, which is characterized by the use of grit as the primary or sole temper, as well as the general absence of slip. Nonetheless, the pottery retains the light orange/red buff appearance of most Seleucid pottery. The paste is a pale yellow or yellowish buff, sometimes pinkish orange, orange, or even pale brown. Clay is mixed with varying amounts of grit and sand. The black/dark gray grit is normally visible and present. Very often, frequent red and white inclusions are also added. Surface treatment is either absent or limited to wet smoothing. In rare cases, slip occurs. The clay in PCW is often compact and well fired, and the color is uniform. Corrugation on the body, particularly on the lower part of the coarser ware, is a characteristic of PCW. De Miroschedji [495] defined both a coarse and a common ware for the Parthian period, differentiated only by the presence or absence of a small amount of vegetal temper and hand-smoothing. In the rather small repertoire of pottery collected from the Miyanab, a consistent distinction was not observed between PCW ware. Therefore, this catalogue follows Haernick in not defining a separate category for coarse ware. [496] T2 and T13 are the main categories of Parthian coarser ware.

Two problems were observed in defining the common types of PCW. On the one hand, several vessel types (especially the bowls) categorized in Moghaddam's 2005 catalogue as

[495] "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 48–50.
[496] *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, 19–51.

Parthian, are either absent at Susa, or do not exactly match the cited comparanda. On the other hand, the Miyanab 2005 catalogue offers a wider array of types than are found in the 2014 survey and appear to share characteristics of Parthian common ware. Therefore, an attempt was made here to redefine Moghaddam's 2005 type categories (Fig 21-33) for the Parthian period based on the Susa publications using, in particular, the tables of evolution of shapes through time. In some cases, publications from southern Mesopotamia and the Arabian peninsula were also consulted. A distinction has been made between types that are datable to the Parthian period with more or less certainty and those that could also be dated to the Seleucid or earlier Sasanian period. Types 2 and 13 are the most common form collected during 2014 Miyanab survey.[497]

Common Types

T1. Cups

The two most common cup forms in the Parthian period are a convex type with simple blunt or incurved rim as well as a flaring type. Both of these forms are common in the Seleucid period too. However, bowls with other rim forms, such as carinated, flaring were also made.[498]

T2. Coarse basins and vats

[497] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 204–209, 250–281; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 46–50, 98–129; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, 1:8–9, Pl 70-72; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, 19–51.

[498] Boucharlat and Haerinck, *Tombes d'époque parthe* Pl 21: GS2337, Pl 35: GS 2899, GS2900; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 205, Table 17, Fig 61: 2, 8, Fig 62: 5, Fig 66:4; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 27:1-3, ; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, Fig 3:2, Fig 6:4, Fig 9:1-11; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 26: 1-3.

Deep basins and vats with a rim diameter of 25-40 cm. A coarse ware, which is one of the most common PCW types on the Miyanab. Rims usually grooved, but bevelled or hammer head rims are also known. Corrugation on the body is typical.

T3. Large bowls with simple squared/in-curving rim

The forms in PCW.T3 are shared with GCW1.T1, which is a long-lived common ware. Finds on the Miyanab suggest that this type dates to the Parthian period and examples are illustrated in the Miyanab 2005 catalogue. This type could be related to T2 in the present category, and a few examples are also published in the Susa reports. Nonetheless, given the similarity of the form and fabric to some of the GCW.T1 types, attributions to this type are uncertain. [499]

T4. Bowl with upright ridged/carinated rim

A bowl with upright or slightly out-slanting rim and a sharp carination or a ridge some 2 cm under the lip. The type with slightly slanting rim usually has a triangular lip. Susa publications suggest the longevity of the form, both glazed and unglazed. However, the plain types were part of the common ware of the Seleucid and Parthian periods.[500]

T5. Bowl with upright rounded rim

[499] In retrospect, no sherd collected in the 2014 survey, was securably attributable to this type. Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 26: 14-15; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 23:2,3; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 25: 12, 15, 16, Fig 27: 1-12, Fig 32:9-10.

[500] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 20, Fig 67:1,3.

The type is related to T4. Also, one of the long-lived types from the Parthian to Islamic times. Based on the published material from Susa, shallow and small bowls of this type are earlier while big bowls of this type were made later in the Parthian period up to early Sasanian period.[501]

T6. Bowl with sharp carinated flaring rim

Types T6 and T7 (see below) are similar and classified as one group in the tables of evolution of vessel forms excavated at Susa, datable to the Seleucid and Parthian periods. However, the large sample recovered during the Miyanab 2001 survey suggested that the distinction between the two groups becomes more noticeable in the larger vessels.[502]

T7. Bowl with sharply carinated in-turned rim

As a plain ware T7 form is far more common in the Seleucid period, in ASW3 fabric. Appears in Parthian contexts too.[503]

T8. Plates/shallow bowls with soft carinated flaring rim

Variety of cups and plates with flaring rims and, often, a carinated body began to be produced in the Achaemenid period, and continued in the Seleucid and Parthian periods, both glazed and unglazed. Over time, the frequency drops and the vessels are larger. The type even continues into the Islamic period in the form of large glazed bowls with flaring rim.[504]

T9. Bowl with blunt or tapered rim

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[501] Ibid., Table 20, Fig 61:3, Fig 67: 2, Fig 74:1; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 33:1-2.
[502] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 20, Fig 67:1; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 22.
[503] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 20, Fig 67:3.
[504] Ibid., 205–206, Table 18-20; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, Fig 9; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, FIg 14, 24.

A few bowls with blunt or tapered rim, sometimes straight and sometimes incurving, constitute a relatively rare category of the common ware in the Parthian period. The glazed vessels are far more common. Given the rarity of the type, reports from Iraq and the Arabian peninsula have been consulted to confirm this form as a Parthian common ware type.[505]

T10. Bowl with channeled rim

A very long-lived type, common from the Achaemenid to the Islamic period. In some vessels, the rim is flat and the groove is hardly noticeable or even absent. Given the similarity of the form through time, fabric is the main factor in dating such vessels. Although most vessels are glazed, plain types are found in the later periods. In coarser and larger vessels, the distinction between T10 and T2 disappears. Because of the longevity of this form, T10 with PCW fabric has been considered a marker of the Parthian-Early Sasanian period, if the assemblage in general does not favors either period.[506]

T11. Simple hemispheric or convex bowl

The typical form for fine egg-shell bowls, but, also made in common ware fabric, in glazed and unglazed varieties. The glazed types become a common forms in the Islamic period. Given the

[505] Debevoise, *Parthian Pottery from Seleucia on the Tigris*, Fig 23; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 24:4; Hannestad, "Pottery from Failaka", Fig 4; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar* Fig 25: 16, Fig 26: 4, 6; Potts, "Northeastern Arabia in the Later Pre-Islamic Era", Fi,g 8: 19-21, Fig 9: 9-11, 17.

[506] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 26, 28, 29; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 19, Fig 57, 59, 66, 70-72; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 25, 33, 34; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 29: 1-5, 9-12, Fig 30: 1-4, Fig 31:2, Fig 32: 1, 2, 4, 5.

longevity of the form, T11 with PCW fabric has been considered a marker of Parthian-Early Sasanian period, if assemblage in general does not favors either period.[507]

T13. Storage Jars/Amphora

Large cylindrical or bag-shaped jars comprise a very common group of Parthian-period ceramics and one of the coarser types of PCW. Sherds are gritty and very often corrugated. Surfaces are untreated or wet smoothed. Some examples have a thick slip. It is important to note that similar storage jars were produced until the Islamic period. Tables showing the evolution of Susa pottery forms have been consulted to differentiate between the forms that are more likely to be of Parthian date and the more long-lived forms. [508] On the other hand, the inventory of rim forms of PCW fabric collected on the Miyanab in both surveys is more varied than that found in Susa publication reports. Some forms in the Miyanab 2001 survey catalogue have been compared to survey collections from Khuzistan and the Arabian peninsula. Similar examples were recovered in predominantly Parthian-Early Sasanian assemblages in the 2014 survey. [509] In general, Parthian jars have a distinctive upright collar, which is oval in section. [510] A collared jar with a corrugated oval rim is also a Parthian type. [511] In the later periods, the collar becomes round or even squared;

[507] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 26: 14, Fig 20:7, Fig 23:3; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 61:14, Fig 72:1; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 34:9, Fig 35: 9, Fig 45:18; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 27: 14, 15, Fig 28.
[508] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 209, Table 25.
[509] Several whole-mouth jars have been classified in 2005 catalogue as Parthian (Fig 41). But, examples from 2014 survey, and the types classified as Islamic in the same publication (Fig 65) suggest that the form was in use until Early Islamic period, and a Parthian date is not certain.
[510] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 62:8; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 23:5.
[511] de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 23:4.

if oval, it is angled toward the center, in general the jars gradually distance from collared form and become whole-mouth.[512]

T14. Flasks

Flasks are in general always glazed. However, few unglazed types have been found.[513]

T15. High necked pitchers

T15 comprises high necked pitchers of various height and rim forms. They may have one or two handles, which start off on or right under the rim. Similar to T13, this group includes forms that continued to exist beyond the Parthian period. Pitchers with no handle and a corrugated thickened rim, as well as pitchers with band rim or flaring and corrugated body are diagnostics of the Parthian period. Pitchers with ribbed decoration on the neck can be dated to the Parthian-Early Sasanian period.[514]

T16. Pots

Although not a common category at Susa, pots of various forms with PCW fabric have been excavated in Parthian layers on the Miyanab.[515]

TU. Unidentified sherds of PCW fabric

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[512] Boucharlat and Haerinck, *Tombes d'époque parthe*, Fig 19 a, b; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 4–8, 209, Table 25, Fig 68:2; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl72:I-L; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique," 49–50, Fig 23:4, 5, Fig 29, 30; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 37, 38, 41 Q.C., 42 Q.C., Fig 146: 7-10.
[513] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 32; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)* Fig 4: 1, 2.
[514] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 27: 8-15; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 208, Table 23, Fig 59:17; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 71: F, H, I, Pl 72: E; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, Fig 7, Fig 10:1-2; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 33-35, Fig 39:2-4, Fig 146: 1-6.
[515] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 147, Fig 148: 1-7.

Fabric corresponds with PCW, but, either the sherd is not diagnostic, or a reliable match in the excavation reports is lacking.

6. Brown Gritty Ware (BGW)

Brown, brown-gray, or red-brown ware, with visible grits, including big white particles.

Several brown gritty sherds were collected in the 2014 survey. Despite the distinct look, the long use of this fabric for production of cooking pots make it a difficult type for dating purposes.[516] Thanks to Boucharlat's detailed description of fabric and temper,[517] one may identify the Parthian ware with more certainly. However, even in such cases, one cannot rule out the possibility of continued production of vessels in the same fabric after the Parthian period. Another problem has risen due to the fact that the dating of some forms classified as Parthian in the Miyanab 2005 catalogue is based on questionable comparisons. Given the limited number of brown ware in the Susa publications and the lack of accompanying color images, it is nearly impossible to date some of the very long lived forms. For these reasons, three types have been defined below, based on the range of dates that can be attributed to each form and on the certainty of this attribution. The bibliography will follow each category.

T1. Parthian Types

Parthian brown ware is of grayish-black or brown fabric which may be orange-brown/red brick on the surface. Temper is abundant and variously sized grit, which include many visible white inclusions. Two types seem most reliably datable to the Parthian period.

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[516] For this reason, Miyānāb 2005 catalogue is not very consistent in dating brown ware; some forms appear both in the Parthian and Islamic period categories, e.g. compare Fig 43 and 65.
[517] "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 185.

T1a. Pot with triangular rim and internal ledge

This ledged pot is the form which is most reliably datable to the Parthian period. It has been recovered in excavations on Miyanab and at Chogha Mish. However, a distinction needs to be made between the form with a very prominent ledge, and the form that has a triangular shape and can be more accurately classified as a band rim with triangular section. In the latter case, the Susa material and that recovered in the 2014 survey pose the possibility of continued production after the Parthian period. [518]

T1b. Neckless whole mouth pot with blunt rim[519]

T2. Parthian/Sasanian/Early Islamic Types

This group includes the longest lived and most ambiguous types for dating. Common types are presented below.

T2a. Whole mouth pot with a sharp angles rim

Pots of the distinct Parthian brown ware fabric with this rim form were found in the Miyanab 2014 survey. The Miyanab 2005 catalogue defines this form as a Parthian type. Moghaddam has also published examples of this form from stratigraphic contexts dated to the

[518] Ibid., 49, 185; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, 1:9; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 45 G.C., Fig 151: 3, 4; Moghaddam, "Report of Educational Excavation at Tappeh Meshval 3," 129–130; Moghaddam, "Report of Educational Excavation at Tappeh Meshval 3", Fig 2: 2, 3, 6. In some published examples, the distinction between this type and T2c is blurred. Also, few sherds of this type were collected from the areas of the Islamic site KS1622B raise the question as to whether similar pots were made in the Sasanian-Early Islamic period. These sherds are of varying shades of brown, some similar to the Parthian ware some not, with visible white particles as temper. It is not clear if the sherds represent earlier habitations in this extensive complex site, or remains of the Islamic occupation.

[519] Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, Pl 71:B; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 49:5; Moghaddam, "Report of Educational Excavation at Tappeh Meshval 3", Fig 45: 10-14 Q.C. Wenke, "Imperial Investments and Agricultural Developements in Parthian and Sassanian Khuzestan", Pl 21: 401 A, 403 B.

Parthian period. However, the same form has been excavated in the Sasanian-early Islamic context at Susa, and a similar form appears in early Islamic layers. Several red and gray ware examples with the same rim form are also known in late pre-Islamic contexts in the Arabian peninsula. As such, in this report, the evaluation of this type has been made based on the dating of the associated assemblage and fabrics. In the absence of good T1 fabric as well as other Parthian types in the assemblage, it could be dated to the Sasanian-Early Islamic period.[520]

T2b. Whole mouth jar with a rounded or squared rim

Although marked as Parthian in the Miyanab 2005 catalogue, this must be taken with caution. This dating is based solely on Alizadeh's survey in southern Khuzistan.[521] No examples have been published from Parthian strata at Susa, Choga Mish, or the Miyanab. In the Miyanab 2014 survey, similar examples have been found both in Parthian and Islamic assemblages.[522]

T2c. Pot with upright or slightly slanted band rim

Considered a Parthian type in the Miyanab 2005 catalogue. However, the dating poses some challenges. Several examples of high-band rim brown ware have been excavated in the Seleuco-Parthian layers at Susa. The longevity of the type is suggested in the tables of evolution of forms at Susa. However, all of the published vessels of this type published among the Late Parthian and Sasanian material are buff ware. A high-band rim pot with brown fabric is illustrated among the Islamic material excavated at Susa. In general, it appears that the in the Seleuco-

[520] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 72: 17; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 32:5; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 34:11; Potts, "Northeastern Arabia in the Later Pre-Islamic Era", Fig 8: 1-9, 11-13.
[521] "Elymaean Occupation of Lower Khuzestan During the Seleucid and Parthian Periods: A Proposal."
[522] Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar* Fig 43, Fig 148:2.

Parthian (and possibly Sasanian) period, rims tend to have the same thickness and the lip is flat or blunt, while the Islamic types are often thickened at the lip. But, care needs to be taken as in some examples this distinction is not easy to make, and exceptions exist.[523] The lack of detailed descriptions of the fabric in publications contributes to this problem.[524]

T3. Islamic Type

T3a. Neckless pots with flat or bevelled lip

The most certain and common category of Islamic brown ware is comprised of neckless pots with simple rims, often bevelled, sometimes flat, and occasionally thickened at the lip. The body is either straight or slightly in-curving, thus all pots have a very large mouth. The Susa material is datable to the late Early and Early Middle Islamic period.[525]

7. Gritty common ware (GCW)

Most abundant fabric; buff and light brown are the standard color, tempered with abundant grit, black is particularly visible on the surface.

A category of coarse ware found in large quantities during the 2014 survey of the Miyanab. Several small levelled sites only yielded non-diagnostic sherds of this ware type, which is easily

[523] Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 49: 6.
[524] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 49: 1-3, 5, 8; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 209, Table 24, Fig 62: 9, Fig 67: 13; Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 21:3; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", fig 1, 2, 4, 6; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 49: 6-9; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 45: 4, 8.
[525] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 21: 4-6; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana" Fig 32L 7-9, Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 65: 1-3; Rosen-Ayalon, "Niveaux islamiques de la 'Ville Royale'", Fig 59: 6.

identifiable because of the thickness of the sherds, their hard firing and mineral temper. Excavation reports from Susa, as well as pottery from the Late Sasanian and Islamic sites such as Ivan-e Karkheh and Askar Mukram, suggest that GCW is the common ware of the late pre-Islamic and Islamic period. Despite the difficulty of using the variations in the ware color and appearance for dating, collections from the two former sites and datable diagnostics suggest that GCW can be divided into two broad groups.[526]

GCW1. Standard colors are buff, yellowish-buff, greenish buff, and buff-pale brown, abundant visible dark grit in the paste and on the surface. Upon close examination, grits of other colors, most frequently red, are also visible in the paste. The sherds are often very thick, and very hard fired, to the extent that the sherds sound clinky. Some sherds are covered with a very thin yellow-buff layer, trace of original smoothing, or (sometimes) subsequent erosion. One of the main fabrics of the dark blue glazed (DBG) sherds.[527] It is possible that this ware was used in the late Sasanian and Early Islamic period. Given the scarcity of Sasanian material from Susa, it is impossible to determine whether this type was common throughout this period.

GCW2. Is characterized by a paste of pale brown, pale red-brown or red-brown. Most of the sherds are hard fired, but, only some clinky. Compared to GCW1, grit is more varied in color. A very distinct type features grits of three colors (black, red, and white) which amplify the reddish appearance of this type. Sherds maybe wet smoothed. A similar ware has been described at Susa

[526] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale," 139; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans," 54.
[527] DBG on this ware is very unstable. Few specks of dark blue glaze on some sherd allow to distinguish DBG sherds from the plain ware of GCW1 fabric.

publication as an Islamic period common ware. In addition, wares of this type were collected in the Miyanab 2014 survey often along with Islamic diagnostics.

Common Types

T1. Vats and basins with simple rim forms

A wide range of large bowls and basins (rim diameter usually 25-50 cm) of GCW fabric were collected in the Miyanab 2014 survey. The rim forms are often simple, including rims with flat or bevelled lip, or various forms of rolled or collared rims. The body is undecorated. The range of rim forms collected in the Miyanab surveys (2001 and 2014) is more varied than found in the Susa excavation reports. It is, therefore, difficult to ascertain whether a sherd is datable to the late Sasanian or Islamic period, particularly, in the case of GCW1.[528] However, most bowls of this form were recovered along with other Islamic diagnostics. Therefore, if the assemblage does not support either dating, this type has been considered a Sasanian-Early Islamic diagnostic. A very important member of this type is a vat with oval lip that has been excavated in the sugar refinery at Susa. Several examples were collected in the Miyanab survey, some of which were placed inside the ground. Also important, is the flat-based basin excavated in the sugar refinery at Susa. The latter is the only form that may have barbotine decoration or combed incisions.

A very important consideration regarding GCW2 is that sherds of finer fabric which are wet smoothed can be easily mistaken for PCW, even in the case of diagnostic sherds since vats of simple rim form were common from the Parthian period onward.[529]

[528] The difficulty becomes clear by checking the Miyānāb 2005 catalogue in which same form and fabric is found in the categories dated to the Sasanian or Islamic periods. (Fig 56 vs. Fig 82).
[529] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 19; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 33; Kervran, "Une sucrerie d'époque islamique sur la rive

T2. Simple storage jars

Simple storage jars, medium size to large; vessels are often neckless or have a very short neck, in both cases with flat, bevelled or rolled lip. However, some examples are high necked with simple rolled rim. The fabric is generally GCW1, buff to pale brown. The body is often globular, but, some torpedo-shaped jars are also known at Susa. Jars may have up to three handles. High necked jars may have simple decorative incisions on the neck (usually) or on the shoulder. Most of the stereographically dated examples from Susa are early Islamic. However, except for very distinct forms, the possibility of Late Sasanian or Middle Islamic date has been considered in this report.[530]

T3. Whole-mouthed jars with thickened lip

Several sherds of this type with a thickened blunt lip were found in both Miyanab surveys. The Miyanab 2005 catalogue identified the type as Sasanian, which is primarily based on survey material. The excavated examples from Susa are from late Sasanian-Early Islamic contexts. Given the similarity of this form and T1b, it is possible that this form was produced throughout the Sasanian period too. However, several assemblages collected in the Miyanab 2014 survey favor

droite du Chaour à Suse II. Le matériel archéologique", Fig 63, 64; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 29; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 56-58.

[530] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 11, 12, Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 79, Fig 21, Fig 22: 1, 7, Fig 23; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 60; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 31: 11, Fig 32: 1, Fig 33, Fig 34: 2, 3.

an early Islamic date. In other cases, this type needs to be considered as a marker of late Sasanian-Early Islamic period.[531]

T4. Pot

Forms are shared with the Islamic types of BGW: T2c & T3a, fabric is GCW.[532]

T5. Flasks and pitchers

This is a mixed category, which includes several small water (or other liquids) containers, made in GCW fabric. The pitchers categorized here are most commonly made in ICW fabric.[533]

T6. Miscellaneous Bowls

Few bowls of GCW fabric were collected in the 2014 Miyanab survey. The assemblages suggest an Islamic date. Few comparisons appear at Susa.[534]

TU. Unidentified sherds of GCW fabric

Fabric corresponds with GCW, but, either the sherd is not diagnostic, or a reliable match in the excavation reports is not found.

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[531] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 72:15; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 34: 14; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 65: 1-11.

[532] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", fig 21; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 32; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 65; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 73-74.

[533] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 13; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 24.

[534] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 72: 1, 2, 5, 6, 8, 9.

8. Torpedo Jars (TJS)

Torpedo jars are categorized as a Parthian type in the Miyanab 2005 catalogue. Comparison is however made with survey material only. Torpedo jars at Susa reports are primarily from Achaemenid, or Seleucid layers and none are known from a Parthian context. The fabric and/or form of the torpedo jars recovered in the 2014 survey is different from the published Susa examples. As a result, despite their distinctive appearance, torpedo sherds have not been used in this report for dating.[535]

9. Islamic Common Ware (ICW)

Yellow/buff ware, sandy, little to no visible temper, sometimes, smoothed with the same color as the paste.

In the Islamic period, common ware was primarily made of a sand-tempered yellowish fabric. Yellow is the standard color, but, yellowish buff, buff, or pale brown occur. Vessels range from relatively coarse to fine ware. Wet smoothing or yellow slip is common.

In the Middle and Late Islamic periods, common ware were made of a sandy or gritty red-brick or brown paste. This fabric comprises a very small proportion of the pottery collected in the 2014 Miyanab survey.

Because of the very distinct appearance of ICW, as well as the wide variety of forms which in most cases is hard to securely match with the rather limited number of plain wares published in

[535] Ibid., 209, Table 25, Fig 56: 17, Fig 60:13; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 17; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 143: 10; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 50.

the Susa reports, general groups have been created here to classify the common ware of the Islamic period. If comparison with Susa material does not favor an early or late date, sherds have been marked simply as Islamic.

Common Types

T1 .Cups

Plain cups are very rare at Susa. Nor have any unglazed cups been published in the Miyanab 2005 catalogue.[536]

T2. Bowls

The number of plain bowls published in the Susa reports is not enough to establish distinct categories. In general, however, the bowl with simple upright blunt rim appears the most common type. A distinct type of bowl with a flat-angled base was made in the Early Islamic period. [537]

T3. Basins

This category shares many forms with GCW.T1, the primary difference being the fabric. Given the similarity of form and the nature of assemblages collected in the 2014 survey, ICW.T3 types are most likely to be Early Islamic, but, a Middle Islamic date is not unlikely. Particularly,

[536] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 33; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 36: 21,.

[537] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 74: 1; Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 23: 1-4; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 35: 2, 5-8, 11-13; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 44: 17.

the basin with thickened oval rim form from the Susa sugar refinery could be Early or Middle Islamic. A form that is exclusive to ICW is the basin with thickened ribbed or incised rim.[538]

T4. Pots

A very rare type which shares some forms with GCW. T4.

T5. Pitchers and jars

A type of high necked pitcher with (often) one handle becomes very common in the early Islamic period, including at Susa. This type presents a wide array of forms and decorations. The body is often ovoid or spherical. Simple forms often feature series of parallel incised lines decorating the shoulder. Many fine vessels of this type, so-called "egg-shell", are published in excavation reports. But, coarser types are also known. It seems that several forms initially made in the egg-shell fabric survived in the coarser fabrics, especially after the proliferation of glazed pottery, from the 9th to the 11th century.[539]

T6. Pithoi/Amphorae [540]

Few examples of very large containers with simple rim form have been published from Susa. Published material suggests Early Islamic or early Middle Islamic date (9th-12th centuries), but, the type might have continued to be produced after the Susa record stops.[541]

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[538] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale," 140, Fig 19; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 63, 64; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 83: 1, Fig 86-89.

[539] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 14-17; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana" Fig 24: 5-7, 9, 12, Fig 26-31; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans," 72–73, Fig 32: 11, Fig 34, 37; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 83: 5, 7, Fig 84.

[540] This category needs to be merged with T5. It is nearly impossible to differentiate between the Islamic jars and pithoi based on rim forms as the mouth in both category is very similar in form and size.

[541] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 12:2; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 21, 23.

T7. Heavily decorated Jars, Pitchers and bowls

Pitchers and jars, as well as some bowls with heavily decorated shoulders, rims and handles were made in the Early Islamic and early Middle Islamic period. Barbotine, incised, and mold decoration on the body of pitchers were typical of Early Islamic vessels, while later vessels of 11th/12th centuries feature heavily decorated rims and handles in the applied and stamped techniques. A later group of water containers with molded decorations datable to 12th/14th centuries is absent at Susa.[542]

T8. Slipped Islamic Fabric

Includes the Islamic ware that is unmistakable because of its thick yellow slip that creates a creamy smooth surface. Several non-diagnostic sherds of this type, particularly bases, were collected in the survey. In the absence of other more securely datable sherds, this type has been considered diagnostic of the Early or Middle Islamic period.

TU. Non-diagnostic sherds

Non-diagnostic sherds of ICW, in particular bases, slender handles, decorated pieces etc, which in the absence of reliable diagnostics, can be used to suggest an Islamic date in general. However, some examples, particularly decorated pieces, imply a narrower date.

10. Islamic Red Ware (IRW)

A very coarse red/pinkish brown ware, tempered with abundant straw.

[542] Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 27, 28; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 35, 36, 42; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 85, 93-97; Watson, *Ceramics from Islamic Lands*, 106–126.

T1. Large Basins with incised or cordon decoration

The reason for naming this category reddish coarse ware is that even the body sherds of this type are easily recognizable in the survey and can be confused with early pottery, particularly Neo-Elamite (GEW3). The only type made of this ware attested at Susa is a large simple basin (diameter 25-50 cm), of a reddish paste and very poorly made. The ware is tempered with abundant vegetal temper; straw is often visible on the surface. The coarsest examples may be unfired, of a dark brown, reddish brown paste, which is sun-dried. Decoration is limited to combed incision or an applied cord just under the rim. Similar basins are also part of the repertoire of GCW.T1. Susa publications suggest a date of 9-11th centuries, however, the production of this type may have continued beyond the latest occupation at Susa.[543]

T2. Other forms

Two jars of IRW fabric were found in the 2014 survey.

[543] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale," 144, Fig 19, 20; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 80, Fig 33; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique," 180, Fig 66: 1-4; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans," 55, 78.

Glazed Ware

Monochrome blue glaze (MBG) is the most common type both in the survey material and in publication records. For other glazed types, if the sherd is diagnostic, the typology follows that of the MBG. These types do not represent the full variety of glazed forms at Susa, or, on the Miyanab, and are meant to be used as a guide for the most frequently found forms. Comparison with the extensive publication of finds from Susa has been occasionally utilized for the dating the less common types.

In general, the glazed pottery of Miyanab is made of buff and red paste. The paste in the buff category ranges from fine sand-temper yellow fabric to gritty greenish ware of GCW1. The paste in the red category may be light reddish brown, light red, red or red-brown.

1. Monochrome Blue Glazed (MBG)

A very distinctive and yet for dating purpose difficult to use category of glazed ware. The color ranges from various shades of pale blue or gray, green-blue, to turquoise. Blue glaze is the dominant monochrome glaze from the Parthian period to the later Early Islamic period, and continues to be made, in smaller quantities, in the Middle Islamic period as well. A pale iridescent blue characterizes MBG in the Parthian and Sasanian periods. A matt weathered pale blue that can appear white dates to the Early Islamic period. Turquoise glaze was common in the Islamic period, a matt chipped type in the Early Islamic period and a shiny dark type in the Later Islamic periods. A very dark green-blue glaze has been defined separately (DBG), and is a marker of the very late Sasanian and Early Islamic period.

MBG is found in various shades of the two categories of paste, buff or red. The fabric can be medium, coarse or fine. Grit and sand became the common temper from the later Parthian period onward. In general, the fabric of Islamic glazed ware can be distinguished from earlier types in being hard fired.

Given the prevalence of blue-glazed pottery, making the distinction between Parthian and Sasanian, or Sasanian and Islamic vessels is challenging, even for complete vessels. The case is even more problematic for survey sherds. However, an attempt has been made to define three rather broad categories of earlier and later blue glaze which could be helpful for the study of survey pottery. [544]

MBG1. Parthian-Early Sasanian Blue Glaze

Little MBG has been excavated in Seleucid layers at Susa, but, it begins to dominate the assemblages from the Parthian period onward. The fabric of the Parthian glazed ware is similar to the common ware of this period but is often less compact and more fragile than the plain ware. In some cases, the edges of the glazed ware sherds can be easily chipped off. In some cases, a paste similar to the coarser gritty ware of this period may also be used for glazed ware.

Blue glaze is alkaline-based and of low quality. Parthian glaze is particularly unstable and can easily detach from the body. MGB1 is, particularly in the Parthian period, highly cracked and iridescent. Often various shades of blue are found on a single sherd. The consensus is that the quality and durability of PGS increased from the Middle Parthian period onward, around the turn of the first millennium BCE.

[544] Some sherds with traces of turquoise blue-glazed might be pieces of UGP.

In the early Parthian period, the glaze was applied as a thin layer that covered the entire vessel. From the middle Parthian period onward, the glaze became thicker and less regular, sometimes covering the bottom. Given the unstable nature of the glaze, it is difficult to differentiate between weathered pale blue, yellow and white, all of which co-existed in the Parthian period. In some cases, the glaze has totally disappeared, leaving a thin white/pale yellow layer on the body. Forms may help differentiate between a Parthian and Sasanian glaze date. In the Parthian period, same forms appear in glazed and unglazed types. Beginning in the Sasanian period (maybe even late Parthian) glazed ware appeared in new forms that have no precedence.[545]

MBG2. Late Sasanian-Islamic Blue

Pale blue and blue-green are the dominant monochrome glaze of the Sasanian and early Islamic periods. Susa provides stratigraphic evidence for the use of MBG in the middle Islamic period, although the frequency drops. In the Islamic period, blue glaze was applied on a multitude of forms that in many cases developed from the plain ware of the Parthian-Sasanian period. A turquoise glaze became the dominant glaze in the Early Islamic period. Finds on the Miyanab show that late Sasanian-Early Islamic blue glaze is very unstable. Unlike the Parthian type however, the glaze does not flake away in layers. The whole layer of glaze detaches from

[545] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 185–187; Delougaz and Kantor, *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*, 1:8–9; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique"46-50; Haerinck, *La Céramique En Iran Pendant La Période Parthe (ca. 250 Av. J.C. à Ca. 225 Après J.C.)*, 19–51; Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 8–10.

the body and tiny specks of blue glaze on several sherds is the only proof that the vessel was originally glazed.[546]

MBG3. Late Islamic blue glaze

Sherds belonging to two types of MBG were collected from Late Islamic contexts on the Miyanab. Because these sherds fall outside the chronological frame of this research, and because a dearth of stratigraphic publications for the later Islamic periods poses serious challenges for dating these sherds, comparative research has not been carried out for MBG3 sherds, but, a sample of these sherds is published here.

Common Types

T1. Cups of the Seleucid-Parthian period

Forms are shared with unglazed common ware (ASW: T1, PCW: T1), including simple convex or hemispheric cups, with simple blunt rim, flaring or everted rim, or slightly incurving rims.[547]

T2. Cups of the Islamic period

Along with some of the old forms, new forms appear in the Islamic period. Flaring simple convex cups continue to exist. Cups with upright or sharply incurved rim become common in the

[546] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 185–187; Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 8–10; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 29–30, 102, Fig 5; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 88–89.

[547] Boucharlat and Labrousse, "La Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 28: 1; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 205, Table 18, Fig 52: 1-4, Fig 63: 2-3, Fig 68: 2; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 22: 17, 19, fig 33: 6, 7; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 52: 1, 2, 11.

Middle Islamic period. In general, cups of the Islamic period become increasingly smaller and finer through time. A type of lamp datable the middle Islamic period has a section that is similar or identical to some of the incurved cups.[548]

T3. Fish plates

Glazed fish plates are datable to the Seleucid and Parthian periods. In general, vessels became larger in the Parthian period. A fish plate with a band rim is a late Parthian type. A bowl with a ledged triangular rim, datable to the Early Islamic period, has been found at Susa and in the 2014 survey.[549]

T4. Bowl with carinated/ridged rim

Includes various types of carinated rim bowl that are common in the Seleucid and Parthian periods. Particularly common is the sharply carinated bowls with in-curved rim (similar form as PCW: T7; ASW: T7). A bowl with a perpendicular carination is dated only to the Parthian period. This same type continues to be made in the early Islamic period but the carination becomes very soft. No such type is published for the few Sasanian excavated contexts at Susa.[550]

T5. Bowls with flaring rim

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[548] Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 36: 10-12; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 43: 9-14, Fig 44: 4, 5, 7, 13-16; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 106: 4-11.

[549] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 19, Fig 55: 11, 12, Fig 63: 1, 4, 5, 7; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 22: 20, Fig 25: 3-7; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 34: 1.

[550] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 206, Table 19, Fig 63: 6, Fig 65: 2, Fig 70: 4; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 11: 10, 11, Fig 25: 9-11; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 34: 5-6; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 52: 6.

Bowls with flaring rim are common in assemblages dated to Seleucid and Parthian period. It is possible that the form continued to be made also in the Sasanian period. A very deep bowl with small flaring rim appears in the late Parthian-Early Sasanian period. Soft carinated bowls, with a fine flaring rim were made in the Islamic period, and comprised the most common type with the opaque white glaze. The latter form is also found with other colors of glaze, in far lower numbers. A bowl with heavy flaring rim is datable to the later Islamic period. Islamic bowls with a flat ledged rim have been also included in this category.[551]

T6. Simple bowls with simple rim forms

Various forms of simple bowl of MBG are found in the Parthian, Sasanian, and Early Islamic periods. More bowls of this type have been published from the Early Islamic period than the earlier periods. Usually, the rims are blunt or slightly pointed. Less commonly the lip may be flat. In general, small bowls of the Islamic period have a thin, fine body. Also, several Islamic forms have a thickened rim, compared to the body, and a thickened lip. A hemispheric bowl with simple rim that is markedly incurved is datable to the Early Islamic period and is included in this category.[552]

T7. Bowls with soft upright rim

[551] Boucharlat and Labrousse, "Le Palaise d'Artaxerxes II Sure La Rive Droite Du Chaour a Suse", Fig 28: 7; Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 65: 1, Fig 66: 2, Fig 70: 1, 3; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 36: 13; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 108: 1, 2, 4, 9, Fig 110: 26, 30, 31.

[552] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 65: 6, Fig 74: 3, 4, 9, 10; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 25: 12, Fig 33: 10; Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 23: 5, Fig 24: 2, 3, 8-12; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 36: 7-9; Moghaddam, *Barrasī'hā-Yi Bāstān'shinākhtī-I Miyānāb, Shūshtar*, Fig 109: 5, 6, Fig 110: 27-29.

This group is related to T6, and the distinction between the two groups is blurred in the very simple T7 forms. The upper part of the bowl follows a soft angle to become an upright blunt rim. The unglazed type appears in the late Parthian-Sasanian period, but, many glazed forms of this, fine and coarse, date to the Early Islamic period. Also, several bowls that have this general form were made in the Islamic period with more complex rim forms, often featuring one or several ridges on the rim and at the carination. A very distinct form that becomes common in the Early Islamic period is a large vat with several ridges inside and outside the rim band, covered with a mat pale blue glaze on one or two sides. Large numbers of the latter form were recovered in both Miyanab surveys.[553]

T8. Bowls with simple or complex channeled rim

Bowls with channeled rim have a long history. Glazed types appear in the Parthian period. The bowls became coarser and larger in the Sasanian-early Islamic period, and the channel became more pronouced. Most Parthian-Sasanian forms are only slightly different from bowls with flaring rims. In addition to a general increase in size, bowls with complex rim forms develop from the channeled rim bowls in the Islamic period.[554]

T9. Jars/pitchers

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[553] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 70: 5, Fig 74: 6; Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 23: 7-11, Fig 24: 2, 4-6; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 34: 3, 4, 7-11, Fig 77: 1, 2, 4, 15, 16; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 110: 2-9, 11-15, 36.

[554] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fif 66: 1, 2, Fig 40:2; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 25: 8; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 66: 6, 7; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971"1972: 5-14, 16, 18; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 29: 2-5, 9-11, Fig 30: 1-5, Fig 31: 2, 3, Fig 32: 1-2,.

Glazed neckless, short or high necked jars, medium or (often) large, appear at Susa from the early Sasanian period on, and continue to be made in large variety and quantity in the Islamic period. DBG type is in fact a T9 jar with dark blue glaze. In general high necked jars, with complex rim forms and neck decoration are more likely early Islamic. Simpler rim and neck forms are very long-lived.[555]

T10. Miscellaneous bowls

Various types of bowls and basins which do not fit the above categories, but are Islamic because of their glaze and context, are grouped under this type, in particular glazed examples of basins with thickened rim, similar to ICW.T2.

TU. Unidentified MBG sherds

Either the sherd is not diagnostic, or a reliable match in the excavation reports is not found.

2. Thick dark greenish blue-glazed (DBG)

A thick dark greenish-blue glaze, which is often applied on large storage jars, is categorized as a separate group of monochrome blue glaze because small body sherds of this type can be easily recognized in the assemblages. In the assemblages from the 2014 survey of the Miyanab, except in rare cases, DBG was applied over buff ware. The color of the paste ranges from light grayish yellow, yellow to buff or grayish buff. Clay is mineral-tempered with sand or visible grits. Occasionally, one side of the sherd is glazed with a lighter blue. Many examples of the distinct

[555] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord", Fig 73: 3, 7, 8; Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 18: 1, 2, 5, 7-10; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 25; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 60: 2-4, Fig 61: 5, 6; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 43: 1-4, 7.

storage jars covered with DBG are known from various excavations of late pre-Islamic and Early Islamic date, which may have barbotine, stamped, or incised decorations. The glaze is often very unstable, highly cracked or totally detached from the paste. In some examples, the DBG sherds at first glance resemble plain gritty ware. While DBG could have been produced in the late Sasanian period too, various excavations of late Sasanian-Early Islamic contexts favor an Early Islamic date.[556]

3. Monochrome Green Glaze (MGG)

Green glaze appears in the Susa assemblage during the later Parthian period, from the 1st century CE, in small numbers. Its use increased in the Sasanian period, and died out sometime in the Abbasid period. However, green glaze started to be widely used again in the Middle Islamic period. The green glaze sherds collected in the survey can be grouped into three broad categories as follows. The types follow MBG.

MGG1. Parthian-Sasanian

The earliest type of green glaze is pea-green or, less commonly, olive-green. Pea green is the standard and most common glaze in the Sasanian period. The Sasanian green glaze continued to be produced in the early Islamic period, until the 8th century at least. The common vessel type is the large storage jar that was also produced as dark-blue glazed (DBG). In the early Islamic

[556] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 185–187; Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 10; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 29–30; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 88–89, Fig 61: 5-6; Mason and Keall, "The 'Abbāsid Glazed Wares of Sīrāf and the Baṣra Connection," 55–58; Simpson, "Partho-Sasanian Ceramic Industries in Mesopotamia"; Watson, *Ceramics from Islamic Lands*, 160.

period, green glaze was also applied on new types of vessels, in particular the mold-decorated pieces. Few sherd were identified that belong to this group. [557]

MGG2. Early-Middle Islamic

This is the monochrome green glazed ware that emerged in the Islamic period. Sherds which are covered with a similar green glaze on a typical Islamic-period fabric (soft sandy yellow, deep red or red-brown), but which are too small to be associated with a specific type, have also been included in this category. Islamic green glazed sherds that belong to SPW or IGP are marked under these categories.

Archaeological excavations in various Islamic sites suggest that in the second half of the 11th century, green glaze was used in the production of monochrome green glazed and sgraffiato glazed ware. MGG2 is typically found on bowls, occasionally on closed vessels. MGG2 was in circulation in the 12th century and died out in the 13th century.[558]

MGG3. Late Islamic

A consistent shiny pea green on a gritty dark red/red brown fabric collected in a late Islamic village. This group needs to be expanded based on future finds and excavations from late Islamic contexts in Khuzistan.

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[557] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 186–188; Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 10; Simpson, "Partho-Sasanian Ceramic Industries in Mesopotamia"; Watson, *Ceramics from Islamic Lands*, 157–165.The fact that MGG1 vessels comprise only a small fraction of the Parthian and Sasanian pottery, along with the lack of accompanying color photos for the Susa material can be considered main contributing factors.

[558] Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 35, 36, 43, 44; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89, Fig 43: 2, Fig 44: 3,4; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 70: 1-4; Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans" Fig 43: 7, 12, Fig 44: 7, 14,15.

4. Mustard or Yellow Glaze (MYG)

This category has been defined for the small number of sherds that are covered with yellow or mustard glaze.

MYG1. The earliest examples of glazed ware excavated at Susa, from the Achaemenid-Early Parthian period, are often covered with a pale yellow/whitish glaze. Given the very poor quality of early glaze, yellow may not have been the original color, but rather a result of the deterioration of other colors, such as pale green, or pale blue. [559] The forms are as defined for ASW. [560]

MYG2. A mustard/light brown glaze that is applied as a homogenous thick layer on the biscuit is datable to the Islamic period. Dating of body sherds is not straight forward as the mustard glaze might be part of different glazed traditions, e.g. SPW datable to the Early Islamic period or SGW datable to the late Early or Middle Islamic period (see below). Or, the sherd might be one a few types of monochrome yellow glazed bowls known in the Early Islamic layers at Susa. [561]

5. Opaque white glaze (OWG)

Several body sherds, covered with opaque white glaze, on one or both sides, were recovered on survey. OWG is typically applied only on buff fabrics. The paste is usually smooth, with medium hardness. The clay is pale yellow to pale grayish-buff. Mineral temper is often

[559] Deteriorated OWG can also look pale yellow, but, the glaze cannot be mistaken with the fading early yellow glaze.
[560] Boucharlat, Perrot, and Ladiray, "Les Niveaux Post-Achéménides à Suse, Secteur Nord," 185–187, Fig 55: 2, 4, 5, 8, Fig 56: 1, Fig 57: 2, 3, 5, 6, 9, Fig Fig 59: 3, 6-10, 14, 15, Fig 63: 6, 10, 12; de Miroschedji, "Fouilles Du Chantier Ville Royal II à Suse (1975-1977) II. Niveaux D'epoques Achemenide, Parthe et Islamique", Fig 8: 9, Fig 10: 2, 4; Labrousse and Boucharlat, "La Fouille Du Palais Du Chaour à Suse En 1970 et 1971", Fig 37, 52.
[561] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 29: 2, 5; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana", Fig 35: 4.

invisible. The sherds covered with opaque white glaze are either pieces of plain white ware or undecorated parts of other categories of Early Islamic glaze decoration which are applied on an opaque white glaze. OWG is an Early Islamic innovation, diagnostic of the late 9th and 10th centuries. Typology of diagnostic OWG sherds follow MBG. The most common form associated with OWG is a bowl with flaring rim (T5).[562]

6. All Lustre Ware (ALW)

Lustre ware is a rare category in the 2014 survey collection. Only two sherds of ALW1, and no ALW2 was found.

ALW1. Abbasid Lustre Ware

Abbasid lusterware is part of the story of the opaque white glazed ware, and is dated to the 9th and 10th century. The consensus is that Abbasid lustre ware started with a polychrome design followed by a bi-chrome design in the 9th century and a later monochrome style appearing in the 10th century. Kervran dated the monochrome lusterware at Susa to the 9th century. Nonetheless, her stratigraphy of the Islamic period at Susa might be extended to a slightly later period. As such, this catalogue uses the above chronology.[563]

ALW2. Iranian Lustre Ware

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[562] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 27; Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 12–13; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 32; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89, Fig 45: 1-2, Fig 46: 4, ; Watson, *Ceramics from Islamic Lands*, 36–38, 171–181; Williamson, Andrew, "Regional Distribution of Medieval Persian Pottery in the Light of Recent Investigations," 7–14, 21.

[563] Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 33–34; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89, Fig 40, 41; Watson, *Ceramics from Islamic Lands*, 38–40, 183–197.

Also known as Kashan ware, a very distinctive monochrome and bi-chrome (lustre and blue glaze) style of glaze decoration that was produced in the 12th century and survived, with some interruption, the Mongol invasion. ALW2 died out in the early 14th century. Production of ALW2 is related to the invention of fritware and related glaze styles.[564]

7. Splashed Ware (SPW)

Splashed ware is characteristics of the Samarra horizon, and one of the most common categories of Islamic glazed ware. Nevertheless, various members of this family and their relationship are not well researched, and the term splash has been used for different techniques. In this catalogue, the definition of splash ware follows Kennet and Mason, and refers to the application of splash colors in a transparent glaze on a slipped clay, which corresponds to Kevran's category of *glaçure jaspée ou à coulures*. The most predominant splashed color is green, but, yellow, brown, and purple are occasionally combined in decoration. Small sherds of IGP with large green-glaze splash on opaque white glaze might be hard to be distinguished from SPW. Green is the most common color. The inception of SPW dates to the 9th century (most likely second half), and it continued to be produced in the 10th century. Few SPW sherds were found in the 2014 survey.[565]

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[564] Mason, *Shine like the Sun*, 128–130; Watson, *Ceramics from Islamic Lands*, 40, 347–361.

[565] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 25: 3, 7; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 33; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89 Fig 42, 43; Mason, *Shine like the Sun*, 40, 41, 199–203; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 113, 114. In Moghaddam 2005 examples, it is not clear if the splash decoration in in the transparent glaze or over white glaze. In the material recovered in 2014 too this distinction was not always clear, although it does not change the dating, i.e. Early Islamic

8. In-glaze painting (IGP)

IGP is also part of the Samarra horizon and belongs to the tradition of the Early Islamic opaque white glaze. The technique is characterized by a white glaze in which stylized vegetal or calligraphic patterns have been painted. The most renowned type of this family is the cobalt-blue painted glazed ware, which was most likely produced only around Basra. As in-glaze painting spread out from Iraq, both forms and decorative styles took on local characteristics. Outside Iraq, painting in green and brown/manganese appeared. Both inside and outside Iraq, decoration in splashes or dots of green and brown/yellow glaze was used with or without in-glazed painting. In several cases, it is difficult to establish if the painting has been originally blue, becoming brown as a result of weathering. Painting over glazes of other colors may occur but is rare. The Basra ware has been generally dated to the late 8th and 9th centuries. The technique however was in use elsewhere in the Islamic world at least until the 10th century. At Susa, IGP material is dated to the 9th century.[566]

9. Slip Painted Ware (SPN)

Slip paint describes the technique of using a white slip to cover earthenware, and to decorate it with thick slips of various colors, under a final transparent glaze. The technique was developed in and was restricted to Iran and eastern Iranian world in the 10th and 11th centuries. SPW ware at Susa is dated to the 11th century. At its best, eastern Iranian slipware, produced

[566] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 25: 5-9, Fig 26; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89, Fig 37-39, 45; Moghaddam, *Barrasī'hā-Yi Bāstān'shināKhtī-I Miyānāb, Shūshtar*, Fig 117-121 N.C. Sarre, *Die Keramik von Samarra*, Tafel XVIII-XX; Watson, *Ceramics from Islamic Lands*, 36–38, 173–181. Small pieces of IGP with splashes of green might be confused with SPW. Most examples in Moghaddam 2005 have been described as paint under transparent glaze, but comparison of decoration and color suggests that they are painted in white glaze.

particularly in Nishapur and Samarqand, is astonishing, featuring calligraphic and abstract designs. Despite the fact that SPN is known for its very best examples, evidence has begaun to surface of small workshops producing less sophisticated wares for local market.[567]

10. Sgraffiato glazed ware (SGW)

'Sgraffiato' is one of the most long-lived and wide spread techniques of glaze decoration in the Islamic world. It refers to the technique of incising linear designs through a white slip, on the interior of the vessels that are nearly always bowls. The surface is then covered with splashed transparent glaze. As the body is usually dark (red or red-brown), the incised line stands out against the slipped/glazed surface. Or, this effect may be attenuated by filling the incised lines with green, brown, or yellow glaze. Although Kervran has suggested a date in the early 9th century for sgraffiato bowls excavated at Susa, evidence from Samarra and Siraf is stronger and suggest that sgraffiato was introduced in the late 9th or 10th century. By the 11th and 12th century, it was widespread all over Iran and is thought to have been terminated by the Mongol invasion. Given the geographical and temporal extent of the use of SGW, it is difficult to relate the fragmentary survey (or even excavated material) to the art-historical categories that are suggested for sgraffiato tradition. Therefore, no subdivision has been suggested here for SGW. In general however, it is understood that early sgraffiato ware was developed as a later category related to splash ware. The examples, like those excavated at Susa, feature incised decorative line under transparent glaze, simple or splashed with green, yellow or brown glaze. Somewhere around the middle of the 11th

[567] Kervran, "Recherches sur les niveaux islamiques de la Ville des Artisans", Fig 45-46; Watson, *Ceramics from Islamic Lands*, 40, 205–235; Williamson, Andrew, "Regional Distribution of Medieval Persian Pottery in the Light of Recent Investigations."

century, the later categories of sgraffiato, in particular monochrome green or mustard were, hatched sgraffiato, or transparent sgraffiato with a yellowish/green tint, were introduced (although an earlier date has been suggested for these variations too). In the later vessels, glaze was normally applied on the interior and over the rim, up to 2 cm from the edge of the vessel. No sherds were found in the 2014 survey material that can be identified as SGW with certainty. But, small sherds with green and brown splashes might come from the plain surfaces of SGW bowls.[568]

11. Underglaze painted ware (UGP)

Beginning in 12th century, two major technological changes are observed in the ceramic production throughout the Islamic world, namely, the adoption of the frit body and the underglaze decoration technique. The emergence of the UGP technique is closely related to the Iranian lusterware, produced in the 12th century in Kashan. However, these two techniques spread all over the Middle East in the 13th and 14th century, and local production centers adopted these techniques to produce local stylistic taste and needs. Although major publications that discuss Islamic ceramic production almost exclusively discuss the underglaze painting on fritware, archaeological material (surveys and excavations) shows that earthenware was commonly decorated with the same techniques. "In the 14th and 15th century, there is little difference in form and decoration between frit and earthenware."[569] UGP, particularly, black paint under turquoise glaze, is the most common non-monochrome glaze on the Miyanab, and it is exclusively found on earthenware.[570]

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[568] Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 11; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 34–37; Kervran, "Les niveaux islamiques du secteur oriental du Tépé de l'Apadana," 89, Fig 44; Morgan and Leatherby, "Excavated Ceramics from Sirjan."
[569] Kennet, D. Personal communication, Aug 1, 2014.
[570] Hill, *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain, Southwestern Iran*, 13–14; Kennet, *Sasanian and Islamic Pottery from Ras Al-Khaimah*, 40–41, 45; Watson, *Ceramics from Islamic Lands*, 41–42, 333–345.

UGP1. Pre-Mongol, silhouette and black under blue

The early UGP painting, when well preserved, features distinct black painting under a blue (usually turquoise) glaze. The earliest technique used to generate this look is called Silhouette, and was produced in the late 12th century. In this technique, the entire surface is covered in black slip, and the decoration is carved out of the slip. Finally, a blue glaze covers the entire vessel. The more common UGP1 technique, which was widely used in the early 13th century, is characterized by precise black foliage painting under turquoise glaze.

UGP2. Post Mongol, Sultanabad style

After the destruction and economic hiatus caused by the Mongol invasion, new styles of underglaze decoration emerged, which show the impact of Chinese design, in vessel forms as well as decorative motives. Nonetheless, in this group of UGP too, local variants in form and style are observed all over the Islamic lands. Post Mongol decoration style is more crowded and applies a three color design composed of blue, black, and white. The most wide spread style of decoration is known as “Sultanabad”, referring to a place where it was originally found. The interior of the vessel is usually decorated with a central animal or vegetal motif against a background which is filled with repeating motives (scrolls, dots, etc.). The interior may also be divided, by radiating bands, into panels which are again filled with repeating motives. The exterior is also decorated with panels and/or repeating motives. In terms of technique, the underglaze paint, in blue and black, is applied on white glaze, or, a raised white slip may be applied on a darker (usually green-gray) slip, and both surfaces can be painted with black and blue decorative motives. These techniques became widespread in 13th-15th centuries. The development in the 15th century is not

completely understood yet. A little studied ware, which in fragmentary material cannot be easily differentiated from UGP1, applies broad outlined painting in black under turquoise glaze.

12. Late Islamic Glaze (LIG)

Material datable to the late Islamic period was recovered in few surveyed areas. Because this period falls beyond the scope of this research and because study of late Islamic ceramic is hindered by the dearth of published stratigraphic material, these ceramics have not been more precisely studied. However, a representative sample is published in this report, and a category is established here for the Late Islamic pottery with the hope that it can be expanded by future research. A most common type is a very shiny turquoise glaze which has been classified as MBG3. Another group is marked by violet lines on a white glaze background.

13. Miscellaneous Islamic Ware (MIW)

This group is created to describe the (primarily Islamic) glazed pottery that does not easily fit well-known categories. Among the Miyanab 2014 finds, the following subcategory can be defined.

MIW1. Black paint or slip on creamy Islamic ware

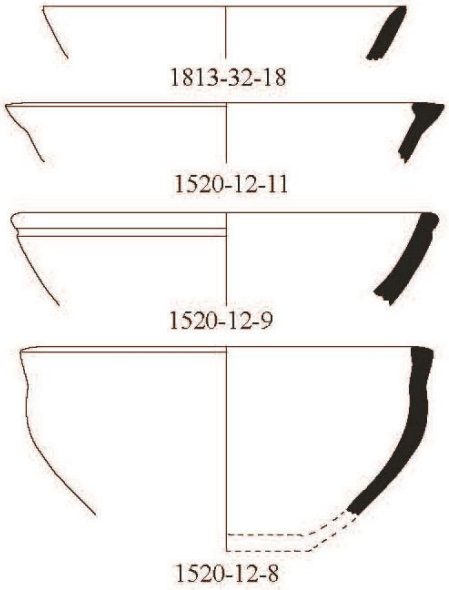
Certain vessels excavated from Islamic layers at Susa have been described as decorated with splashes of black glaze, alone or in combination with other colors. Several sherds were recovered in the 2014 survey, that were covered with glazes that look black; but the sherds were

too small and/or weathered to establish whether black was the original color or the result of weathering of other colors such as blue or manganese. [571]

[571] Hardy-Guilbert, "Les niveaux islamiques du secteur Apadana-Ville Royale", Fig 29: 2; Kervran, "Une sucrerie d'époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique", Fig 62: 5, Fig 67: 9, 11.

I. PLAINWARE

GEW.T1



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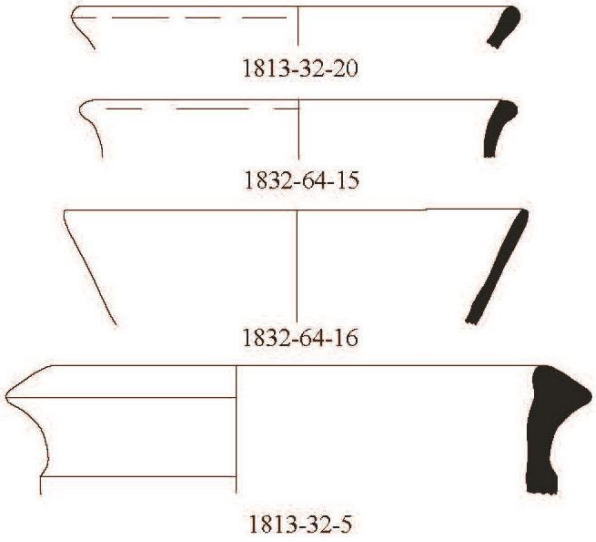
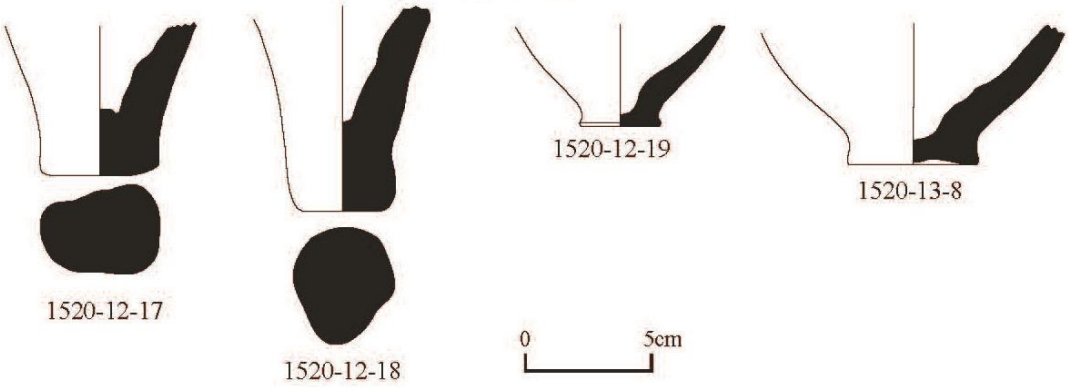
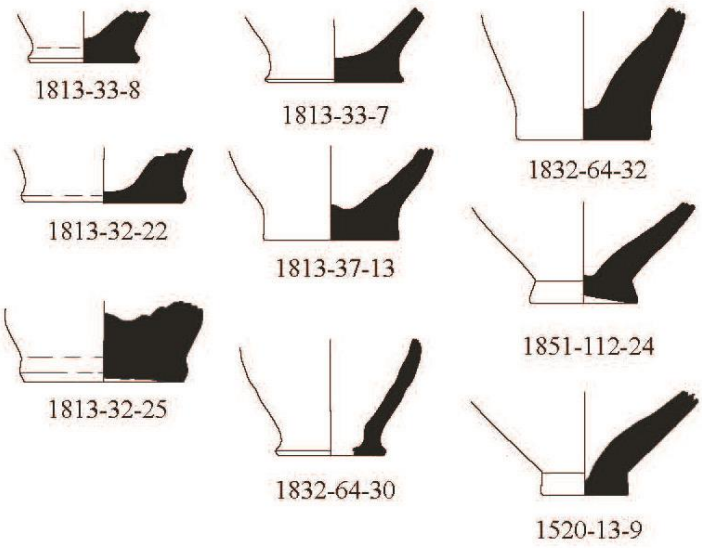


GEW.T3

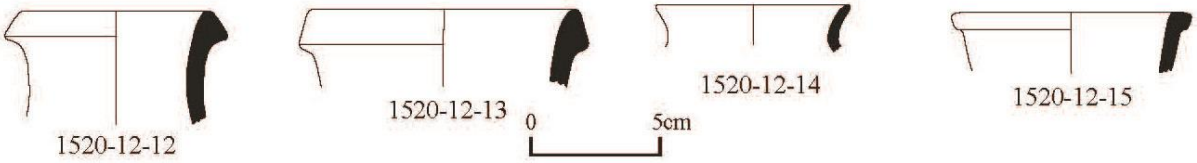


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1520-12-8	Brownish buff; mixed; light buff/wet hand smoothed; light buff wet hand smoothed; none; 15cm
1520-12-9	Brownish buff; mixed; light buff/wet hand smoothed; light buff wet hand smoothed; none; 16cm
1520-12-11	Brownish buff; mixed; light buff/slipped; light buff/slipped; none; 15cm
1813-32-18	Brownish buff; vegetal; light buff-orange/slipped; light buff-orange/slipped; none; 14cm
1813-32-5	Buff; vegetal; light buff/slipped; light buff/slipped; none; 24cm
1813-32-20	Buff; vegetal; brown/slipped; brown/slipped; none; 17cm?
1832-64-15	Brown; mixed; buff/slipped; buff/slipped; none; 16cm
1832-64-16	Red-brown; mixed; buff-orange/wet hand smoothed; buff-orange/wet hand smoothed; none; 18cm
1520-12-17	Buff; mineral; none; none; none; 4.5cm
1520-12-18	Light buff-orange; mineral; white/slipped; white/slipped; none; 4cm
1520-12-19	Light brown; mineral; none; buff/slipped; none; 3cm
1520-13-8	Light buff-yellow; mixed; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 5cm

GEW.T3

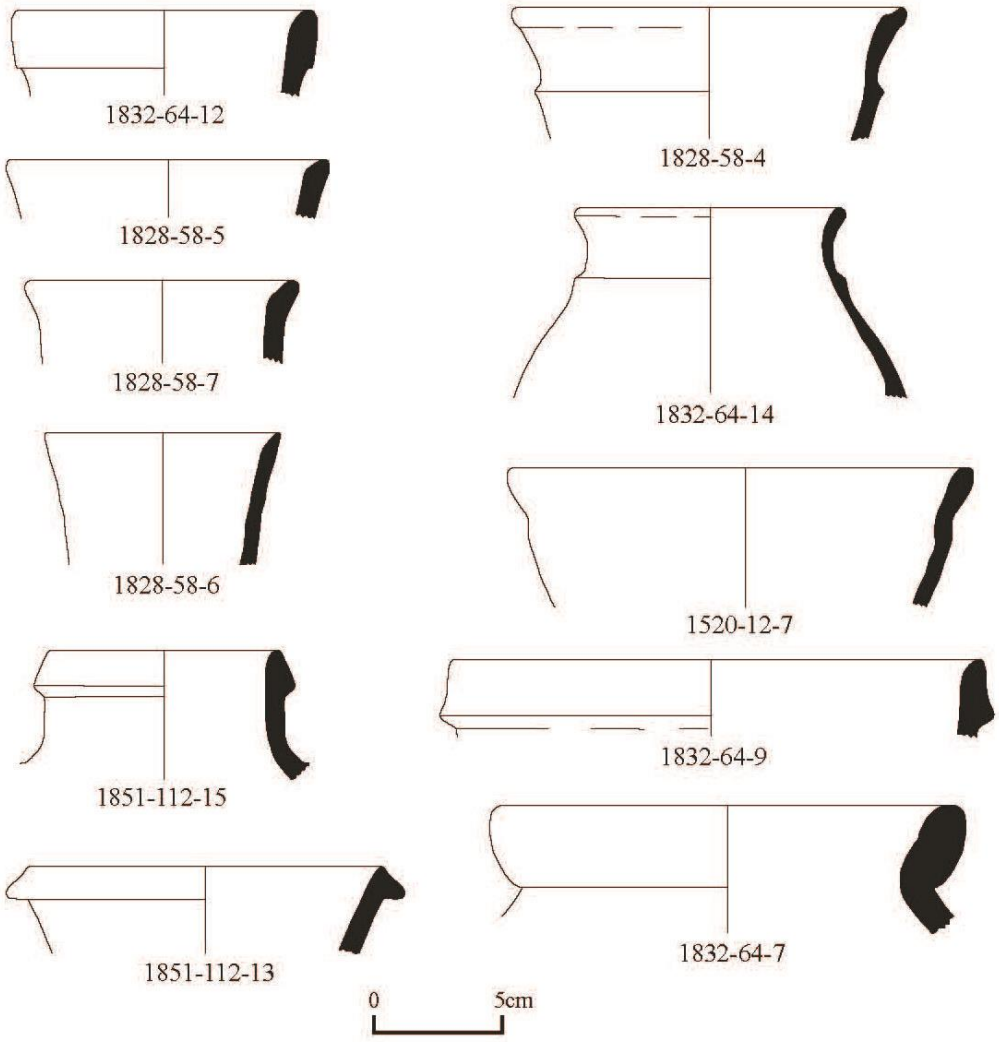


GEW.T4



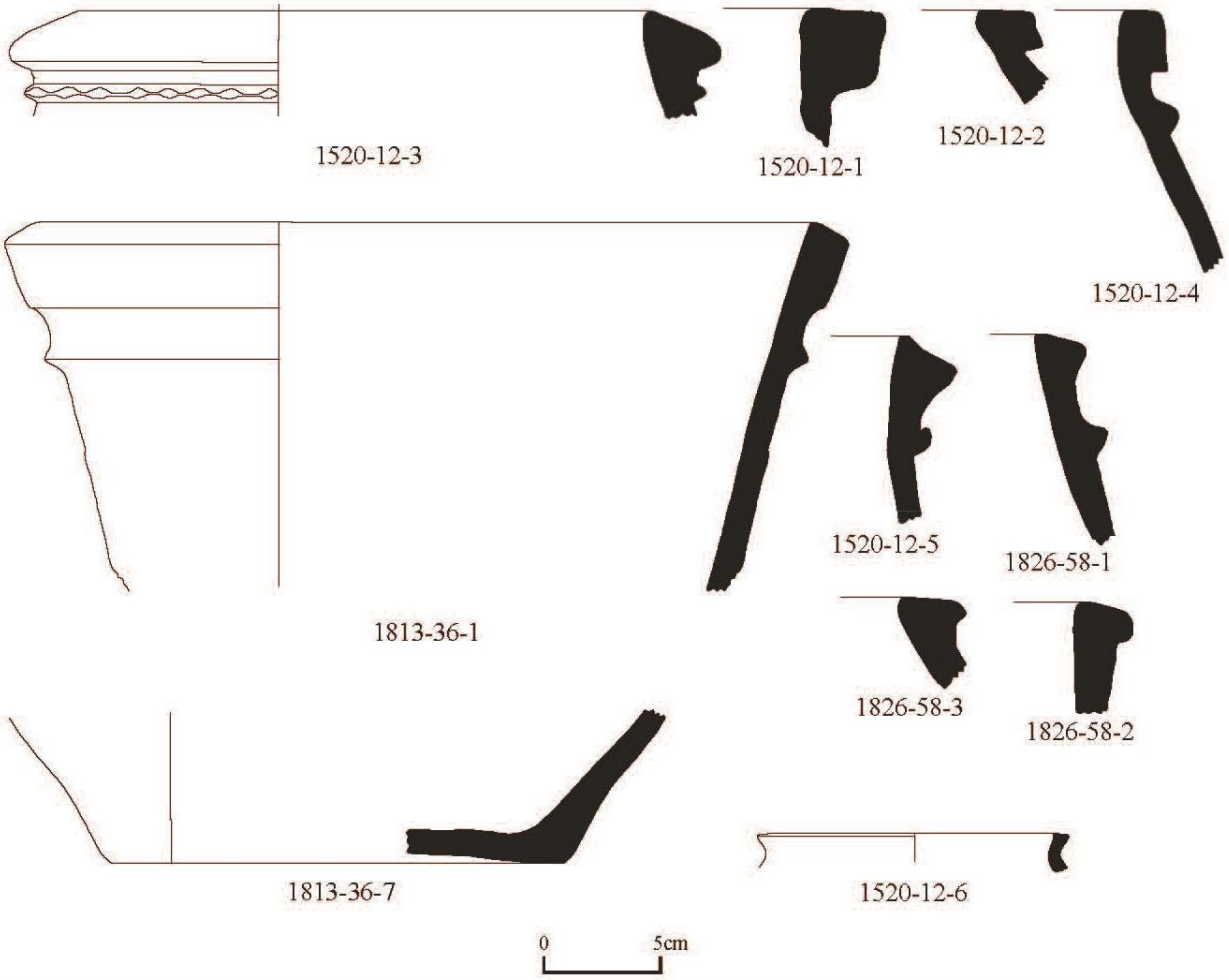
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1520-13-9	Light buff-yellow; mixed; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 3.5cm
1813-32-22	Buff-orange; vegetal; orange-buff/wet hand smoothed; orange-buff/wet hand smoothed; none; 6cm
1813-32-25	Dark buff; vegetal; none; red-brown/slipped; none; 6cm
1813-33-7	Brownish-buff; vegetal; none; red-brown/slipped; none; 5cm
1813-33-8	Light brown; vegetal; none; red-brown/slipped; none; 4cm
1813-37-13	Dark buff; vegetal; none; light brown/slipped; none; 5cm
1832-64-30	Buff; mixed; greenish-buff/slipped/ greenish-buff; slipped; 4cm
1832-64-32	Red-brown; vegetal; none; none; none; 5cm
1851-112-24	Bown; mineral; buff/slipped; buff/slipped; none; 4cm
1851-112-26	Green; vegetal; light green/slipped; light green/slipped; 5cm
1851-112-27	Buff to light brown; mixed; buff to light yellow/slipped; buff to light yellow/ slipped; none; 5cm
1851-112-28	Brown; mineral; white/slipped; white/slipped; none; 5cm
1851-112-29	Green; mineral; green/slipped; green/slipped; none; 4cm
1520-12-12	Buff to light brown; mixed; buff-orange/slipped; buff-orange/slipped; none; 7cm
1520-12-13	Dark buff; mixed; light buff/slipped; light buff/slipped; 10cm
1520-12-14	Light red-orange; mixed; none; none; none; 7cm
1520-12-15	Buff; mineral; none; none; none; 8cm

GEW.T5



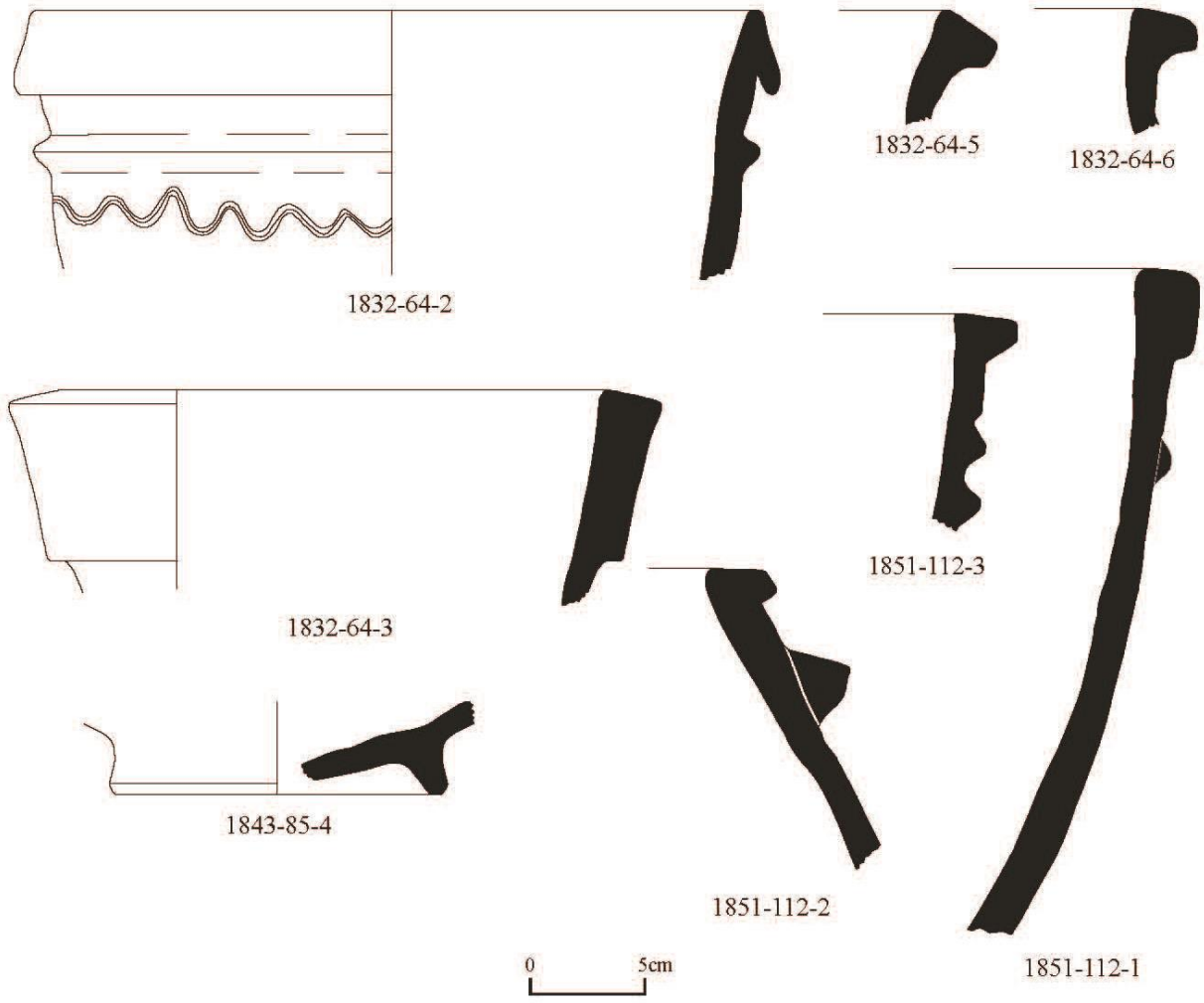
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1520-12-7	Dark buff; mixed; dark buff/wet hand smoothed; dark buff/ wet hand smoothed; none; 12cm
1828-58-4	Buff; mixed; white/slipped/ white/slipped; none; 15cm
1828-58-5	Light red-orange; vegetal; light orange/slipped; light orange/slipped; none; 12cm
1828-58-6	Buff; vegetal; buff-orange/wet hand smoothed/ buff-orange/wet hand smoothed; none; 9cm
1828-58-7	Light buff; vegetal; none; none; none; 10cm
1832-64-7	Buff to light green; vegetal; buff/slipped/ buff/slipped; none; 17cm
1832-64-9	Green to light buff; vegetal; buff/slipped; buff/slipped; none; 21cm
1832-64-12	Buff; vegetal; white/slipped; white/slipped; 11cm
1832-64-14	Buff; mixed; none; none; none; 10cm
1851-112-13	Buff; vegetal; light green/wet hand smoothed; light green/wet hand smoothed; none; 14cm
1851-112-15	Green; vegetal; buff/slipped; buff/slipped; none; 9cm

GEW.T6

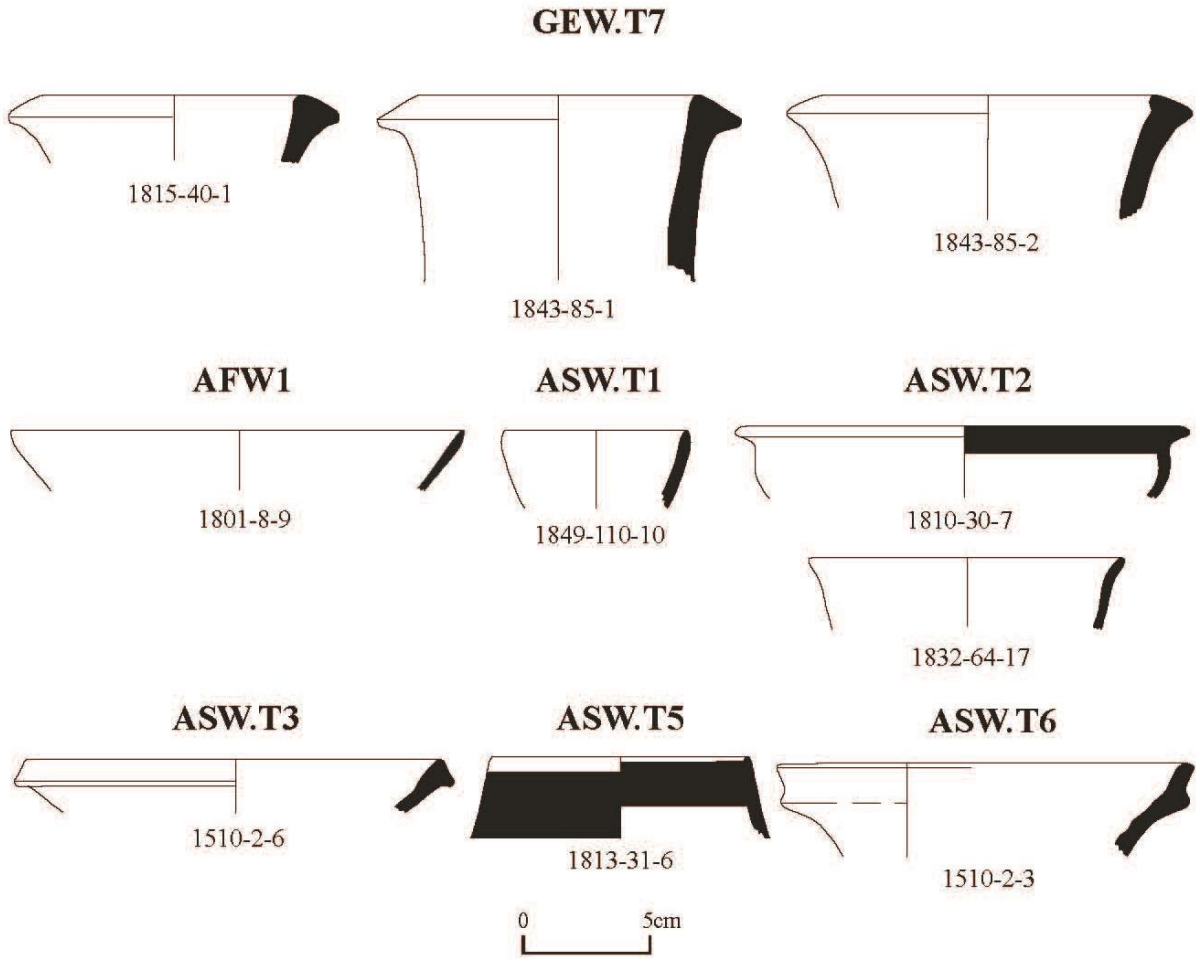


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1520-12-1	Buff to light green; mixed; wet hand smoothed; wet hand smoothed; none; 44cm
1520-12-2	Light buff-green; mixed; light red-orange/slipped; light red-orange/slipped; none; 31cm
1520-12-3	Buff to light green; mixed; none; none; none; 38cm
1520-12-4	Light greenish buff; vegetal; light buff/wet hand smoothed; light buff/wet hand smoothed; exterior appliqué strip; 35cm
1520-12-5	Light greenish buff; mixed; light buff/wet hand smoothed; light buff/wet hand smoothed; exterior appliqué strip; 37cm
1520-12-6	Light buff; mixed; dark buff/wet hand smoothed; dark buff/wet hand smoothed; exterior appliqué strip; 18cm
1813-36-1	Light green; mixed; none; none; none; 45cm
1813-36-7	Light green; mixed; none; none; none; 33cm
1828-58-1	Buff; vegetal; none; brick-red/slipped; exterior appliqué strip; 30cm
1828-58-2	Buff; vegetal; none; red-orange/slipped; none; 24cm?
1828-58-3	Dark buff; vegetal; red-brown/slipped; red-brown/slipped; none; 24cm

GEW.T6

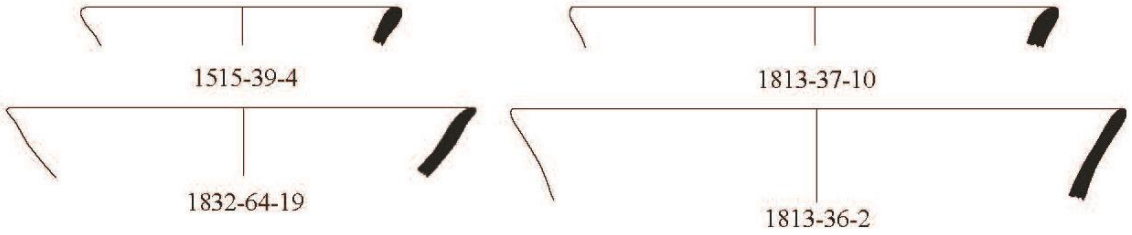


Sherd Number Site-Lot-Sherd	Description: Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1832-64-2	Buff; vegetal; buff/slipped; buff/slipped; exterior appliqué strip & wavy incised line below the strip; 31cm
1832-64-3	Green to light buff; mixed with visible black grit; none; none; 37cm
1832-64-5	Green; vegetal; none; none; none; 31cm
1832-64-6	Buff; vegetal; buff/slipped; buff/slipped; none; 31cm
1843-85-4	Yellow to light buff; mixed; none; buff/slipped; none; 14cm
1851-112-1	Green; vegetal; light green/slipped; light green/slipped; exterior appliqué strip; 47cm
1851-112-2	Green; vegetal; light green/slipped; light green/slipped; none; 42cm
1851-112-3	Green; vegetal; light green/slipped; light green/slipped; exterior appliqué strip; 45cm



Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-8-9	Light red; mixed; red-orange/slipped; red-orange/slipped; none; 19cm
1849-110-10	Brown; vegetal; brownish buff/slipped; brownish buff/slipped; none; 7cm
1810-30-7	Buff brown; mineral; buff/slipped; buff/slipped; red-brown painted band on the interior below the rim; 17cm
1832-64-17	Buff; mineral; none; none; none; 12cm
1586-65-7	Brown; mineral; green glazed; green glazed; none; 17cm
1510-2-6	Buff to light brown; mineral; none; none; none; 16cm
1813-31-6	Red brown; mineral; red brown/slipped; red-brown/slipped; none; 10cm
1510-2-3	Dark buff; mixed; red brown/slipped; red-brown/slipped; none; 22cm

ASW.T8



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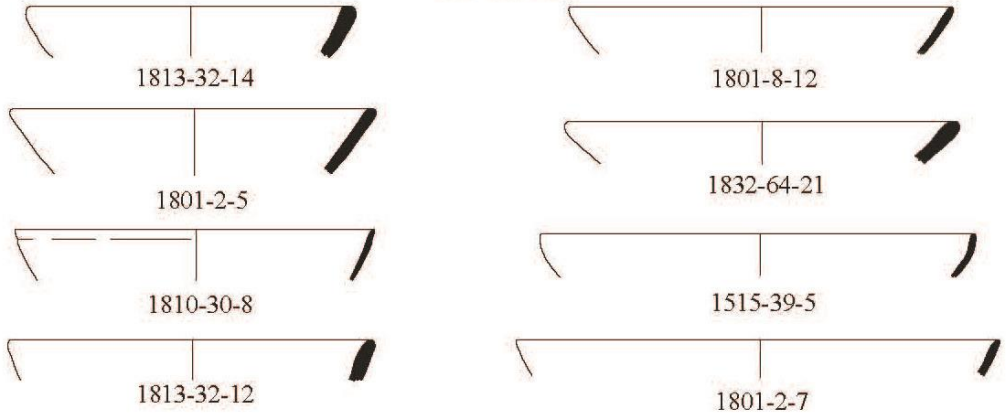

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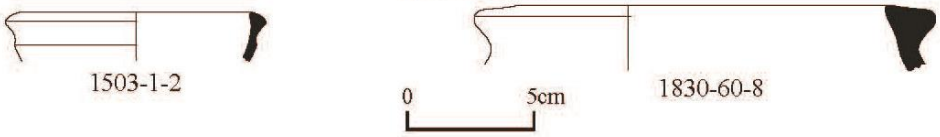
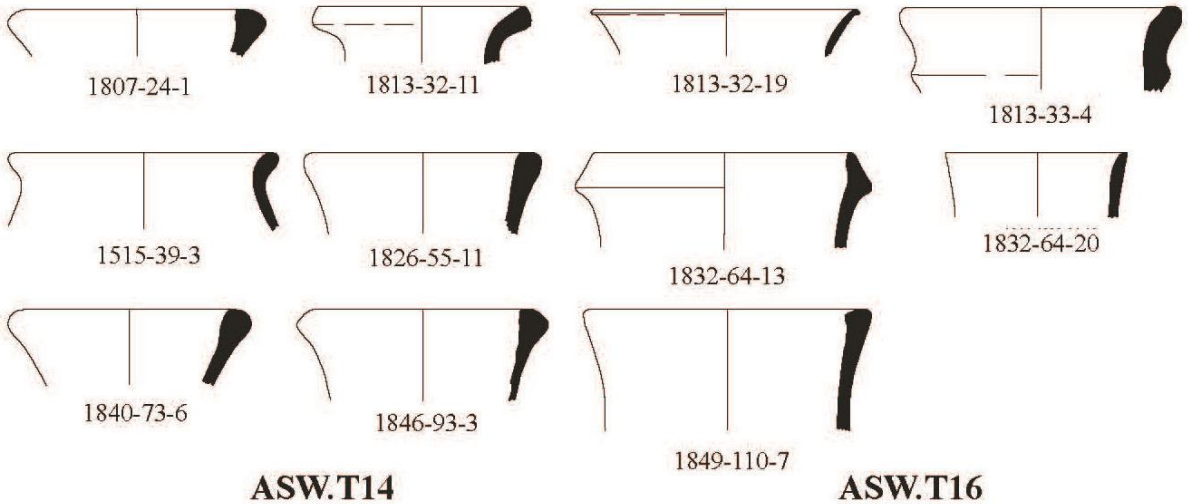
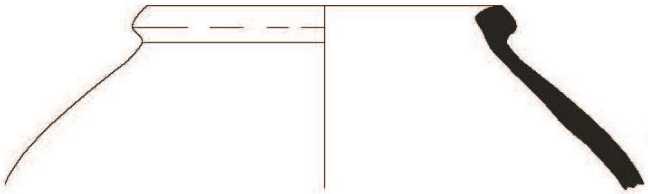


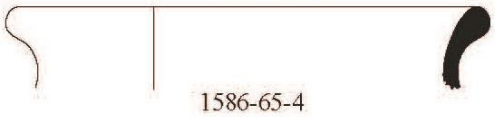
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1832-64-19	Buff to orange; vegetal; pink/slipped; pink/slipped; none; 18cm
1813-37-10	Buff; mixed; none; none; none; 19cm
1515-39-4	Buff; mixed; white/slipped/ white/slipped; none; 12cm
1813-36-2	Red orange-mineral; none; white/slipped; none; 24cm
1801-2-5	Brown; mineral; none; none; none; 14cm
1801-2-7	Buff to light red; mineral; red brown/slipped; red brown/slipped; 19cm?
1801-8-12	Dark buff; mineral; none; none; none; 16cm
1810-30-8	Buff to light green; mineral; none; none; none; 14cm
1813-32-12	Buff orange; vegetal; buff orange/wet hand smoothed; buff orange/wet hand smoothed; 14cm
1813-32-14	Brown; vegetal; brown/slipped; brown/slipped; 12cm
1515-39-5	Greenish buff; mineral; buff/slipped and burnished; 17cm
1832-64-21	Red brown; mineral; none; none; none; 15cm
1503-1-2	Light red; mineral; dark buff/slipped; dark buff/slipped; parallel incised lines on the shoulder; 16cm
1830-60-8	Buff to light brown; mineral; none; none; none; 21cm?

ASW.T13



ASW.T14





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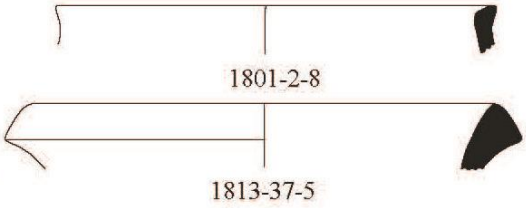
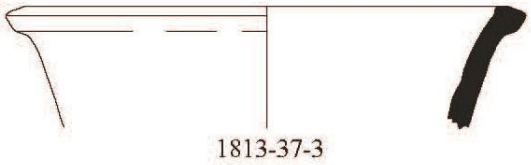


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1807-24-1	Red brown; mineral; none; none; none; 8cm
1813-32-11	Brown; mixed; brown/slipped; brown/slipped; none; 8cm
1813-32-19	Buff; mineral; none; brown/slipped; none; 10cm?
1813-33-4	Light brown; vegetal; brown/slipped; brown/slipped; none; 10cm
1515-39-3	Buff orange; vegetal; white/slipped; white/slipped; none; 10cm
1826-55-11	Red brown; mixed; buff/slipped; buff/slipped; none; 8cm
1832-64-13	Buff to light green; mixed; none; none; none; 10cm
1832-64-20	Buff; mineral; none; none; none; 7cm
1840-73-6	Brown; mixed; none; none; none; 8cm
1846-93-3	Red brown; mixed; dark buff/slipped; dark buff/slipped; none; 8cm
1840-110-7	Red; mixed; buff/slipped; buff/slipped; none; 11cm
1832-64-8	Buff; mineral; buff/slipped; buff/slipped; none; 15cm
1586-65-4	Buff; mineral; white/slipped; white/slipped; none; 26cm
1801-2-8	Gray; mineral; light brown/slipped; red orange/slipped; none; 18cm?
1813-37-5	Buff; vegetal; red brown/slipped; red brown/slipped; none; 18cm

ASW.T17



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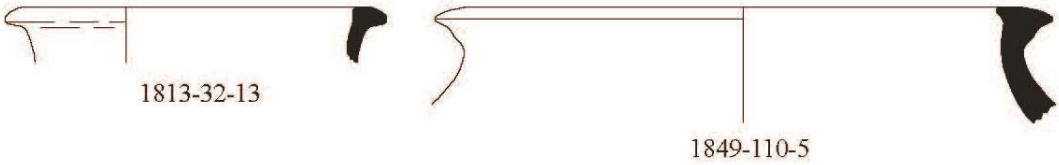

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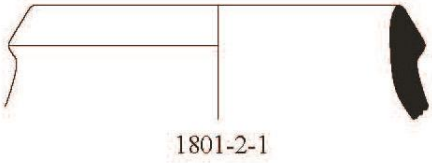

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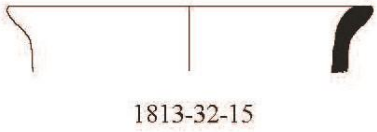

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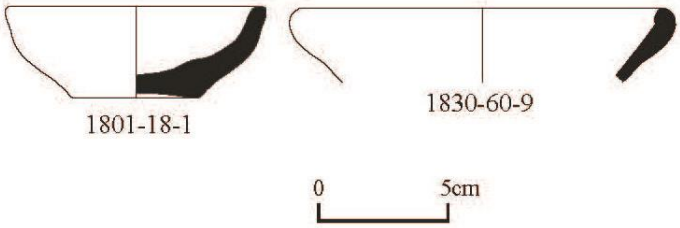
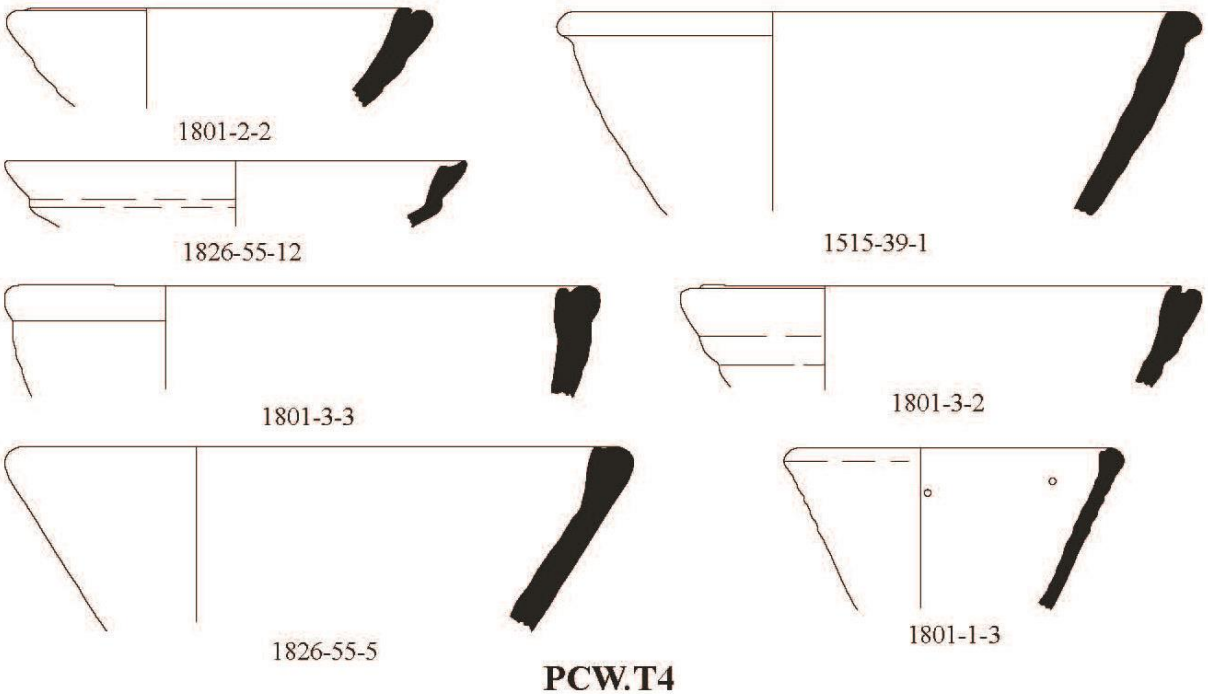


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1813-37-3	Brown; vegetal; red brown/slipped; red brown/slipped; none; 18cm
1849-110-5	Brown; vegetal; brown/wet hand smoothed; brown/wet hand smoothed; none; 20cm
1813-32-13	Buff; mineral; none; yellow/slipped; none; 18cm
1801-2-1	Buff to light yellow; vegetal; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 14cm
1810-30-6	Brown; mixed; light buff/slipped; light buff/slipped; none; 13cm
1813-32-15	grayish white; vegetal; none; none; none; 13cm
1801-18-1	Dark buff; mineral with visible dark grit; none; dark buff/wet hand smoothed; nonoe; 10cm
1830-60-9	Buff to light yellow; mineral; none; none; none; 14cm

PCW.T2



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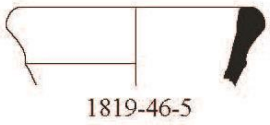
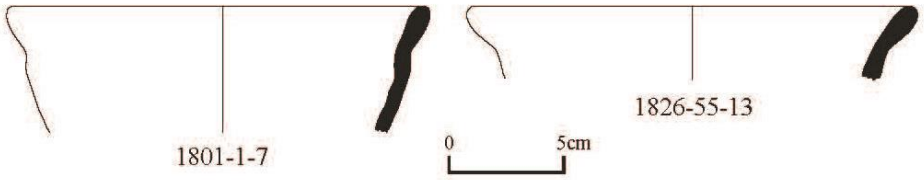
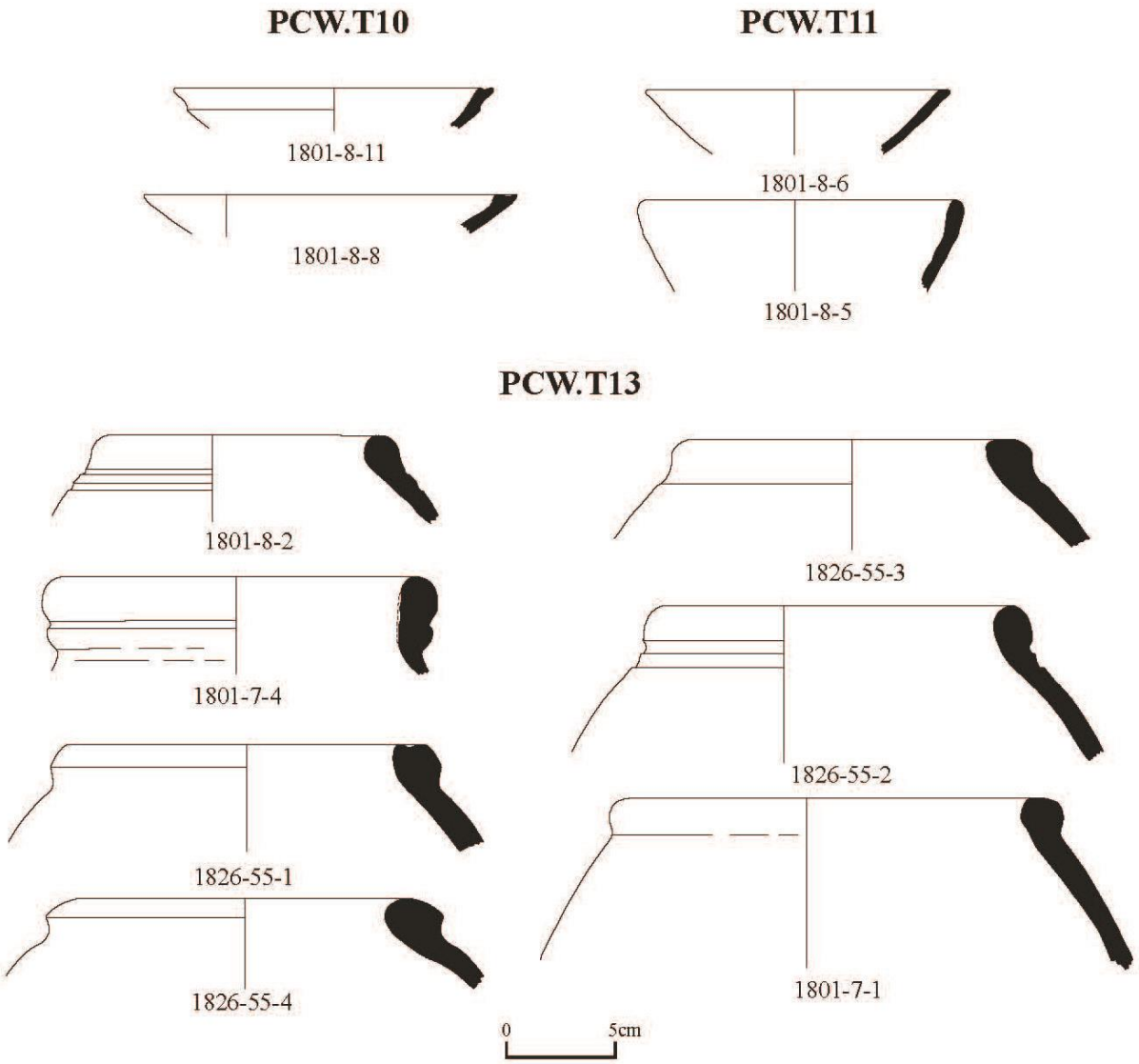


PCW.T8

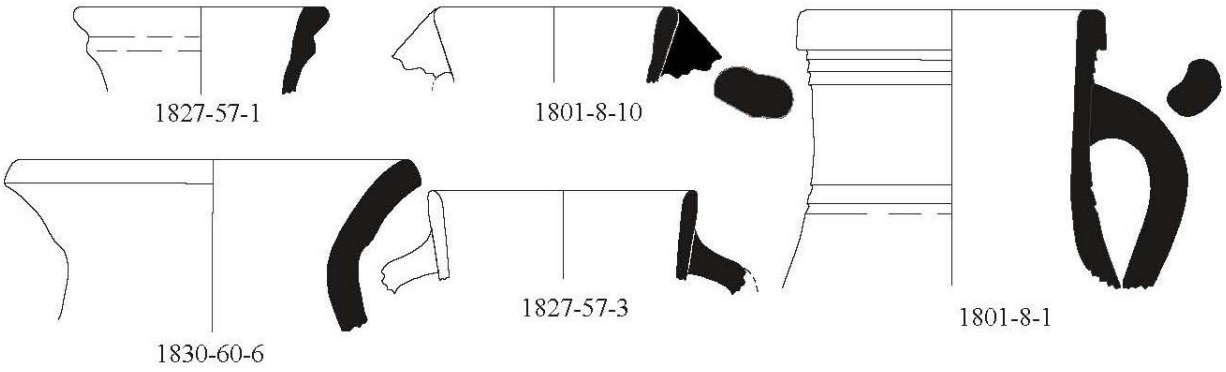


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-2-2	Dark buff; mineral; dark buff/slipped; dark buff/slipped; none; 22cm
1801-1-3	Dark buff; mineral; light buff/slipped; light buff/slipped; none; 28cm
1801-3-2	Light orange buff; mineral; none; none; grooved on the exterior; 30cm
1801-3-3	Dark buff; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 36cm
1515-39-1	Light brown; mineral; none; light buff/wet hand smoothed; 34cm
1826-55-5	Yellow to light buff; mixed; light buff/slipped; light buff/slipped; none; 37cm
1826-55-12	Buff; mineral; yellowish white/glazed; none; 20cm
1819-46-5	Buff to light yellow; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 9cm
1801-1-7	Orange buff; mineral; light buff/slipped; light buff/slipped; none; 26cm
1826-55-13	Buff; mineral; light yellowish buff/slipped; light yellowish buff/slipped; none; 19cm

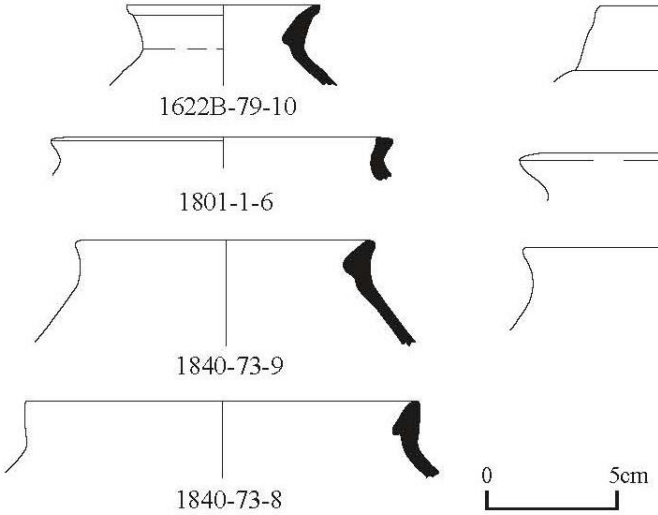


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-8-8	Dark buff; mineral; white to very light green/slipped; white to very light green/slipped; none; 26cm
1801-8-11	Light brownish red; mineral; orange buff/wet hand smoothed; orange buff/wet hand smoothed; none; 14cm
1801-8-5	Light orange; mineral; orange buff/slipped; orange buff/slipped; none; 15cm
1801-8-6	Dark buff; mineral; white to very light green/glazed; white to very light green/glazed; none; 14cm
1801-7-1	Light orange red; mineral; bitumen covered?; buff to light yellow/slipped; none; 20cm
1801-7-4	Dark buff; mineral; light buff/slipped; light buff/slipped; none; 16cm
1801-8-2	Light greenish buff; mineral; greenish buff/slipped; greenish buff/slipped; grooved on the exterior; 15cm
1826-55-1	Buff green; mineral; light green/slipped; light green/slipped; none; 14cm
1826-55-2	Buff green; mineral; light green/slipped; light green/slipped; none; 21cm
1826-55-3	Buff green; mineral; light green/slipped; light yellow/slipped; none; 15cm
1826-55-4	Light pinkish buff; mineral; light pink/slipped; light pink/slipped; none; 15cm

PCW.T15

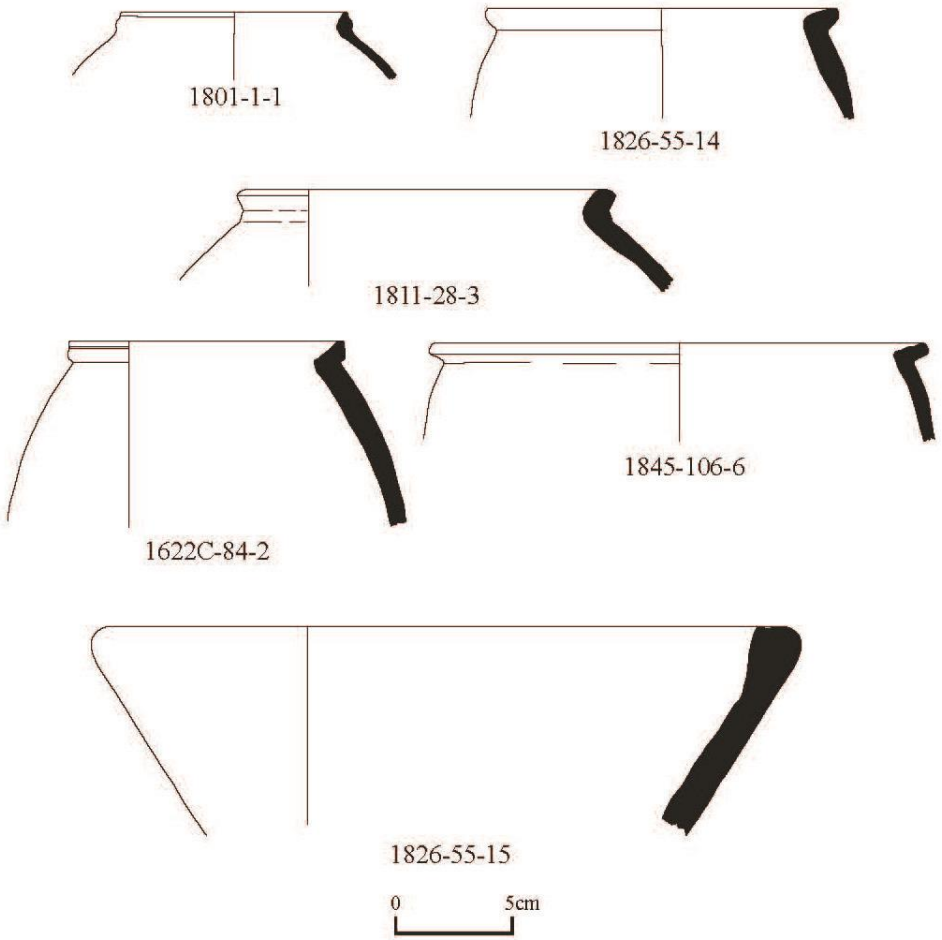


BGW.T1a



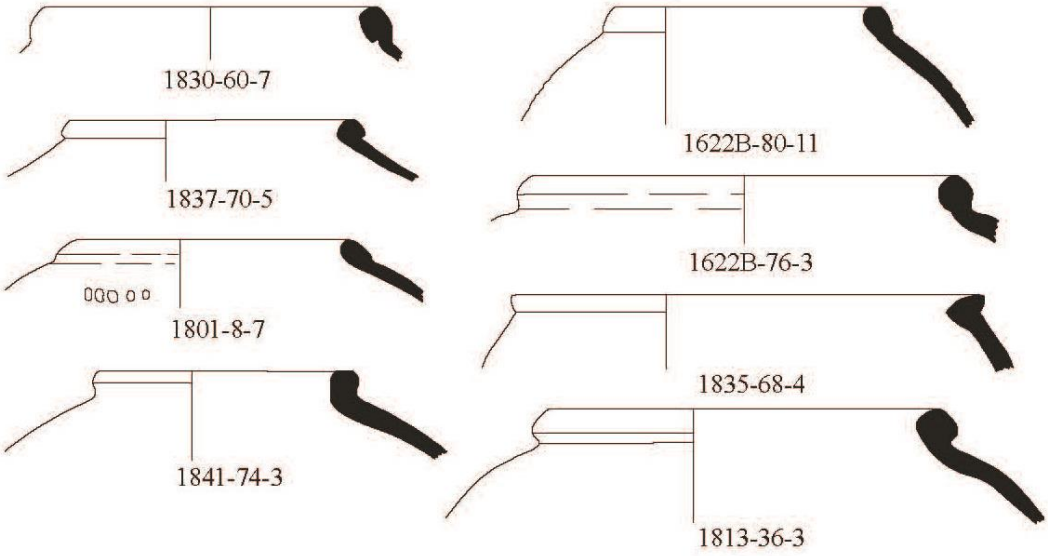
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-8-1	Light greenish buff; mineral; greenish buff/wet hand smoothed; greenish buff/wet hand smoothed; grooved on the exterior; 10cm
1801-8-10	Buff to light brown; mineal; buff/wet hand smoothed; buff/wet hand smoothed; none; 9cm
1827-57-1	Buff green; mineral; none; none; none; 8cm
1827-57-3	Light buff green; mineral; none; none; none; 10cm
1830-60-6	Light buff green; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 15cm
1801-1-6	Dark brown; mineral; none; none; none; 12cm
1801-3-7	Red brown; mineral; none; none; none; 19cm
1840-73-8	Brown; mineral; brown/slipped; brown/slipped; none; 15cm
1840-73-9	Gray; mineral; brown/slipped; brown/slipped; none; 11cm
1622B-79-10	Gray; mineral; none; brown/slipped?; none; 7cm
1622B-79-11	Gray; mineral; none; brown/slipped?; none; 20cm
1622B-80-10	Gray; mineral; none; brown/slipped?; none; 18cm

BGW.T2a

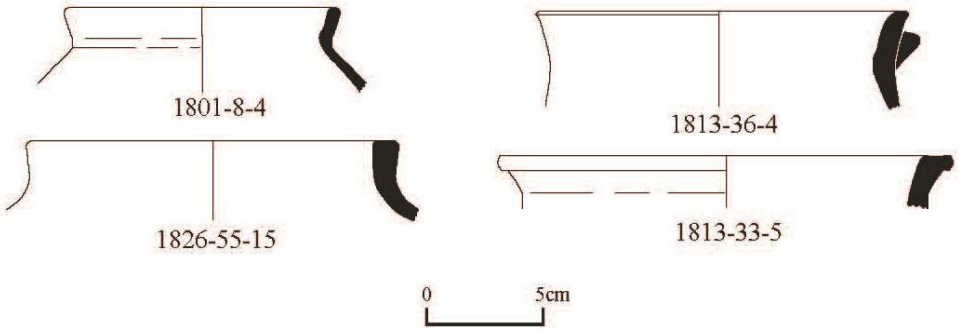


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1826-55-15	Brown; mineral; none; none; none; 14cm
1801-1-1	Light brown; none; none; wavy incised line on the exterior; 17cm
1811-28-3	Light red brown; mineral; none; none; none; 25cm
1826-55-14	Gray; mineral; none; red orange; none; 15cm?
1622C-84-2	Brown; mineral; brown/slipped; brown/slipped; none; 18cm
1845-106-6	Dark gray; mineral; none; none; none; 21cm

BGW.T2b

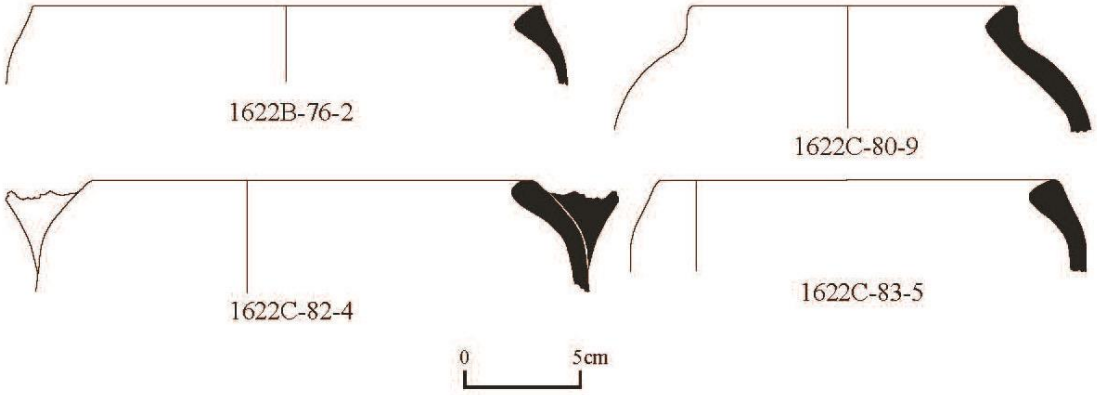


BGW.T2c



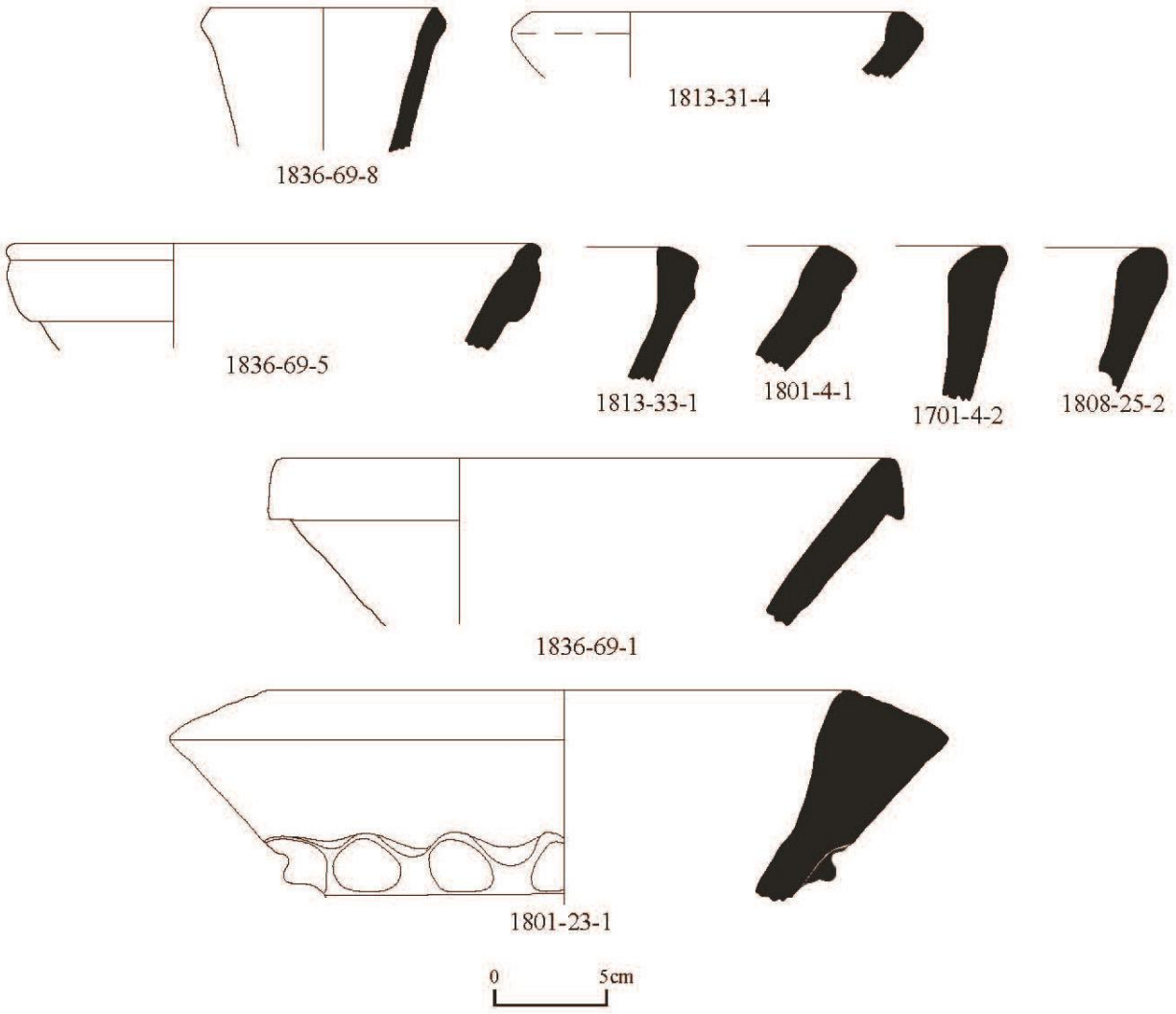
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-2-4	Red brown; mineral; none; none; none; 22cm
1801-8-7	Light brown; mixed; none; red brown/slipped; exterior incised dots; 15cm
1813-36-3	Gray; mineral; none; none; none; 21cm
1830-60-7	Brown; mineral; brown/slipped; brown/slipped; none; 14cm
1835-68-4	Red brown; vegetal; white/slipped; greenish white/slipped; exterior appliqué strip; 27cm
1837-70-5	Red brown; mineral; none; none; none; 15cm
1841-74-3	Buff; mineral; light brown/slipped; light brown/slipped; none; 14cm
1622B-76-3	Gray; mineral; none; light brown/slipped; none; 18cm
1622B-80-11	Gray; mineral; none; brown/slipped; none; parallel incised lines on exterior; 18cm
1801-8-4	Light red brown; mineral; none; red orange/slipped; none; 12cm
1813-33-5	Dark brown; mineral; none; none; none; 17cm
1813-36-4	Light brown; mineral; none; none; none; 15cm
1826-55-15	Brown; mineral; none; none; none; 14cm

BGW.T3a



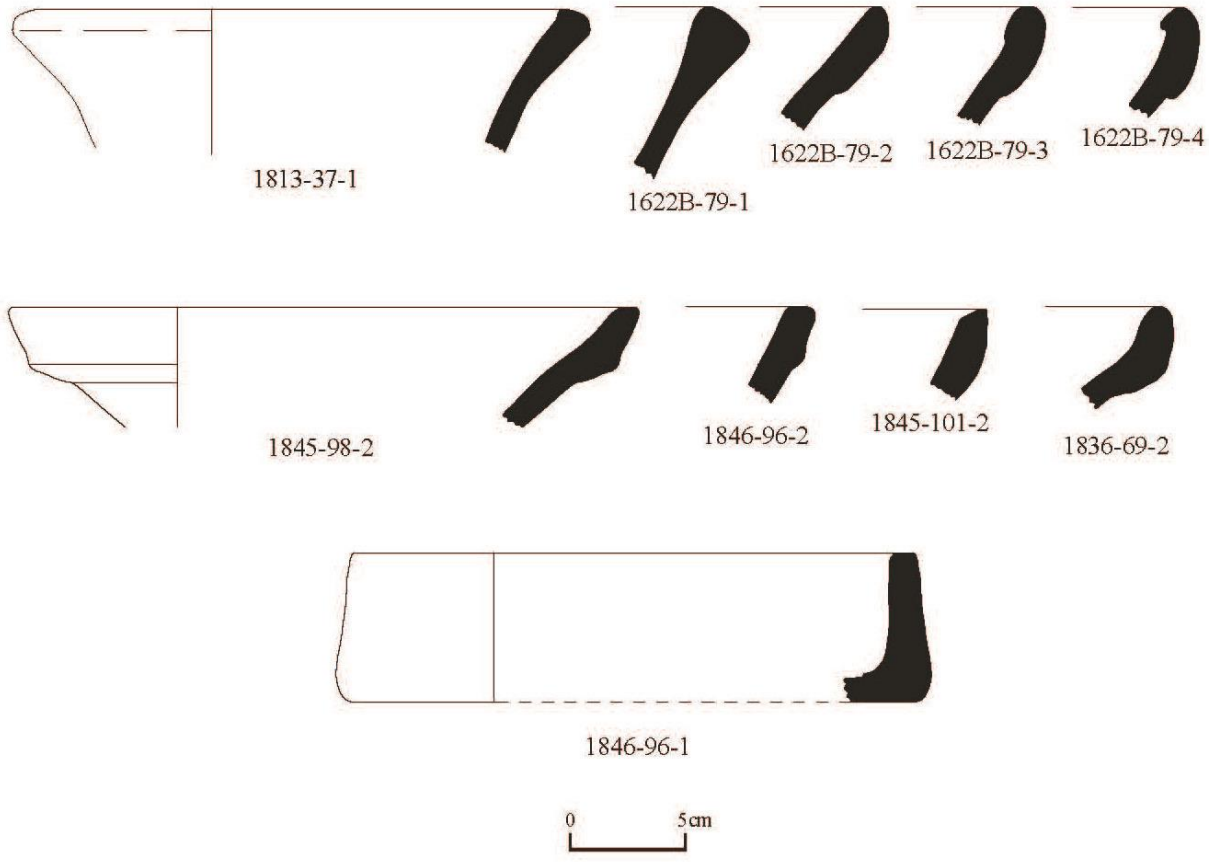
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1622B-76-2	Gray; mineral; red brown/slipped; red brown/slipped; none; 22cm
1622B-80-9	Brown; mixed; none; brown/slipped; none; 14cm
1622C-82-4	Brown; mineral; brown/slipped; brown/slipped; none; 24
1622C-83-5	Brown; mineal; brown/slipped; brown/slipped; none; 28cm

GCW.T1



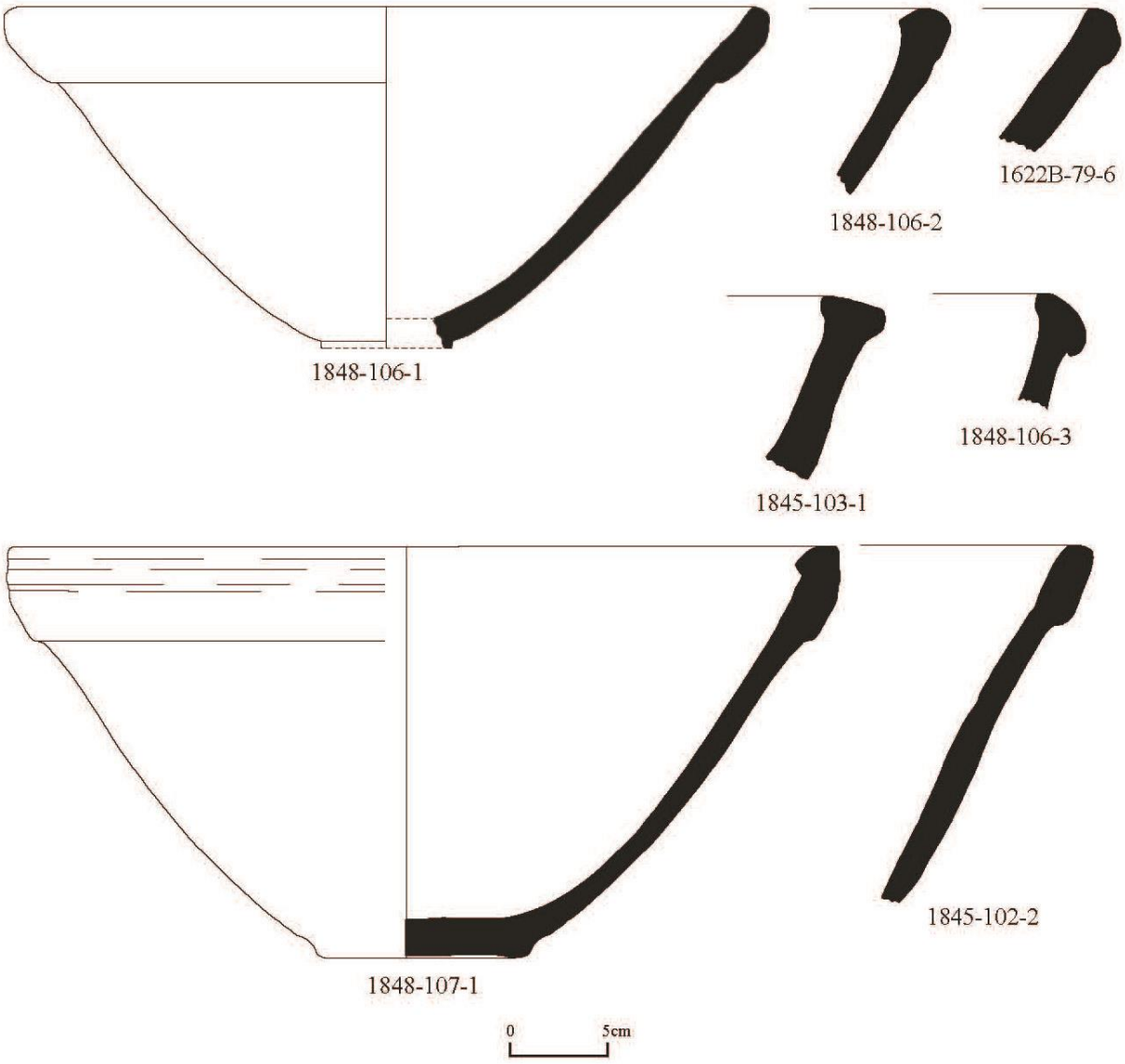
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1806-23-1	Dark buff; vegetal; none; none; wawy appliqé decoration; 54cm
1813-31-4	Light buff green; mixed; none; none; none; 26cm
1813-33-1	Light buff; mineral; none; none; none; 45cm?
1836-69-1	Buff; mineral; none; none; none; 38cm
1836-69-5	Yellow; mineral; none; none; none; 32cm
1836-69-8	Light buff green; mineral; none; none; none; 10cm
1801-4-1	Light buff green; mineral; none; none; none; 48cm
1801-4-2	Light buff green; mineral; none; none; none; 36cm
1808-25-2	Light buff green; mineral; none; none; none; 52cm?

GCW.T1



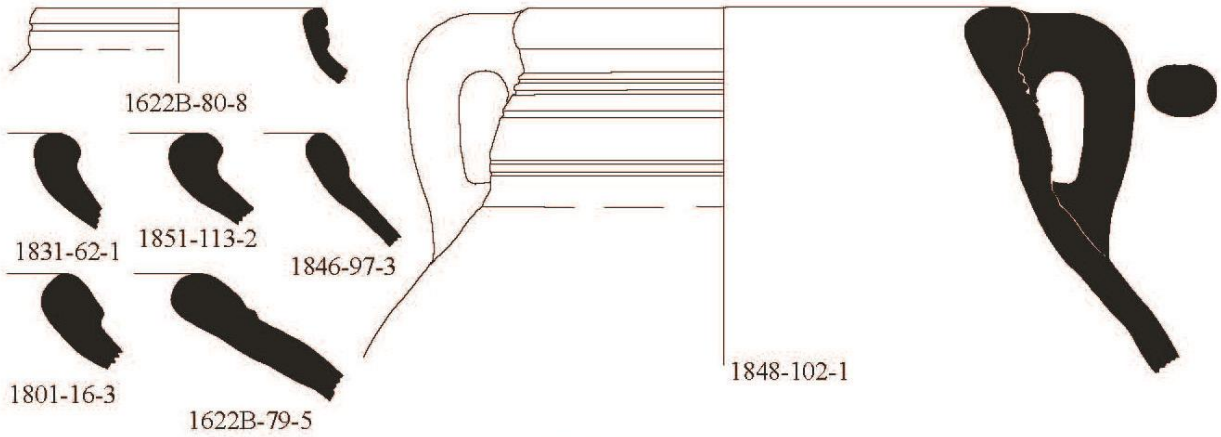
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1813-37-1	Green; mineral; green/slipped; green/slipped; none; 32cm
1622B-79-1	Buff; mixed; none; none; none; 38cm
1622B-79-2	Light greenish buff; mineral; buff/wet hand smoothed; buff/wet hand smoothed; none; 40cm
1622B-79-3	Light yellowish buff; minreal; light buff/slipped; light buff/slipped; none; 35cm
1622B-79-4	Light yellowish buff; minreal; light buff/slipped; light buff/slipped; none; 31cm
1846-96-1	Dark green; mixed; buff/slipped; buff/slipped; none; 40cm
1846-96-2	Buff; mineral; none; none; none; 37cm
1845-98-2	Yellow; mineral; none; brown/slipped; none; 40cm
1836-69-2	Buff green; mineral; none; none; none; 38cm
1845-101-2	Green; mineral; green/slipped; green/slipped; none; 40cm

GCW.T1

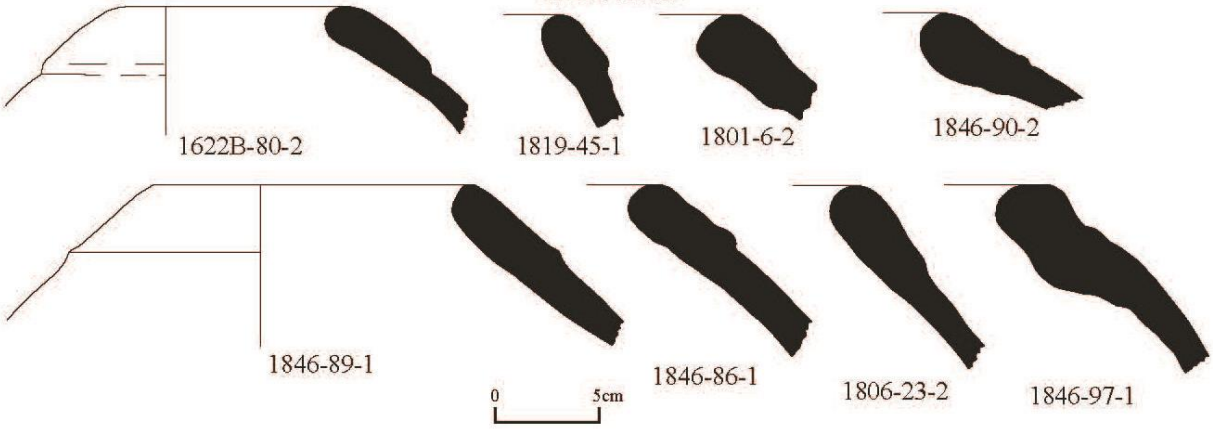


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1845-102-2	Green, mineral; light buff green/slipped; light buff green/slipped; none; 43cm
1845-103-1	Brown; mixed; buff/slipped; buff/slipped; none; 33cm
1848-106-2	Green; vegetal; buff green/slipped; buff green/slipped; none; 43cm
1848-106-3	Light greenish buff; mixed; light buff/slipped; light buff/slipped; none; 39cm
1622B-79-6	Light buff green; mineal; none; none; none; 25cm?
1848-106-1	Brown; mineral; buff/slipped; buff/slipped; none; 34cm
1849-107-1	Green; vegetal; green/slipped; green/slipped; none; 40cm

GCW.T2

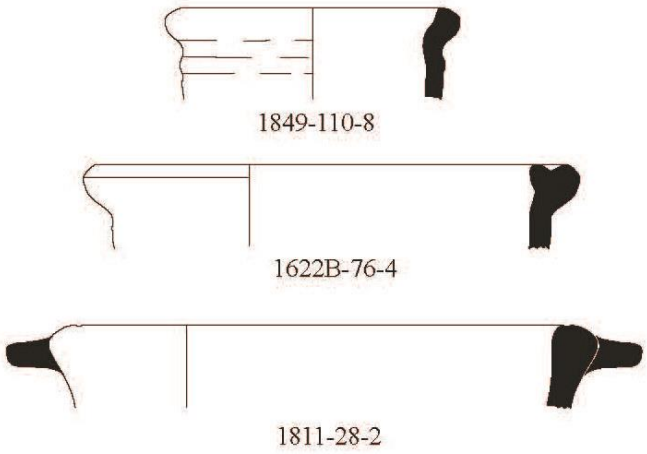


GCW.T3

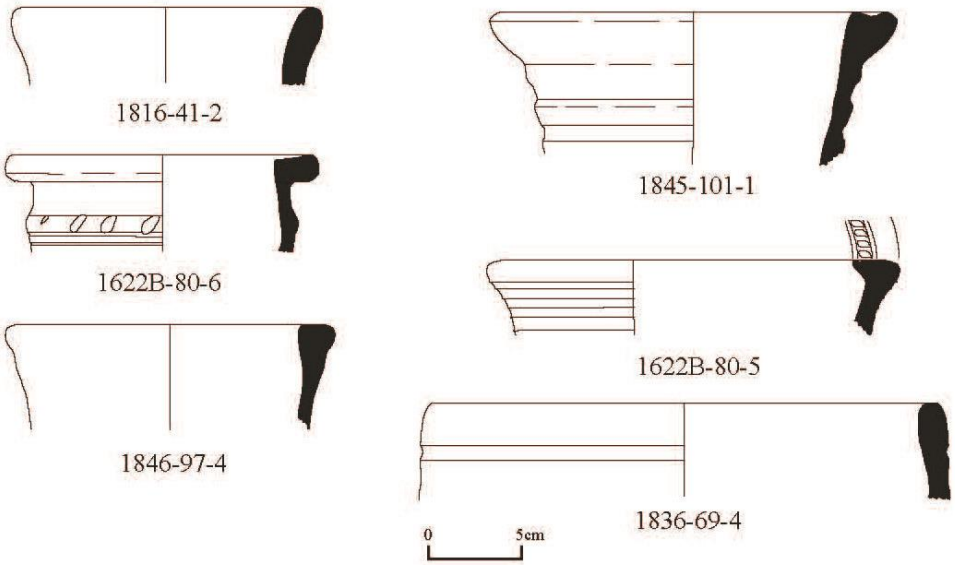


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-16-3	Dark buff; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 17cm
1622B-79-5	Light pinkish buff; mineral; none; none; none; 14cm
1622B-80-8	Light buff green; mineral; none; none; none; 12cm
1831-62-1	Buff; mineral; none; none; none; 12cm
1846-102-1	Green; mixed; light buff green/wet hand smoothed; light buff green/wet hand smoothed; none; 24cm
1851-113-2	Buff; mineral; buff/slipped; buff/slipped; none; 15cm
1846-97-3	Light green; mineral; light green/slipped; light green/slipped; none; 13cm
1622B-80-2	Light yellowish buff; mineral; none; none; none; 15cm
1801-6-2	Light greenish buff; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 14cm?
1806-23-2	Light buff green; minreal; none; none; none; 24cm
1819-45-1	Light buff; mineral; none; none; none; 18cm
1846-86-1	Light yellowish buff; mineral; bitumen splashes; none; none; 15cm
1846-97-1	Light buff green; mineral; light green/slipped; light green/slipped; none; 15cm
1846-89-1	Light pinkish buff; mineral; none; none; none; 18cm
1846-90-2	Pink; mineral; light buff/slipped; light buff/slipped; none; 14cm

GCW.T4

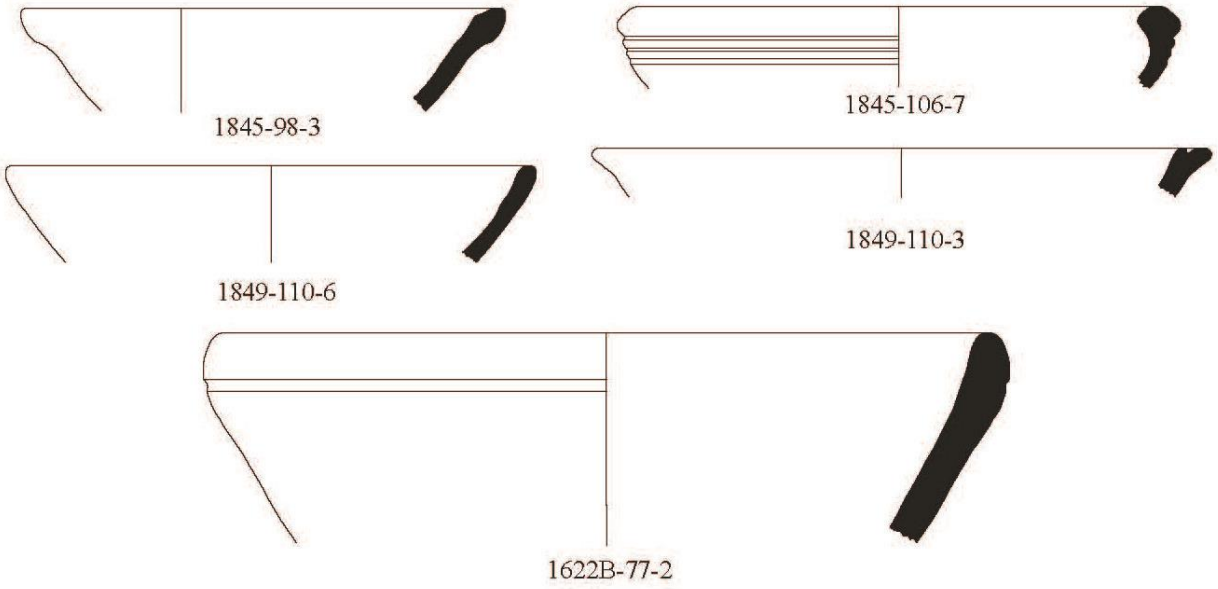


GCW.T5

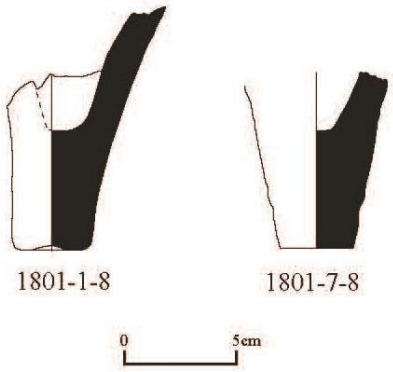


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1811-28-2	Dark buff; mineral; light buff/slipped; light buff/slipped; none; 32cm
1622B-76-4	Light red; mineral; buff/slipped; buff/slipped; none; 28cm
1849-110-8	Buff; mineral; light buff/slipped; light buff/slipped; none; 11cm
1816-41-2	Dark buff; vegetal; brown/slipped; brown/slipped; none; 12cm
1836-69-4	Buff; mineral; light buff/slipped; light buff/slipped; none; 22cm
1622B-80-5	Buff; mineral; light buff/slipped; light buff/slipped; none; 19cm
1622B-80-6	Light green; mineral; light buff green/slipped; light buff green/slipped; oblique stabs above parallel incised lines; 13cm
1845-101-1	Light yellow; mineral; none; none; none; 14cm
1846-97-4	Buff; mineral; Light buff/slipped; light buff/slipped; trace of bitumen (?) on the rim; 12cm

GCW.T6

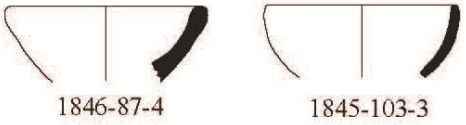


TJS

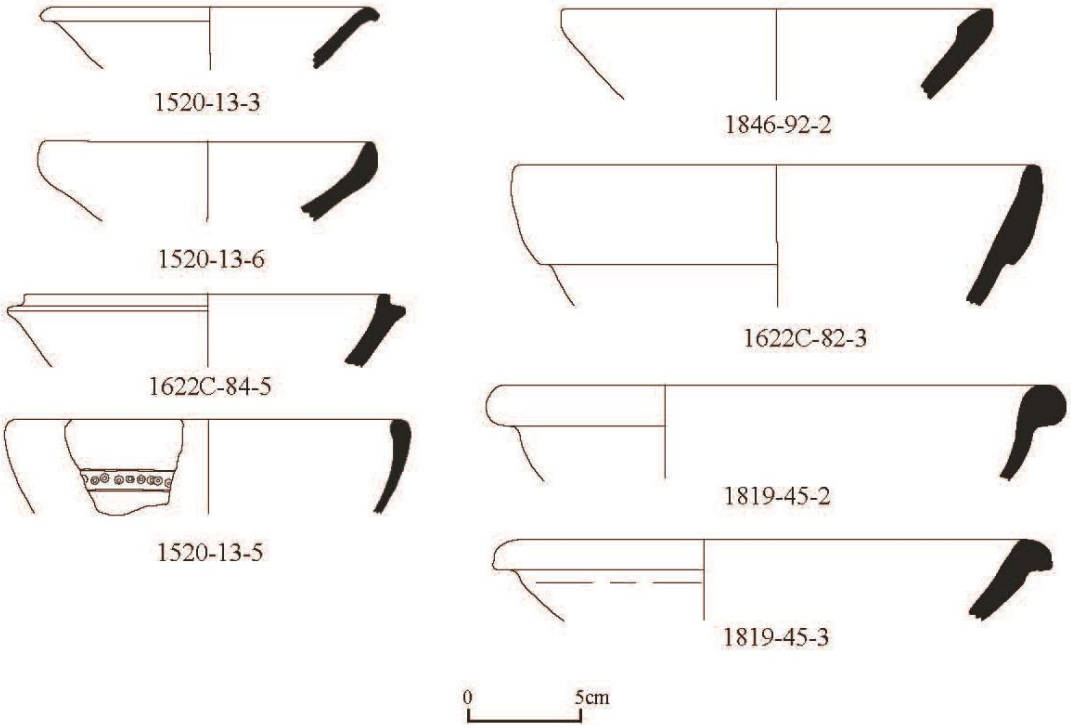


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1622B-77-2	Light yellowish buff; mineral; none; none; none; 33cm
1845-98-3	Light brown; mineral; none; none; none; 27cm
1845-106-7	Brown; mineral; white/slipped; white/slipped; none; 22cm
1849-110-3	Buff; mineral; none; none; none; 26cm
1849-110-6	Brown; mineral; light buff/slipped; light buff/slipped; none; 21cm
1801-1-8	Red brown; mineral; none; none; none; 3cm
1801-7-8	Light brown; mineral; trace of bitumen; none; none; 3cm

ICW.T1

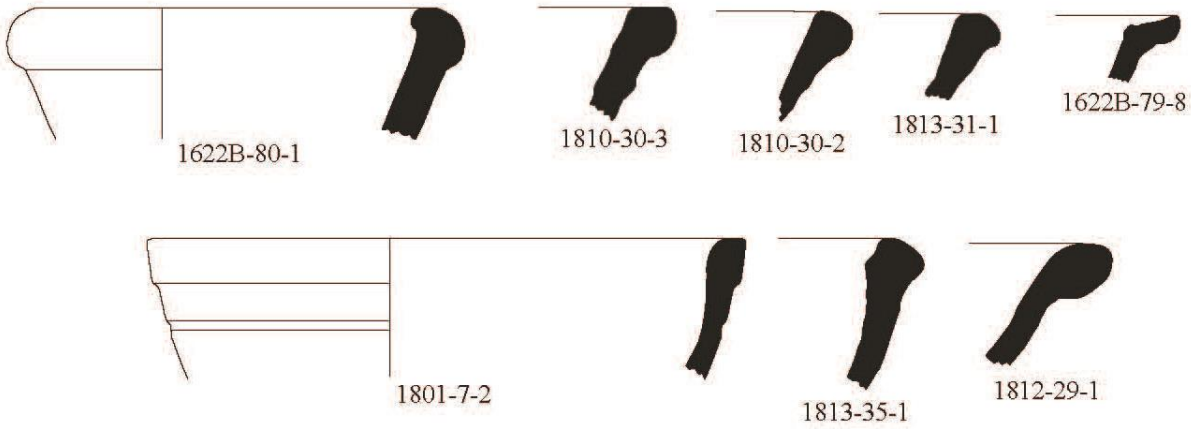


ICW.T2

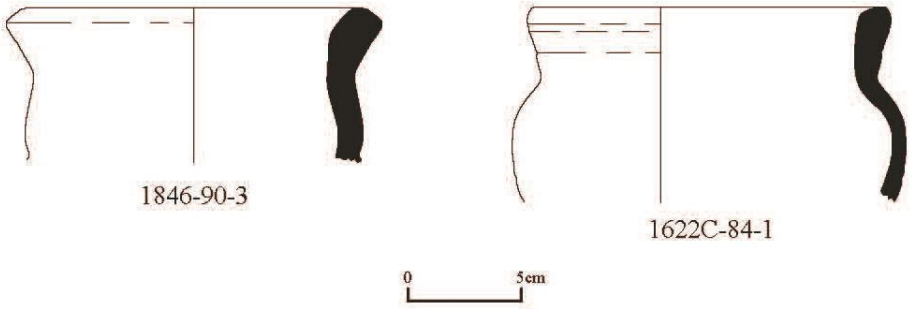


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1846-87-4	Buff; mineral; white/slipped; white/slipped; none; 8cm
1845-103-3	Green; mineral; none; none; none; 8cm
1520-13-3	Buff; mineral; none; none; none; 12cm
1520-13-5	Dark buff; mineral; none; none; parallel incised lines and incised dots; 16cm
1520-13-6	Dark buff; light green (or degraded green)/glaze; light green (or degraded green)/glaze); none; 14cm
1819-45-2	Light buff; mineral; light buff/slipped; light buff/slipped; none; 32cm
1819-45-3	Buff to light brown; mineral; buff/slipped; buff/slipped; none; 27cm
1622C-82-3	Buff; mineral; none; none; none; 22cm
1622C-84-5	Brown; mineral; none; none; none; grooved and corrugated decoration on the neck; 15cm
1846-92-2	Green; mixed; buff/slipped; buff/slipped; none; 18cm

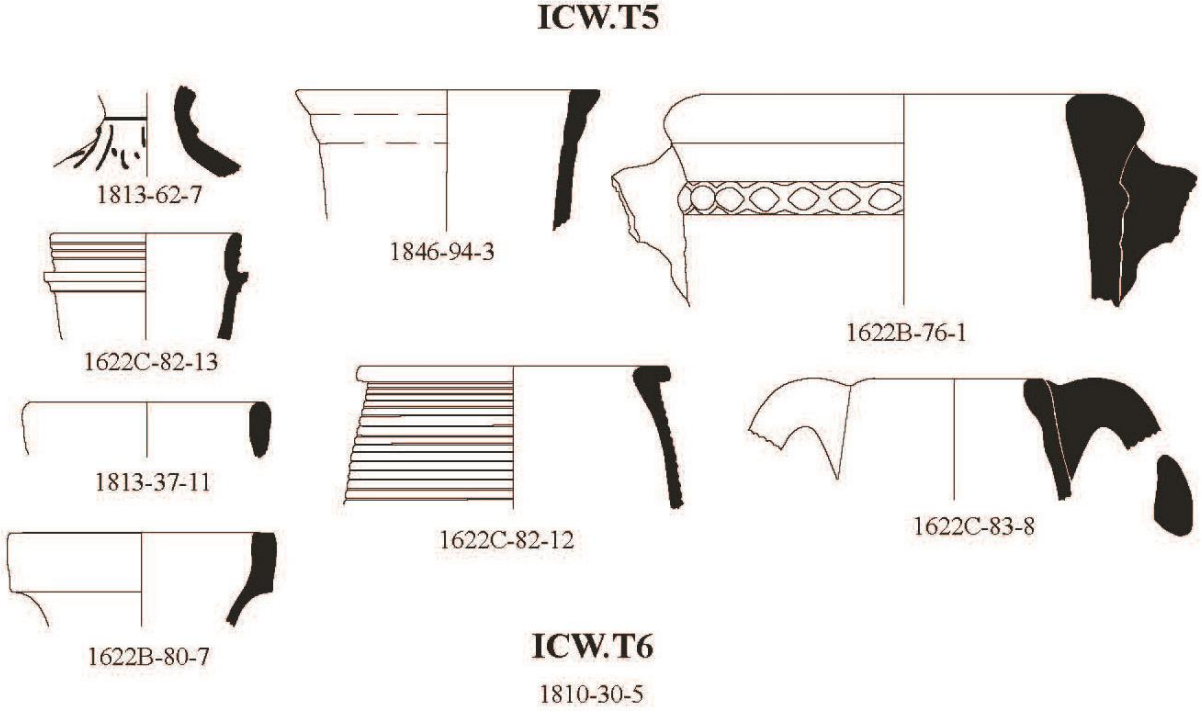
ICW.T3

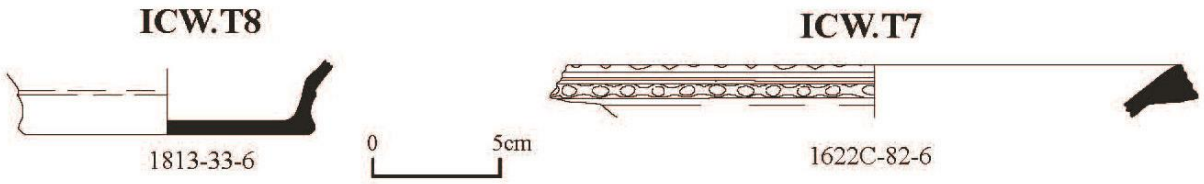


ICW.T4



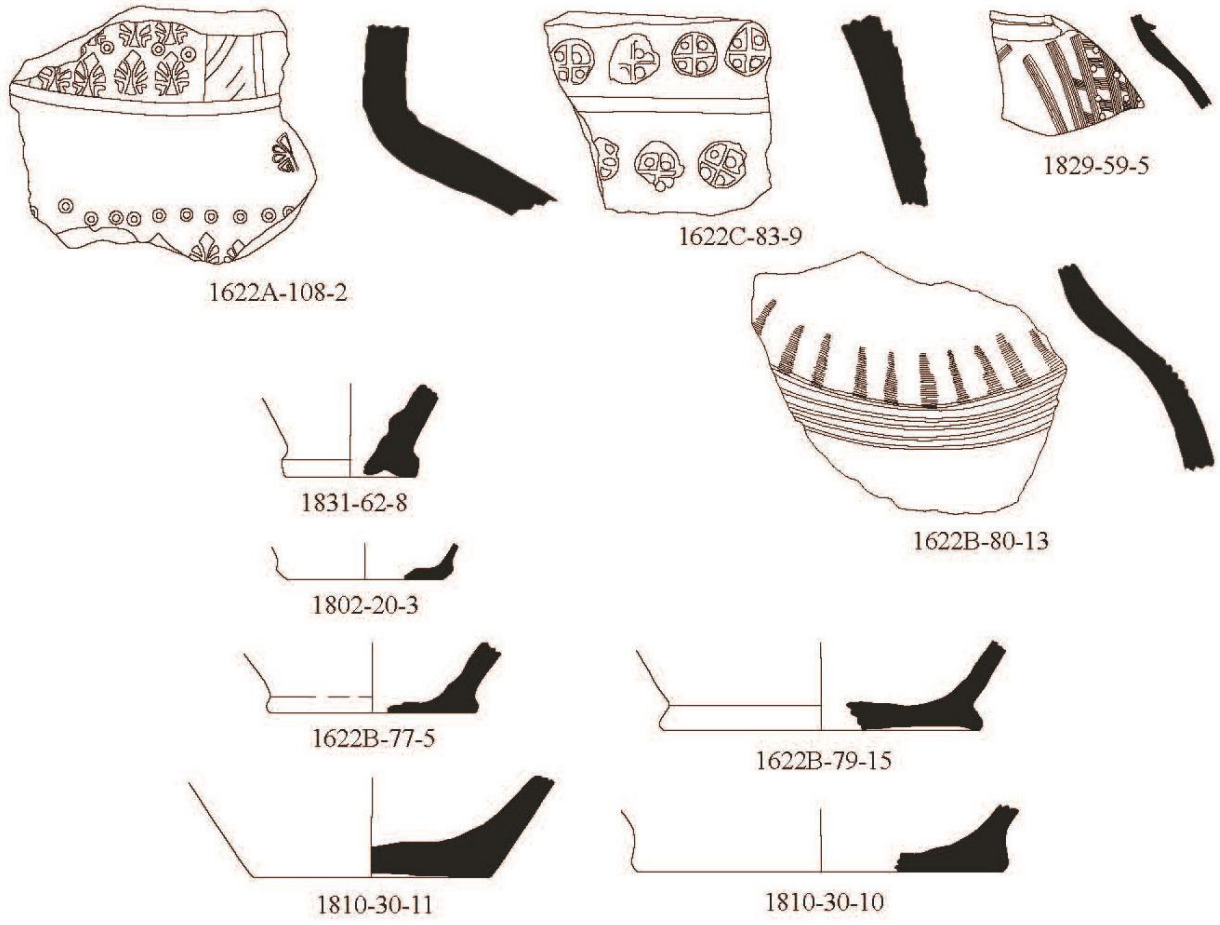
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1812-29-1	Light buff green; mineral; none; none; none; 54cm?
1810-30-2	Light greenish buff; mineral; light buff/slipped; light buff/slipped; none; 37cm
1810-30-3	Light greenish buff; mineral; light buff/slipped; light buff/slipped; none; 34cm
1813-31-1	Light buff green; mineral; light buff/wet hand smoothed; light buff/wet hand smoothed; none; 27cm
1813-35-1	Light buff green; mineral; none; none; none; 30cm
1622B-79-8	Buff; mineral; none; none; none; 36cm
1622B-80-1	Green; mixed; buff green/slipped; buff green/slipped; none; 22cm
1801-7-2	Light buff green; mineral; light yellowish buff/wet hand smoothed; light yellowish buff/wet hand smoothed; none; 34cm
1622C-84-1	Buff; mineral; none; buff/slipped; none; 19cm
1846-90-3	Brown; mineal; buff/slipped; buff/slipped; none; 14cm





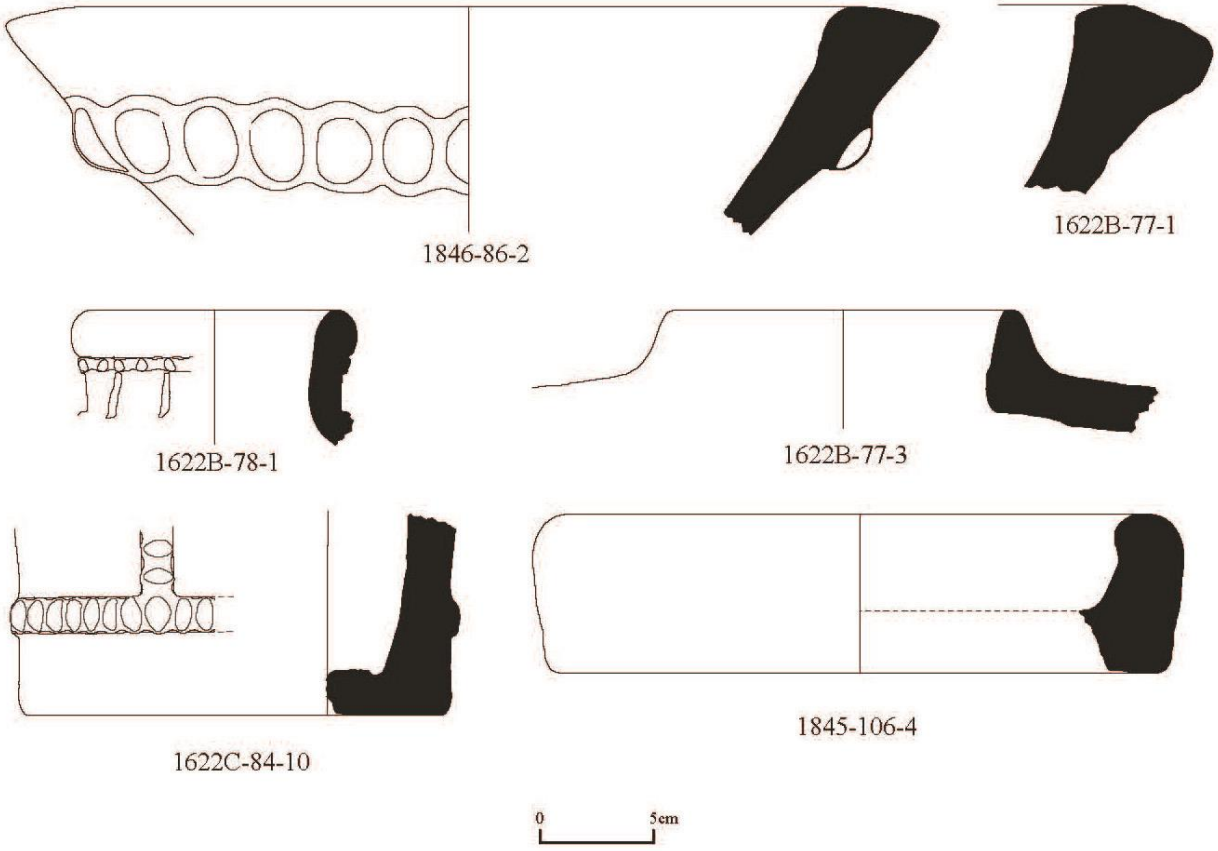
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1813-37-11	Light buff green; mineral; none; none; none; 9cm
1831-62-7	Light greenish buff; mineral; none; none; black painted lines around the neck and on the shoulder; --
1622B-80-7	Buff; mineral; none; none; none; 9cm
1622C-82-12	Light greenish buff; mineral; none; none; corrugated exterior; 12cm
1622C-82-13	Brown; mineral; none; none; none; grooved and corrugated decoration on the neck; 7cm
1622C-83-8	Buff; mineral; light buff/slipped; light buff/slipped; none; 6cm
1846-94-3	Light pinkish buff; mineral; buff/wet hand smoothed; buff/wet hand smoothed; none; 10cm
1622B-76-1	Buff; mineral; light buff/slipped; light buff/slipped; none; 14cm
1810-30-5	Light greenish buff; mineral; none; none; none; 15cm
1622C-82-6	Buff; minreal; none; none; corrugated rim with incised decoration; 24cm
1813-33-6	Light buff; mineral; none; none; none; 11cm

ICW.TU



Sherd Number Site-Lot-Sherd	Description: Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1802-20-3	Buff; minreal; none; none; none; 6cm
1810-30-10	Light greenish buff; mixed; none; none; none; 14cm
1810-30-11	Brown; minreal; white/slipped; white/slipped; none; 9cm
1829-59-5	Light yellowish buff; mineral; none; none; combed incision in a basket wowen pattern interspersed with circular impressions on the exterior; -
1831-62-8	Buff; mineral; none; none; none; 5cm
1622B-77-5	Red; mineral; none; none; none; 8cm
1622B-79-15	Light greenish buff; mineral; none; none; none; 12cm
1622B-80-13	Light yellowish buff; mineral; none; none; hatched incised decoration above grooved shoulder; -
1622C-83-9	Buff; minreal; light buff/slipped; light buff/slipped; rows of circular appliqué decoration on the exterior; --
1622A-108-2	Greenish buff; mixed; none; buff/wet hand smoothed; stamped floral decoration on the exterior; --

IRW.T1

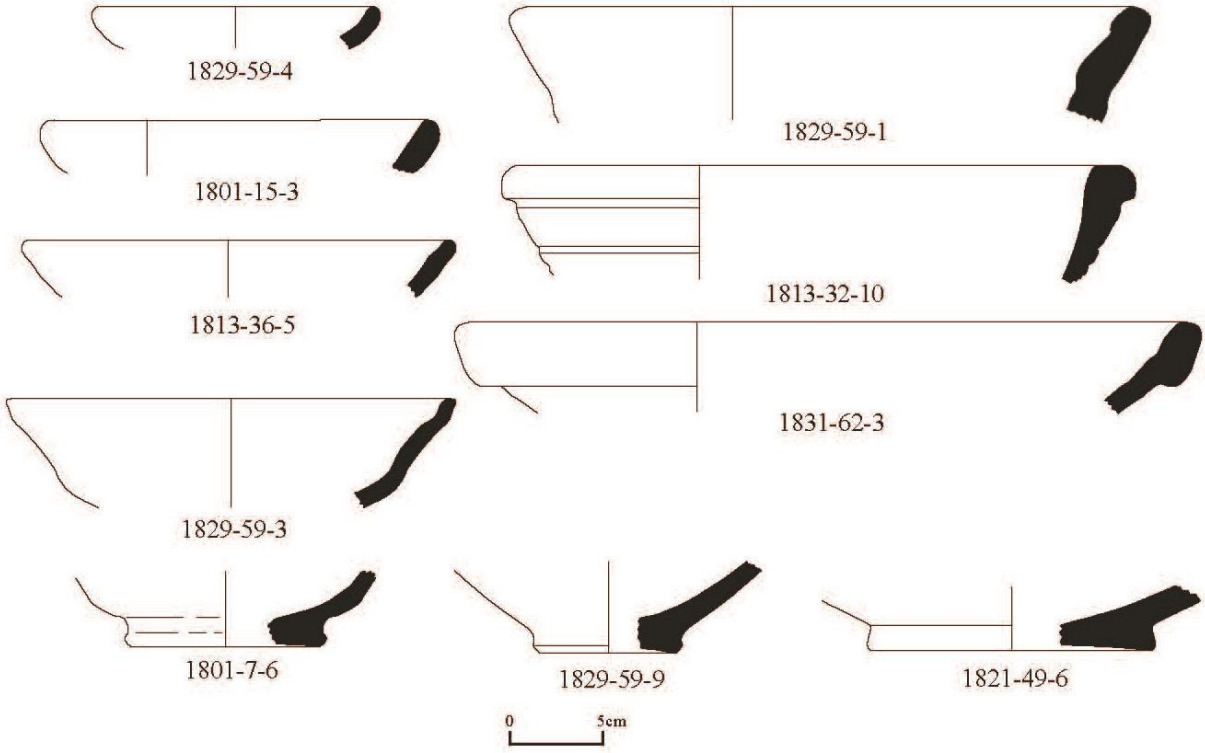


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1622B-77-1	Pink; vegetal; light buff/slipped with bitumen trace; light buff/slipped with bitumen trace; none; 52cm
1622C-84-10	Greenish buff; mixed; none; none; two perpendicular applique bands with finger impression on the exterior; 30cm
1846-86-2	Light brown; vegetal; none; red-brown/slipped; finger impressed appliqué band on the exterior; 67cm
1845-106-4	Brown; vegetal; buff/slipped; buff/slipped; none; ?
1622B-77-3	Greenish buff; vegetal; none; greenish buff/slipped; none; 14cm
1622B-78-1	Green; mixed; yellow/slipped; yellow/slipped; incised horizontal and vertical lines on the exterior; 10cm

II. GLAZEWARE

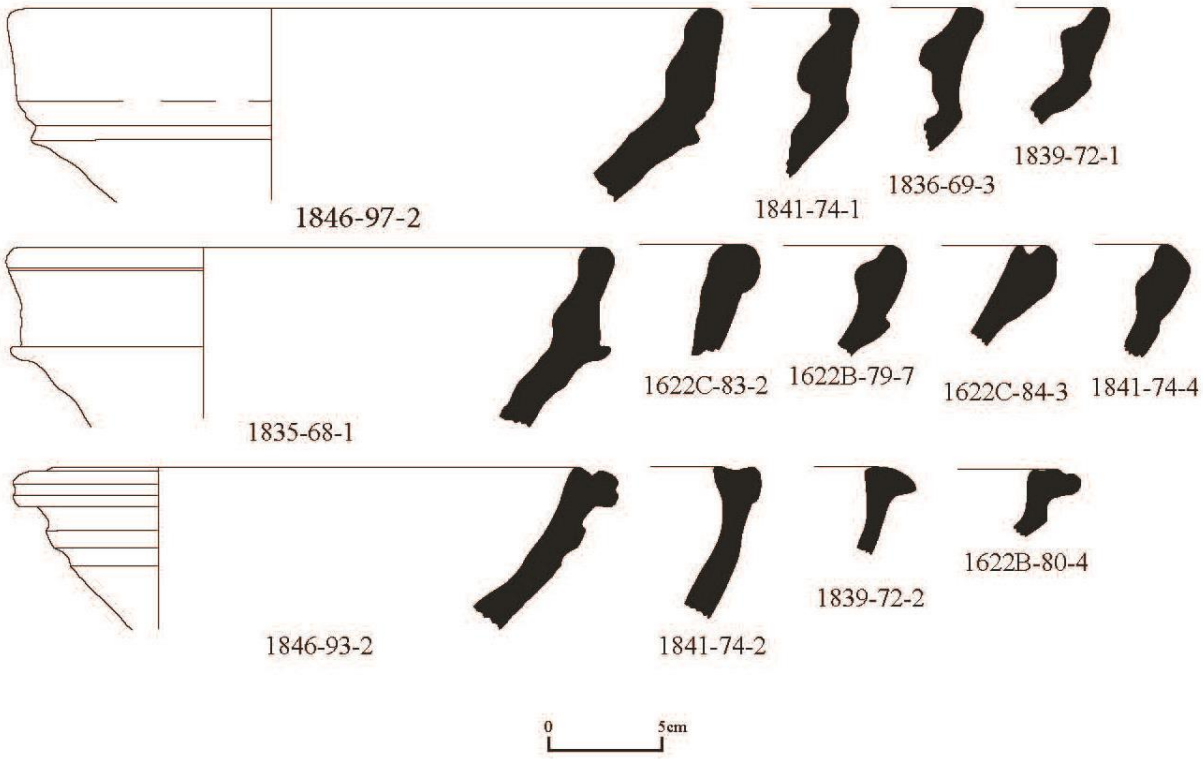
MBG1

MBG2



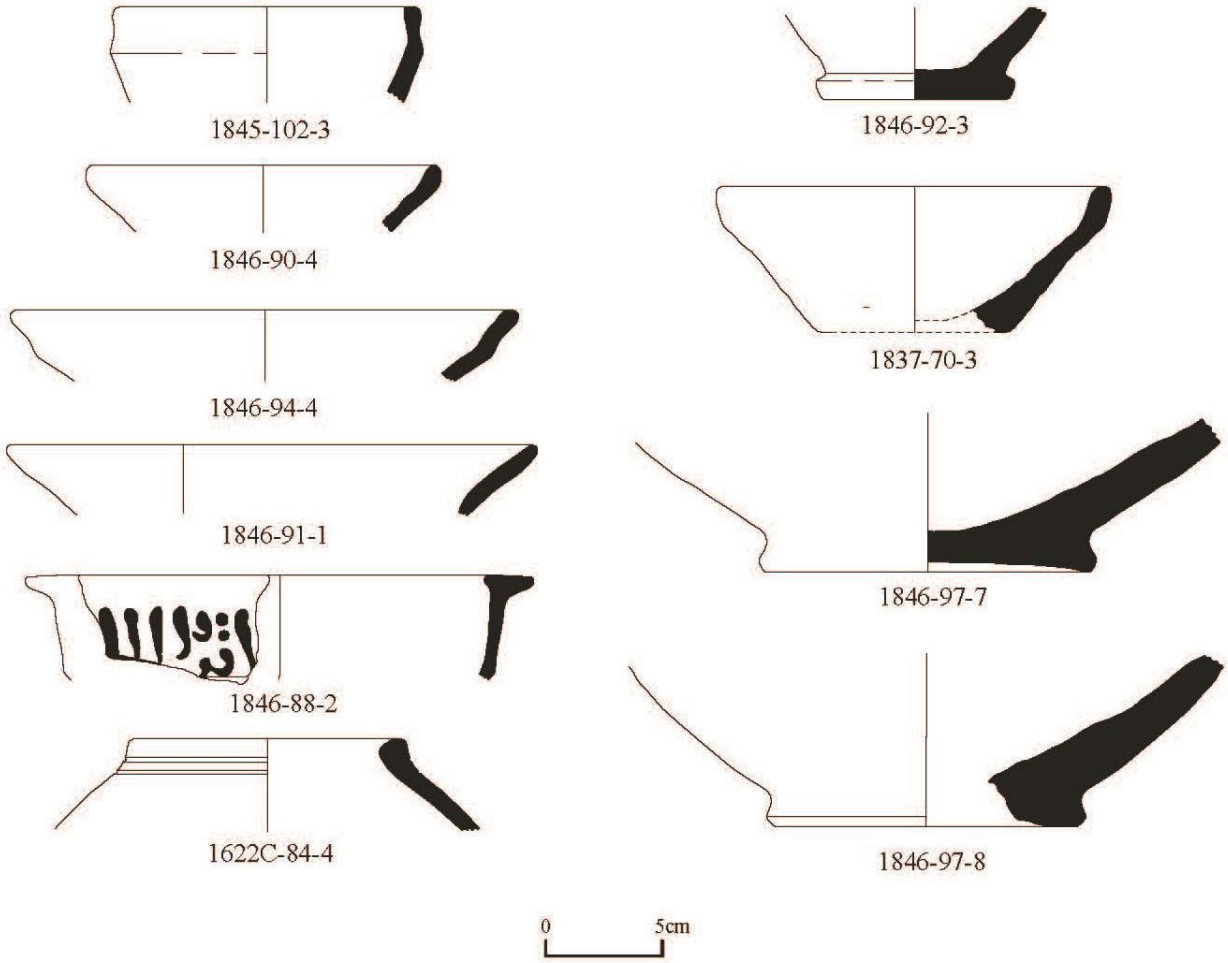
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-8-13	Buff; mineral; blue green/glazed; blue green/glazed; none; 15cm
1846-93-8	Buff; mineral; turquoise/glazed; turquoise/glazed; none; 7cm
1801-7-6	Dark buff; minral; blue green/glazed; blue green/glazed; none; 8cm
1801-15-3	Dark buff; mineral; turquoise/glazed; turquoise/glazed; none; 24cm
1813-32-10	Light yellowish buff; mineral; blue green/glazed; blue/glazed; purple incised lines on the exterior; 34cm
1813-36-5	Dark buff; mineral; blue green/glazed; blue green/glazed; none; 19cm
1821-49-6	Buff; mineral; blue green/glazed; blue green/glazed; none; 12cm
1829-59-1	Light buff; minreal; trace of pea green glaze/trace of pea green glaze; none; 35cm
1829-59-3	Buff; mineral; blue green/glazed; blue green/glazed; none; 19cm
1829-59-4	Bufff; mineral; dark blue green/glaze; dark blue green/glaze; none; 12cm
1829-59-9	Bufff; mineral; dark blue green/glaze; dark blue green/glaze; none; 6cm
1831-62-3	Light yellowish buff;mineral; light green to milky white/glaze; none; none; 42cm

MBG2



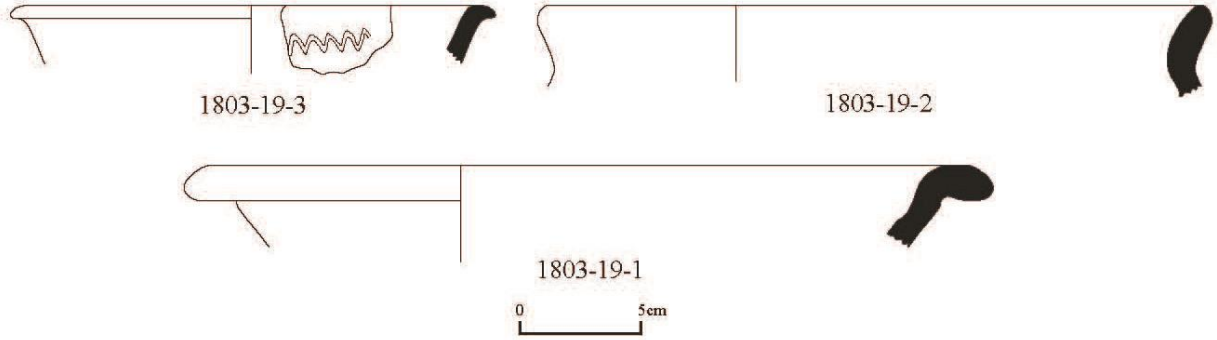
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1846-97-2	Light buff brown; mineral; blue green/glazed; blue green/glazed; none; 37cm
1841-74-1	Buff; mineral; blue green/glazed; blue green/glazed; none; 25cm
1836-69-3	Brown; mixed; none; none; none; 26cm
1839-72-1	Buff; mineral; blue green/glazed; blue green/glazed; none; 36cm
1835-68-1	Pink; mineral; blue green/glazed; blue green/glazed; none; 33cm
1622C-83-2	Light yellowish buff; mineral; blue green/glazed; blue green/glazed; none; 32cm
1622B-79-7	Buff; mineral; blue/glazed; blue/glazed; none; 36cm
1622C-84-3	Brown; mineral; blue/glazed; blue/glazed; none; 24cm
1841-74-4	Buff; mineral with visible black grit; blue/glazed; blue/glazed; none; 24cm
1846-93-2	Buff; muxed; turquoise/glazed; turquoise/glazed; none; 36cm
1841-74-2	Buff; mineral; blue green/glazed; blue green/glazed; none; 27cm
1839-72-2	Buff; mineral; blue green/glazed; blue green/glazed; none; 10cm
1622B-80-4	Buff; mixed; blue green/glazed; blue green/glazed; none; 29cm

MBG2



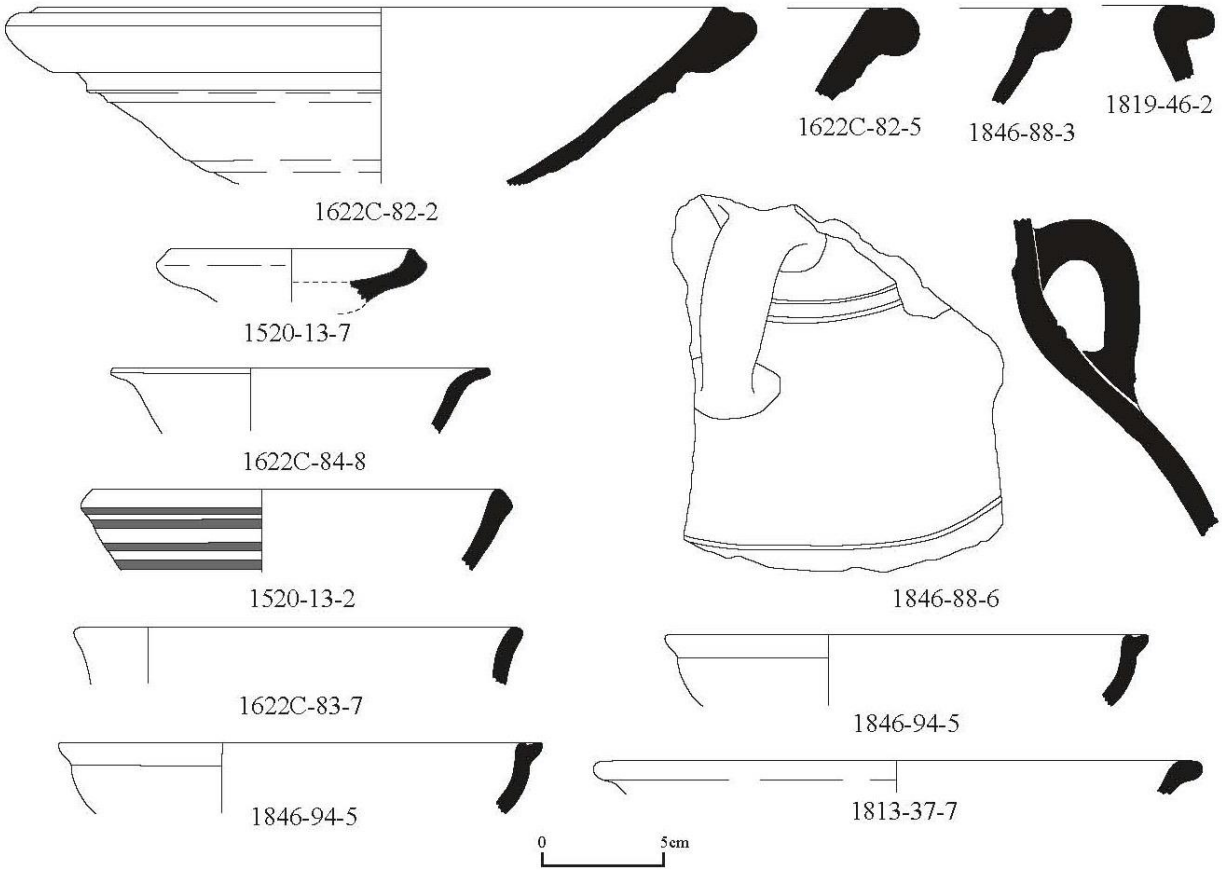
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1845-102-3	Light buff brown; mineral; turquoise/glazed; turquoise/glazed; none; 12cm
1846-92-3	Buff to light brown; mineral; blue green/glazed; blue green/glazed; none; 8cm
1846-90-4	Buff; mineral; blue green/glazed; blue green/glazed; none; 15cm
1837-70-3	Buff; mineral; blue green/glazed; blue green/glazed; none; 16cm
1622C-84-4	Buff; mineral; trace of white or light blue/glaze; trace of white or light blue/glaze; none; 11cm
1846-97-7	Light greenish buff; mixed; turquoise/glazed; turquoise/glazed; none; 14cm
1846-94-4	Buff; mineral; light turquoise to shell white/glazed; light turquoise to shell white/glazed; none; 21cm
1846-97-8	Red brown; mineral; turquoise/glazed; turquoise/glazed; none; 40cm
1846-91-1	Buff; turquoise/glazed; turquoise/glazed; none; 30cm
1846-88-2	Light yellowish buff; mineral; turquoise/glazed; turquoise/glazed; none; 18cm

MBG3



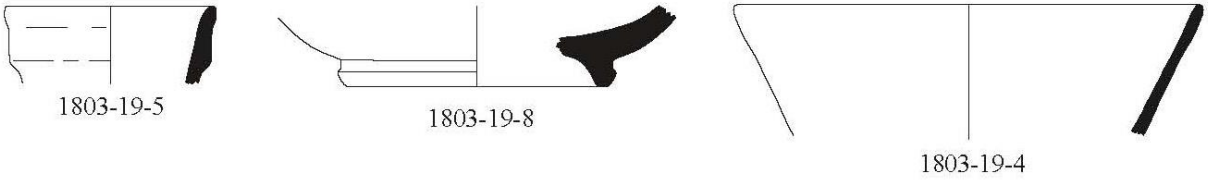
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1803-19-1	Dark buff; mineral; blue green/glazed; blue green/glazed; none; 42cm
1803-19-2	Dark buff; mineral; turquoise/glazed; turquoise/glazed; none; 40cm
1803-19-3	Dark buff; mineral; blue green/glazed; blue green/glazed; incised wavy line under the glaze on the interior; 19cm

MGG2

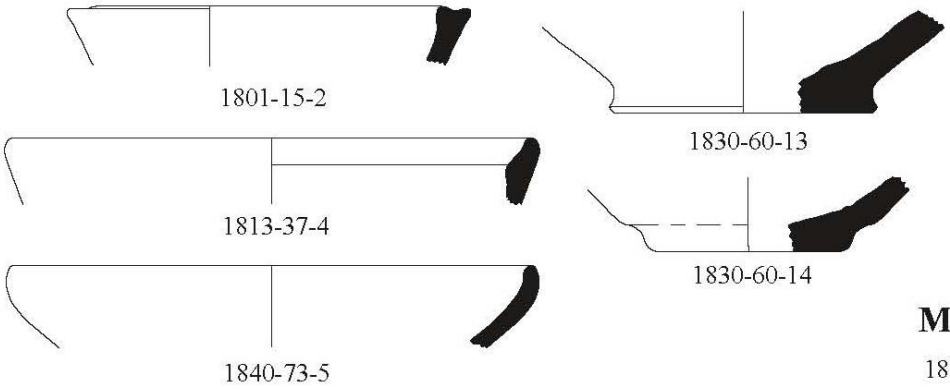


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1846-88-3	Dark buff; mineral; olive green/glazed; none; none; 40cm
1622C-82-5	Yellow; mineral; green/glazed; green/glazed; none; 34cm
1846-88-6	Dark buff; mixed; olive green/glazed; olive green/glazed; none; --
1846-94-5	Pink; mineral; green/glazed; green/glazed; none; 26cm
1824-53-5	Buff; mineral; green/glazed; green/glazed; none; 37cm
1824-53-6	Buff; mineral; blue/glazed; blue/glazed; none; 14cm
1824-53-7	Light buff yellow; mixed; light blue/glazed; light blue/glazed; none; 19cm
1520-13-2	Buff; mineral; green/glazed; green/glazed; interior glazed preserved (designed?) as strips of green over a light green background; 20cm?
1520-13-7	Dark buff; mineral; light green or white/glazed; light green or white/glazed; none; 10cm
1813-37-7	Buff; mineral; light green/glazed; light green/glazed; none; 24cm
1819-46-2	Buff; mineral; blue green/glazed; none; none; 17cm
1622C-82-2	Red brown; mineral; green/glazed also on the rim; none; none; 29cm
1622C-83-7	Buff; mineral; olive green/glazed; olive green/glazed; none; 23cm?
1622C-84-8	Brown; minreal; greenish white/glazed; greenish white/glazed; none; 21cm
1846-94-5	Pink; mineral; green/glazed; green/glazed; none; 26cm

MGG3



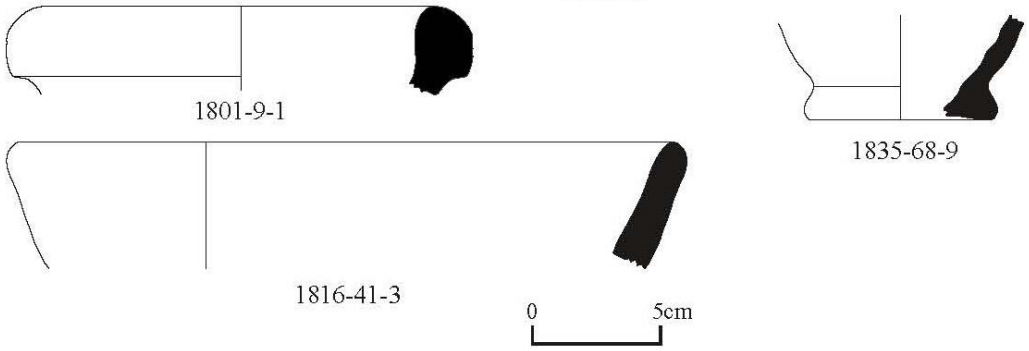
MYG1



MYG2

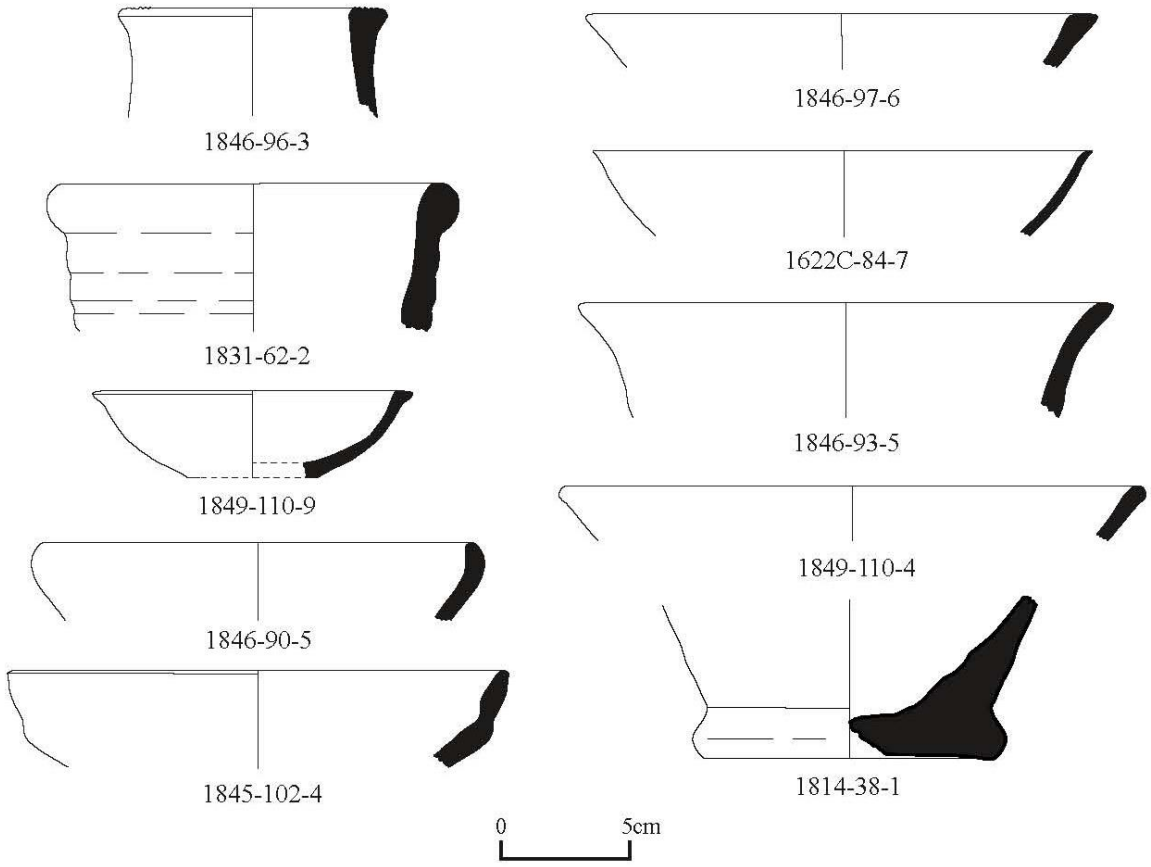
1801-5-5

DBG



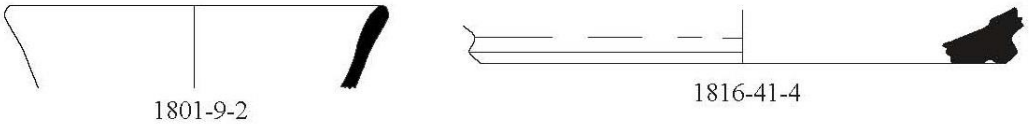
Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1803-19-4	Dark buff; mineral; light olive green/glazed; light olive green/glazed; none; 18cm
1803-19-5	Dark buff; mineral; olive green/glazed; olive green/glazed; none; 8cm
1803-19-8	Dark brown; mineral; olive green/glazed; olive green/glazed; none; 10cm
1801-15-2	Dark buff; mineral; degraded white or light green/glazed; none; none; 18cm?
1813-37-4	Buff; mineral; degraded white or light green/glazed; degraded white or light green/glazed; none; 20cm
1830-60-13	Buff; mineral; none; none; none; 10cm
1830-60-14	Buff; mineral; yellowish white/glazed; yellowish white/glazed; none; 7cm
1840-73-5	Buff; mineral; white/glazed; white/glazed; none; 20cm
1801-9-1	Dark buff; mineral; green/glazed; dark mustard/glazed; none; ?
1816-41-3	Buff; mineral; dark green blue/glazed; dark green blue/glazed; none; 36cm
1835-68-9	Buff; mineral; dark blue/glazed; dark blue/glazed; none; 7cm

OWG

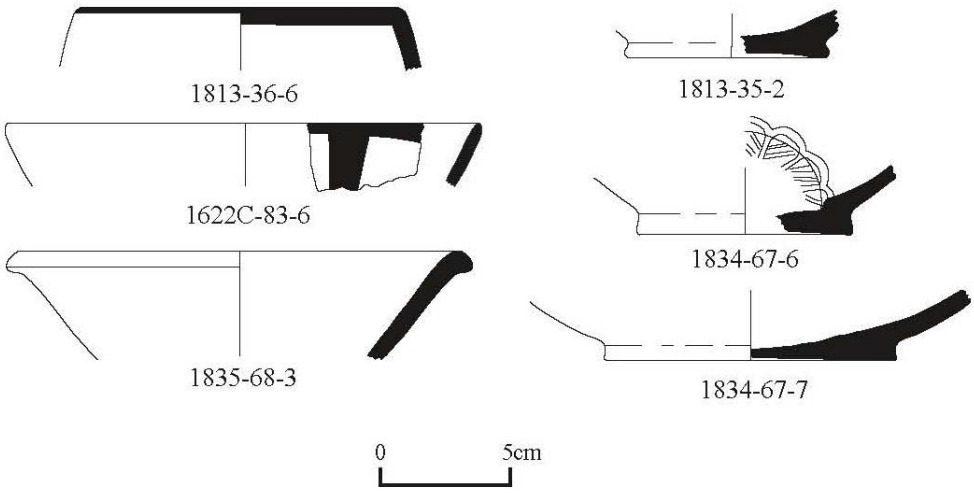


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1814-38-1	Buff; mineral; White or degraded blue/glazed; white or degraded blue/glazed; none; 11cm
1831-62-2	Light yellowish buff; mineral; white/glazed; none; none; 14cm
1622C-84-7	White; ?; shell white/glazed; shell white/gazed; none; 19cm
1846-90-5	Buff; mineral; shell white/glazed; shell white/glazed; none; 17cm
1846-93-5	Buff; mineral; shell white/glazed; shell white/glazed; none; 20cm
1846-96-3	Light buff green; mineral; very light turquoise/glazed; very light turquoise/glazed; none; 8cm
1846-97-6	Buff; mineral; white/glazed; white/glazed; none; 19cm
1845-102-4	Buff; mineral; yellowish white/glazed; yellowish white/glazed; none; 19cm
1849-110-4	Buff; mineral; white/glazed; white/glazed; none; 22cm
1849-110-9	Buff; milky white/glazed; milky white/glazed; none; 11cm

SPW

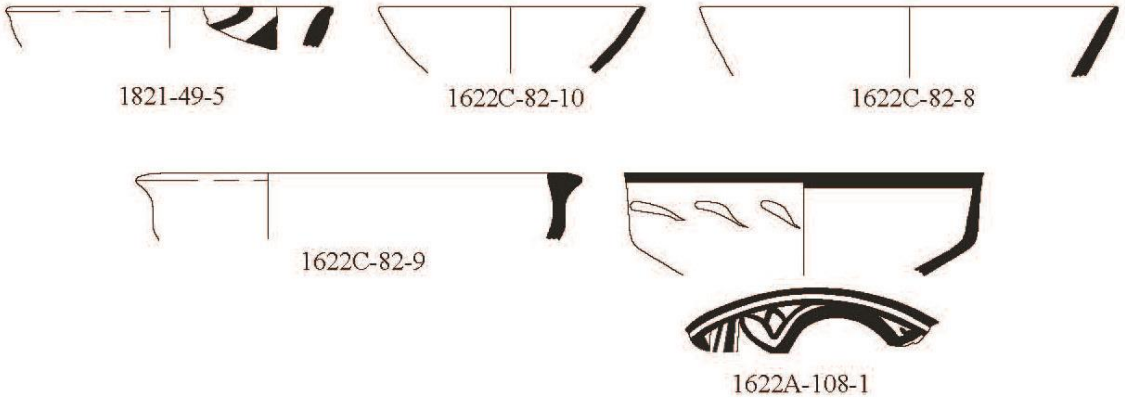


IGP

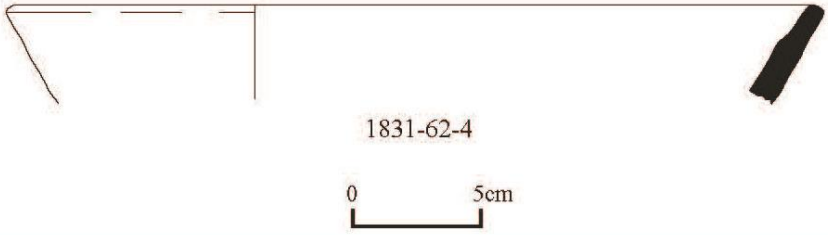


Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1801-9-2	Light buff; mineral; green/glazed; dark mustard/glazed; none; 14cm
1520-13-4	Dark buff; mineral; white/glazed; white/glazed; green & black (& yellow?) splash decoration; 25cm
1813-35-2	Light yellowish buff; mineral; black painted decoration under light green glaze; light green/glazed; 7cm
1813-36-6	Dark buff; mineral; green/glazed; dark mustard/glazed; black painted bank over the rim and below the rim on the interior; 12cm
1834-67-6	Brown; mineral; olive green/glazed; olive green/glazed; traces of floral and linear under glaze black paint on the interior and exterior; 8cm
1834-67-7	Brown; mineral; green glazed; green glazed; none; 11cm
1835-68-3	Buff; mineral; yellow/glazed; yellow/glazed; black painted bands under glaze on the interior; 17cm
1622C-83-6	Buff; mineral; white/glazed; white/glazed; black painted bands under glaze on the exterior; 18cm

UGP_1



LIG



Sherd Number Site-Lot-Sherd	**Description:** Paste Color; Temper; Inside Color/Treatment; Outside Color/Treatment; Decoration; Diameter
1821-49-5	Buff; mineral; blue green/glazed; blue green/glazed; black painted bands under glaze on the interior; 12cm
1622C-82-8	Light greenish buff; mineral; blue green/glazed; blue green/glazed; under glaze black paint on the interior and over the rim; 16cm
1622C-82-9	Yellow; mineral; trace of black paint under blue green glaze; trace of black paint under blue green glaze; none; 22cm
1622C-82-10	Buff; mineral; blue green/glazed; blue green/glazed; none; 10cm
1622A-108-1	Light yellowish buff; mineral; underglaze black and white paint with floral design under blue glaze; underglaze black and white paint with linear design under blue glaze; 14cm
1831-62-4	Light yellowish buff; mineral; black (purple?)/glazed; none; none; 43cm?

GEW. T1

1520-12-8

0 5cm

GEW. T2

1832-64-16

0 5cm

GEW. T3

1520-12-18

0 5cm

1851-112-26

0 5cm

1520-13-8

0 5cm

1813-32-25

0 5cm

1520-13-9

0 5cm

1520-12-19

0 5cm

1832-64-24

0 5cm

1832-64-26

0 5cm

GEW. T4

1520-12-12

0 5cm

1520-12-15

0 5cm

GEW. T5

1520-12-7
0 5cm

1828-58-4
0 5cm

1828-58-6
0 5cm

1832-64-7
0 5cm

1832-64-14
0 5cm

GEW. T6

1520-12-1
0 5cm

1520-12-2
0 5cm

1520-12-3
0 5cm

1813-36-1
0 5cm

1520-12-5
0 5cm

1520-12-6
0 5cm

1828-58-1
0 5cm

1832-64-2
0 5cm

1832-64-3
0 5cm

GEW. T6

1851-112-2

0 5cm

1851-112-1

0 5cm

1828-58-2

0 5cm

1851-112-3

0 5cm

1851-112-5

0 5cm

1832-64-5

0 5cm

GEW. T7

1843-85-2

0 5cm

AFW.1

1801-8-9

0 5cm

ASW.T2

1810-30-7

0 5cm

1586-65-7

0 5cm

ASW.T3

1510-2-6

0 5cm

ASW.T5

1813-31-6

0 5cm

ASW.T6

1510-2-3

0 5cm

ASW.T8

1813-36-2

0 5cm

ASW.T11

1801-8-12

0 5cm

1810-32-12

0 5cm

1813-32-14

0 5cm

ASW.T12

1503-1-2

0 5cm

ASW.T13

1807-24-1

0 5cm

1813-32-11

0 5cm

1813-32-19

0 5cm

1832-64-13

0 5cm

1840-73-6

0 5cm

1846-93-3

0 5cm

1849-110-7

0 5cm

ASW.T14

1832-64-8

0 5cm

1586-65-4

0 5cm

ASW.T17

1813-37-3

0 5cm

PCW.T1

1801-18-1

0 5cm

ASC.T1

1813-32-13

0 5cm

1801-2-1

0 5cm

1810-30-6

0 5cm

PCW.T2

1801-2-2
0 5cm

1801-7-3
0 5cm

1801-14-4
0 5cm

PCW.T4

1819-46-5
0 5cm

PCW.T8

1801-1-7
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PCW.T10

1801-8-8
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1801-8-8B
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1801-8-11
0 5cm

PCW.T11

1801-8-5

1801-8-6
0 5cm

PCW.T13

1801-7-1
0 5cm

1801-7-4
0 5cm

1801-8-2
0 5cm

1801-8-14
0 5cm

1826-55-2
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PCW.T15

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1827-57-1

1827-57-3
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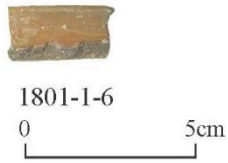
BGW.T1a



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1840-73-8
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1840-73-9
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1622B-79-10
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1622B-79-11
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BGW.T2a

1801-1-1
0 5cm

1811-28-3
0 5cm

1622C-84-2
0 5cm

1845-106-6
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BGW.T2b

1801-8-7
0 5cm

1813-36-3
0 5cm

1835-68-4
0 5cm

1841-74-3
0 5cm

1837-70-5
0 5cm

BGW.T2c

1801-8-4

0 5cm

1813-36-4

0 5cm

BGW.T3a

1622B-76-2

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1622-80-9

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GCW.T1

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1808-25-2

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1813-37-1

0 5cm

1836-69-1

0 5cm

1836-69-2

0 5cm

1836-69-5

0 5cm

1836-69-8

0 5cm

1846-96-2

0 5cm

1848-106-1

0 5cm

1849-107-1

0 5cm

GCW.T2

1801-16-3

0 5cm

GCW.T3

1801-6-2

0 5cm

1846-97-7

0 5cm

GCW.T4

1811-28-2

0 5cm

1849-110-8

0 5cm

GCW.T5

1816-41-2

0 5cm

1836-69-4

0 5cm

1622b-80-5

0 5cm

1622b-80-6

0 5cm

GCW.T6

1845-98-3

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1845-106-7

0 5cm

TJS

1801-7-8

0 5cm

1801-1-8

0 5cm

ICW.T1

1845-103-3

0 5cm

ICW.T2

1520-13-5

0 5cm

1819-45-3

0 5cm

1846-92-2

0 5cm

ICW.T3

1812-29-1

0 5cm

1810-30-2

0 5cm

1810-30-3

0 5cm

ICW.T4

1813-35-1

0 5cm

1622C-84-1

0 5cm

ICW.T5

1831-62-7

0 5cm

1622C-82-12

0 5cm

1622C-82-13

0 5cm

1622C-83-8

0 5cm

1622B-76-1

0 5cm

ICW.T6

1810-30-5

0 5cm

ICW.T7

1622C-82-6

0 5cm

1622C-83-42

0 5cm

ICW.T8

1829-59-6

0 5cm

ICW.TU

1802-20-3

0 5cm

1829-59-5

0 5cm

1622B-79-15

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1622A-108-2

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1622C-83-9

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1622B-77-5

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1622B-80-13

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1622C-84-12

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1622C-84-23

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IRW.T1

1622B-77-1

0 5cm

1622C-84-10

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1846-86-2

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1845-106-4

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1622B-77-3

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1622B-78-1

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MBG1

1801-8-13

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1801-11-1

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1801-8-17

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1801-8-15

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1846-93-8

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1830-60-15

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MBG2

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1801-15-5

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1802-20-7

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1813-34-2

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1813-32-10

1846-97-2

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1813-34-9

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1829-59-3

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1829-59-9

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1831-62-3

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1837-70-3

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1839-72-1

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1839-72-1B

1839-72-2

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1846-97-7

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1841-74-1

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1846-88-2

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1846-91-1

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1846-92-3

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1846-93-2

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MBG3

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1803-19-11

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1803-19-2

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1824-53-6

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1824-53-5

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1824-53-16

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1803-19-3

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1801-9-13

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1801-9-16

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MGG1

1822-50-19

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1822-50-15

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MGG2

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1520-13-2

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1813-35-4

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1849-53-9

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1846-88-3

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1622C-82-2

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1813-35-8

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1622C-83-16

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MGG2

1846-88-6

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MGG3

1803-19-4

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1803-19-5

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1803-19-8

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1824-53-8

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MYG1

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MYG2

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1813-34-8B

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1835-68-21

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1835-68-23

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MYG2

1801-9-7

0 5cm

1622C-83-60

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1849-110-19

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DBG

1801-8-21

0 5cm

1801-9-1

0 5cm

1806-23-5

0 5cm

1816-41-3

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1835-68-20

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1835-68-26

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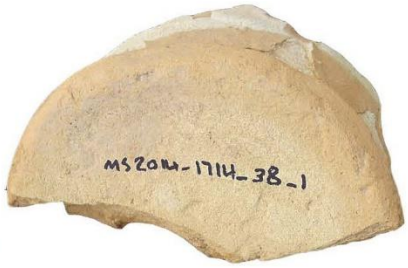
OWG



1814-38-1

0 5cm

1846-93-5

0 5cm

1845-102-4

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1849-110-9

0 5cm

ALW

1802-20-11

0 5cm

1801-9-14

0 5cm

SPW

1801-9-19

0 5cm

1801-9-2

0 5cm

1816-41-4

0 5cm

IGP

1520-13-4

0 5cm

1802-20-4 1802-20-13

0 5cm

1813-35-2

0 5cm

1622C-83-64

0 5cm

1622C-84-11

0 5cm

1834-67-6

0 5cm

1835-68-3

0 5cm

1846-91-11

0 5cm

1846-97-11

0 5cm

1622C-84-26

0 5cm

1813-36-6

0 5cm

1622C-84-18

0 5cm

1622C-84-24

0 5cm

1816-41-11

0 5cm

1622c-83-6

0 5cm

IGP

1834-67-7

0 5cm

1837-70-7

0 5cm

1622C-83-10

0 5cm

UGP_1

1801-3-9

0 5cm

1821-49-5

0 5cm

1622C-82-8

0 5cm

1622C-83-44

0 5cm

1622C-83-49

0 5cm

1622A-108-1

0 5cm

UGP_2

1622C-84-29

0 5cm

1846-89-6

0 5cm

1846-89-7

0 5cm

SGW

1520-13-10

0 5cm

APPENDIX B

Agisoft PhotoScan

Processing Report
03 November 2014

Survey Data

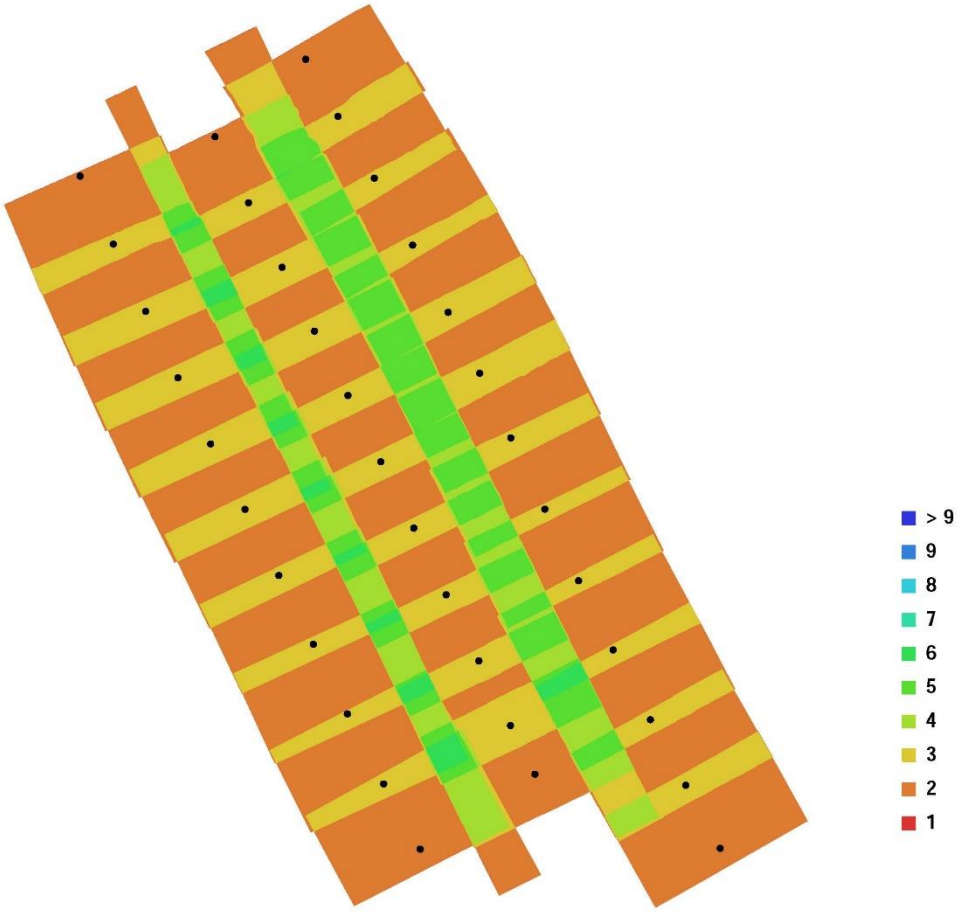

Fig. 1. Camera locations and image overlap.

Number of images:	35	Camera stations:	35
Flying altitude:	2008.78 m	Tie-points:	245771
Ground resolution:	0.749822 m/pix	Projections:	543773
Coverage area:	88.1045 sq km	Error:	0.418309 pix

Camera Model	Resolution	Focal Length	Pixel Size	Precalibrated
Expression10000	3600 x 3600	152.26 mm	63.5 x 63.5 um	No
unknown	3601 x 3601	152.26 mm	63.5 x 63.5 um	No

Table. 1. Cameras.

Ground Control Points

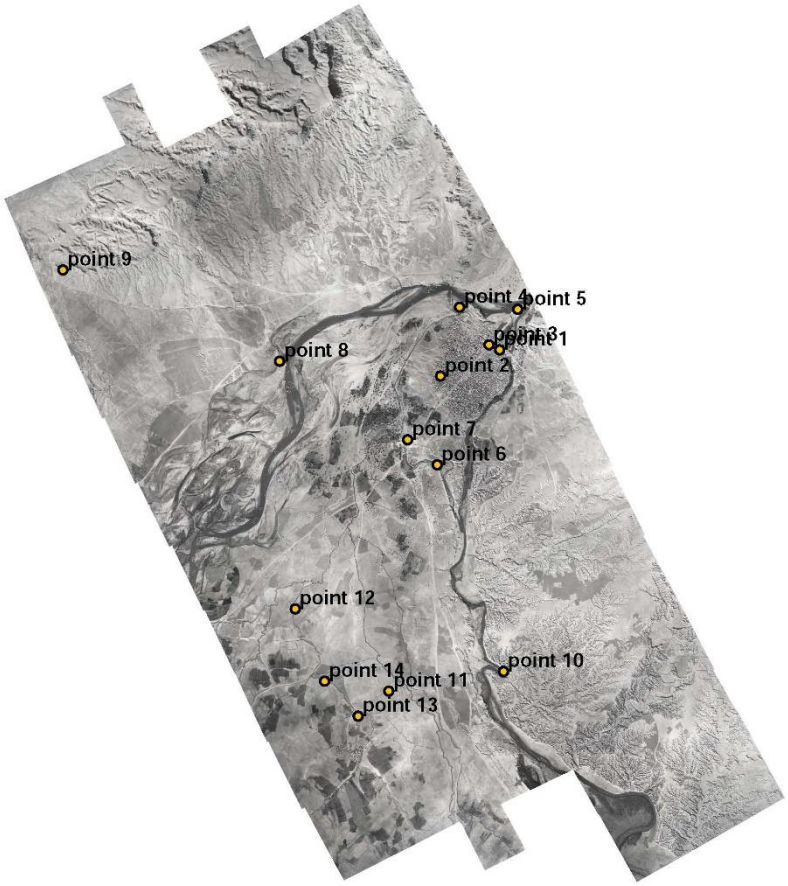

Fig. 2. GCP locations.

Label	X error (m)	Y error (m)	Z error (m)	Error (m)	Projections	Error (pix)
point 1	-0.366135	-1.806668	-2.320314	2.963437	3	0.625789
point 10	-1.464991	1.093053	-3.703664	4.130144	3	0.515759
point 11	1.606268	-3.803201	1.802532	4.504837	2	0.607342
point 13	1.061415	1.087652	1.634785	2.232064	2	0.168693
point 14	-3.255101	-0.034864	-0.617183	3.313278	2	0.241756
point 2	0.447076	-0.652255	1.432057	1.635879	3	0.595465
point 3	2.152470	3.488808	-5.184359	6.609273	3	1.146965
point 4	0.115900	-1.051717	4.334478	4.461753	3	0.641114
point 5	-2.648460	-3.285855	2.415486	4.862690	2	0.173066
point 6	4.099283	3.595612	3.913637	6.711863	5	0.772967
point 7	-1.557022	0.154129	1.099262	1.912184	3	0.736779

Label	X error (m)	Y error (m)	Z error (m)	Error (m)	Projections	Error (pix)
point 8	0.117605	2.897915	-5.603976	6.310015	2	0.530597
point 9	-0.461061	-1.731592	0.840095	1.979077	3	0.748835
Total	**1.919500**	**2.303109**	**3.132822**	**4.336284**	**36**	**0.667686**

Table. 2. Control points.

Label	X error (m)	Y error (m)	Z error (m)	Error (m)	Projections	Error (pix)
point 12	11.358692	17.571208	-9.253207	22.877698	2	0.037071
Total	**11.358692**	**17.571208**	**9.253207**	**22.877698**	**2**	**0.037071**

Table. 3. Check points.

Digital Elevation Model

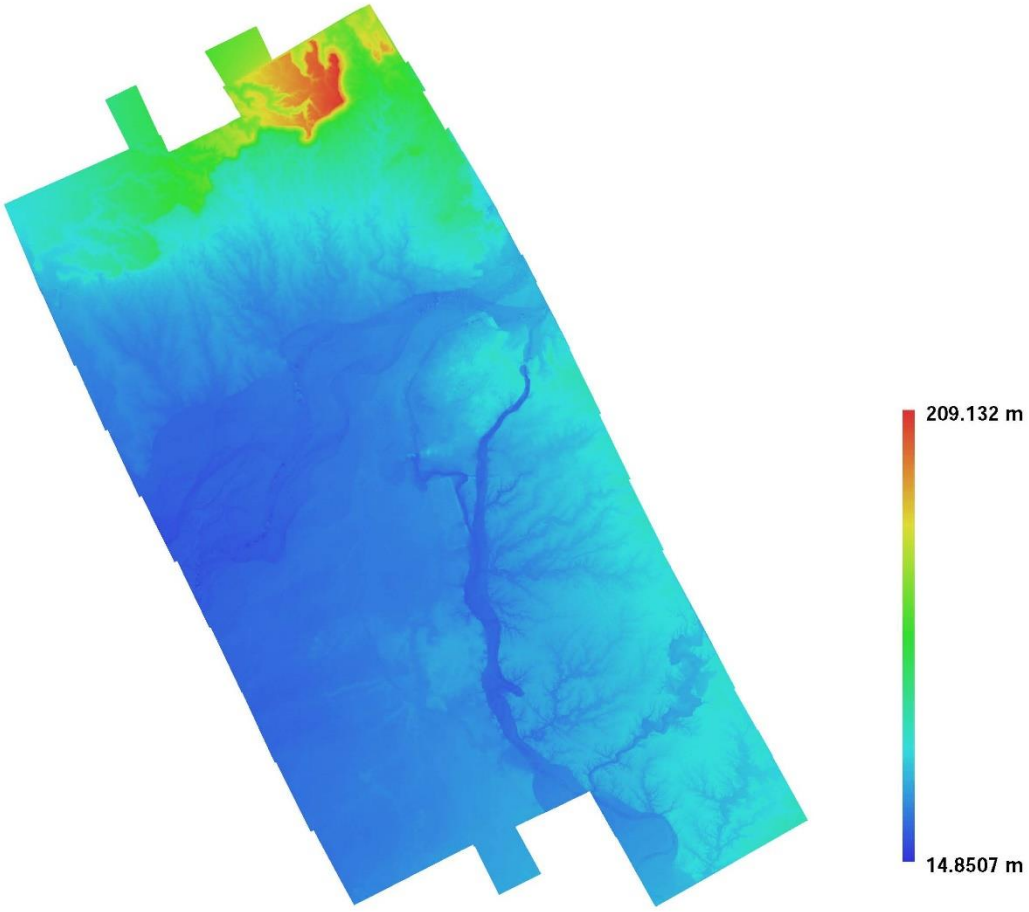

Fig. 3. Reconstructed digital elevation model.

Resolution:	0.749822 m/pix
Point density:	1.77862 points per sq m

APPENDIX C

Historical Sources: Passages Related to the Water History of Miyānāb

al-Balāḏurī, Aḥmad b. Yaḥyā b. Jābir (d. c.892)
Bal Fut
Kitāb Futūḥ al-buldān (Liber expugnationis regionum). Edited by Michael Jan de Goeje. Leiden: Brill, 1968.

فتوح البلدان

فتوح البلدان، ٣٧٦

فتح كور الأهواز

قالوا: غزا المغيرة بن شعبة سوق الأهواز فى ولايته حين شخ عتبة بن غزوان من البصرة فى آخر سنة خمس عشرة و أول سنة ست عشرة فقاتله البيرواز دهقانها ثم صالحه على مال ثم أنه نكث، فغزاها أبو موسى الأشعرى حين ولاه عمر بن الخطاب البصرة بعد المغيرة، فافتتح سوق الأهواز عنوة و فتح نهرتيرى عنوة، و ولى ذلك بنفسه فى سنة سبع عشرة.

فتوح البلدان، ٣٧٧

... فسار أبو موسى إلى الأهواز، فلم يزل يفتح رستاقا رستاقا و نهرا نهرا، و الأعاجم تهرب من بين يديه فغلب على جمع أرضها إلا السوس، و تستر و مناذر، و رامهرمز.

و حدثني الوليد بن صالح، قال: حدثني مرحوم العطار عن أبيه عن شويس العدوى، قال: أتينا الأهواز و بها ناس من الزط و الأساورة فقاتلناهم قتالا شديدا فظفرنا بهم فأصبنا سبيا كثيرا اقتسمناهم، فكتب إلينا عمر أنه لا طاقة لكم بعمارة الأرض فخلوا ما فى أيديكم من السبي و اجعلوا عليهم الخراج فرددنا السبي و لم نملكهم.

... و استخلف أبو موسى الأشعرى الربيع بن زياد على مناذر و سار إلى السوس،

فتوح البلدان، ٣٧٨

ففتح الربيع مناذر عنوة، فقتل المقاتلة، و سبى الذرية و صارت مناذر الكبرى و الصغرى فى أيدى المسلمين، فولاهما أبو موسى عاصم بن قيس بن الصلت السلمى، و ولى سوق الأهواز سمرة بن جندب الفزاري حليف الأنصار و قال قوم: أن عمر كتب إلى أبى موسى و هو محاصر مناذر يأمره أن يخلف عليها و يسير إلى السوس فخلف الربيع بن زياد. حدثني سعدويه، قال: حدثنا شريك عن أبى إسحاق عن المهلب بن أبى صفرة، قال حاصرنا مناذر فأصبنا سبيا، فكتب عمر: أن مناذر كقرية من القرى السواد فردوا عليهم ما أصبتم.

قالوا و سار أبو موسى إلى السوس فقاتل أهلها ثم حاصرهم حتى نفد ما عندهم من الطعام فضرعوا إلى الأمان، و سأل مرزبانهم أن يؤمن ثمانون منهم على أن يفتح باب المدينة و يسلمها فسمى الثمانين و أخرج نفسه منهم

فأمر به أبو موسى فضربت عنقه و لم يعرض للثمانين، و قتل من سواهم من المقاتلة و أخذ الأموال و سبى الذُّرية، ...

فتوح البلدان، ۳۷۹

... قالوا: و هادن أبو موسى أهل رامهرمز، ثم انقضت هدنتهم فوجَّه إليهم أبا مريم الحنفي فصالحهم على ثمانمائة ألف درهم.

حدثني روج بن عبد المؤمن، قال: حدثني يعقوب عن أبى عاصم الرامهرمزي، و كان قد بلغ المائة أو قاربها، قال: صالح أبو موسى أهل رامهرمز على ثمانمائة ألف أو تسعمائة ألف، ثم أنهم غدروا ففتحت بعد عنوة ففتحها أبو موسى فى آخر أيامه.

قالوا: و فتح أبو موسى سرق على مثل صلح رامهرمز، ثم أنهم غدروا فوجه إليها حارثة بن بدر الغُدانى فى جيش كثيف فلم يفتحها، فلما قدم عبد اللّه بن عامر فتحها عنوة، ...

فتوح البلدان، ۳۸۰

قالوا و سار أبو موسى إلى تستر و بها شوكة العدو وحدُّهم فكتب إلى عمر يستمده، فكتب عمر إلى عمار بن ياسر يأمره بالمسير إليه فى أهل الكوفة فقدم عمار جرير بن عبد اللّه البجلي، و سار حتى تستر ... فقاتلهم أهل تستر قتالا شديدا و حمل أهل البصرة و أهل الكوفة حتى بلغوا باب تستر فضاربهم البراء بن مالك على الباب حتى استشهد رحمه اللّه و دخل الهرمزان و أصحابه المدينة بشر حال، و قد قتل منهم فى المعركة تسعمائة و أسر ستمائة ضربت أعناقهم بعد و كان الهرمزان من أهل مِهرِجا نْقَذَف، و قد حضر وقعة جلولاء مع الأعاجم، ثم أن رجلا من الأعاجم استأمن إلى المسلمين على أن يدلهم على أن يدلهم على عورة المشركين فأسلم و اشترط أن يفرض لولده و يفرض له، فعاقده أبو موسى على ذلك، و وجَّه رجلا من شيبان يقال له أشرس بن عوف فخاض به دُجَيل على عَرَق من حجارة ثم علا به المدينة و أراه الهرمزان ثم ردَّه إلى العسكر فندب أبو موسى أربعين رجلا مع مجزاة بن ثور و أتبعهم مائتي رجل و ذلك فى الليل و المستأمن يقدمهم فأدخلهم المدينة فقتلوا الحرس و كبروا على سور المدينة فلما سمع ذلك الهرمزان هرب إلى قلعته و كانت موضع خزانته و أمواله، و عبر أبو-

فتوح البلدان، ۳۷۰

-موسى حين أصبح حتى دخل المدينة فاحتوى عليها و قال الهرمزان ما دل العرب على عورتنا إلا بعض من معنا ممن رأى إقبال أمرهم و أدبار أمرنا و جعل الرجل من الأعاجم يقتل أهله و ولده و يلقيهم فى دجيل خوفا من أن يظفر بهم العرب و طلب الهرمزان الأمان و أبى أبوموسى أن يعطيه ذلك إلا على حكم عمر فنزل على ذلك، و قتل أبو موسى من كان فى القلعة ممن لا أمان له و حمل الهرمزان إلى عمر ...

... و حدثني اسحاق بن أبى إسرائيل قال حدثنا ابن المبارك عن ابن جُرَيج عن عطاء الخراساني، قال: كفيتك أن تستر كانت صلحا فكفرت فسار

فتوح البلدان، ۳۷۱

إليها المهاجرون فقتلوا المقاتلة و سبوا ا لذراري فلم يزالوا فى أيدى سادتهم حتى كتب عمر خلوا ما فى أيديكم.

قال و سار أبو موسى إلى جنديسابور و أهلها منخوبون فطلبوا الأمان فصالحهم على أن لا يقتل منهم أحدا و لا يسبيه و لا يعرض لأموالهم سوى السلاح ثم أن طائفة من أهلها توجهوا إلى الكلبانية، فوجه إليهم أبو موسى الربيع بن زياد فقتلهم و فتح الكلبانية، و استأمنت الأساوره فأمنهم أبو موسى فأسلموا، و يقال أنهم استأمنوا قبل ذلك فلحقوا بأبى موسى و شهدوا تستر و اللّه أعلم.

و حدثني عمر بن حف العمرى عن أبى حذيفة عن أبى الأشهب عن أبى رجاء قال فتح الربيع بن زياد الثيبان من قبل أبى موسى عنوة ثم غدروا ففتحها منجوف بن ثور السدوسي قال و كان مما فتح عبد اللّه بن عامر سنبيل و الزط و كان أهلهما قد كفروا فاجتمع إليهم أكراد من هذه الأكراد و فتح أيذج بعد قتال شديد و فتح أبوموسى السوس و تستر و دورق عنوة و قال المدائني: فتح ثات ابن ذى الحرة الحميري قلعة ذى الرناق.

حدثني المدائني عن أشياخه و عمر بن شبَّه عن مُجالِد بن يحيى أنَّ مصعب بن الزبير ولَّى مُطَرِّف بن سيدان الباهلي أحد بنى جِآوة شرطته فى بعض أيام ولايته العراق لأخيه عبد اللّه بن الزبير فأتى مطَرِّف بالنَّابى بن زياد بن ظَبْيان أحد بنى عائش بن مالك بن تيم الله بن ثعلبة بن عُكابة و برجل من بنى نمير قطعا الطريق فقتل النابى و ضرب النميري بالسياط و تركه، فلما عزل مطرف عن الشرطة و ولى-

فتوح البلدان، ۳۸۳

-الأهواز جمع عبيد اللّه بن زياد بن ظبيان له جمعا و خرج يريده فالتقيا فتواقفا و بينهما نهر فعبر مطرف بن سيدان فعاجله ابن ظبيان فطعنه فقتله فبعث مصعب مُكرَم بن مُطَرِّف فى طلبه، فسار حتى صار إلى الموضع الذي يعرف اليوم بعسكر مكرم فلم يلق بن ظبيان و لحق بن ظبيان بعبد الملك بن مروان و قاتل معه مصعبا فقتله و احتزَّ رأسه، و نسب عسكر مكرم إلى مكرم بن مطرف هذا، قال البعيث السكرى.

و يقال أيضا أن عسكر مكرم إنما نسب إلى مكرم بن الفَزْر أحد بنى جَعْوَنة بن الحارث بن نُمَير و كان الحجاج وجَّهه لمحاربة خرزاد بن باس حين عصى و لحق بإيذج و تحصن فى قلعة تعرف به، فلما طال عليه الحصار نزل مستخفيا متنكرا ليلحق بعبد الملك، فظفر به مكرم و معه درتان فى قلنسوته فأخذه و بعث به إلى الحجاج فضرب عنقه.

و ذكروا أنه كانت عند عسكر مكرم قرية قديمة وصل بها البناء بعد ثم لم يزل يزاد فيه حتى كثر فسمّى ذلك أجمع عسكر مكرم و هو اليوم مصر جامع.

al-Balāḏurī, Aḥmad b. Yaḥyā b. Jābir (d. c.892)
Bal Ašr
Ansāb Al-Ašrāf. Edited by Suhail Zakkar and Riyad Zirikli. Beirut: Dār al-Fikr, 1996.

اشراف الانساب

اشراف الانساب، جزء ۷: ۳۲۲

یوم دجیل و هو یوم تستر

اشراف الانساب، جزء ۷: ۳۲۳

و قال الهیثم بن عدیَ: هزم ابن الاشعث صاحب الحجاج یوم دجیل، و قتل من اصحابه ثمانیة الاف، و قال غیره: قتل الفین.

اشراف الانساب، جزء ۷: ۳۲۴

قال و جاء ابن الاشعث و اهل العراق حتی دخلوا البصرة، فبایعه اهلها علی الحرب الحجاج و خلع عبدالملک، و سارع إلیه القرَاء و الکهول و کان الحجاج أمر سفیان بن الابرد الکلبی حین أقبل إلی البصرة أن یکون فی أخریات الناس فیهدم القناطر و یقطع الجسور و ضمَ الیه جماعة، ففعل سفیان ذلک...

اشراف الانساب، جزء ۷: ۳۴۳

و مضی عبدالرحمن الی المدائن، ثم أتی مسکن الاهواز و هی بقرب تستر.

اشراف الانساب، جزء ۷: ۳۴۴

قالوا: و فصل ابن الاشعث من مسکن، فأمر بقنطرة و شادروان هناک فهدما، فلم تصلح القنطرة ألی هذه الغایه.

اشراف الانساب، جزء ۷/ ۳۴۵

و رکب الناس وجوههم الی المدائن حتی اجتمعوا الی ابن الاشعث بمسکن و هی من الاهواز.

اشراف الانساب، جزء ۷: ۳۴۶

...صار الحجاج الی البصرة فوَجه جیشاً لمحاربة ابن الاشعث، و ضمَه إلی ابنه محمد بن الحجاج، فواقعه بمسکن فقُتل بسطام بن مصقلة و جماعة بایعوه علی الموت، ثم بعد مسکن أتی السوس ساعة من نهار، ثم إن ابن الاشعث انهزم و أصحابه حتی صار الی سابور من فارس...

Ibn al-Faqīh al-Hamaḏānī: (c.902–3)
Kitāb al-Buldān "Abridgment"
Faq A
Compendium Libri Kitāb Al-Buldān (Abridgment). Edited by Michael Jan de Goeje. Leiden: Lugduni Batavorum, 1885.

كتاب البلدان. المختصر.

المختصر، ٢٢٧

و تستر و هی بین اربعة اودیة دُجیل و المَسْرُقان و مایهنان و نروبان...

المختصر، ٢٣۶

و لمّا میِّز قباذ اقلیمه وجد انزه بقاع اقلیمه ثلثه عشر موضعا مدائن و السوس و جندی سابور و تستر و ....

المختصر، ٢۵٣

... و لاهل الاهواز انواع من السِّکر و التمور و لاهل السوس خاصةً و جندَیسابور حذق فی اتخاذ انواع ثیاب الحریر و الدیباج و کذلک لاهل تستر...

Ibn al-Faqīh al-Hamaḏānī: (c.902–3)

Kitāb al-Buldān "Mašhad ms."
Faq M
Het Boek van de Geschiedenis Der Landen. Edited by Zacharias Van Laer. Bruxellis: s.n., 1985.

كتاب البلدان. مشهد.

مشهد، ۲۹۶

تقدير (ماليات) اماكن فى ايام خلافت هادى ۱۷۰ ه/۷۸۶ و ۷۸۷ م....

مشهد، ۲۹۷

-الاهواز. خمسه و عشرون الف الف (۲۵۰۰۰۰۰۰) و من صنوف السُّكَّر ثلاث مائة ألف (۳۰۰۰۰۰) رطل...

مشهد، ۳۰۰

و خراج الاهواز ثلاثون الف الف درهم. و كان الفرس تُقَسَّطُ على خوزستان، و هى الاهواز، خمسين الف الف درهم مثاقيل.

مشهد، ۳۰۳

قال الهيثم بن عُدِى: اردشير خورة حفر المَسرُقان و دُجَيل و انهارَ خوزستانَ السبعَ، و هى: سُرِّق و رامهرمز و سوق الاهواز و السوس و حنديسابور و مناذر و نهر تيرى.

و يقال: لا بناء بالحجارة و لا أبهى من شاذروان تستر لانَّه بالصخر و اعمدة الحديد و ملاط الرصاص. و مخرج دجيل الاهواز من ارض اصبهان و يصب فى البحر الشرقى.

مشهد، ۳۰۷

و لقد اخبرنى به زيد بن محمد، و كان صدوقاًو كان اقام بالاهواز حولاً و راى شدة حرها ...

ثم قال: و كيف لا يكون كذلک [و طعام اهلها خبز الارز، و هم يخبزون فى كل يوم، فيقَّدر أنَّه يُسجَر بها فى كل يوم خمســون الف تنور. فما ظنُّک ببلدٍ اذا اجتمع فيه حرُّ الهواء و بخار هذه النِّيران] و حلف بالله-عزوجل-انه عزم مراراً أن يُغرق نفسه فى المسرقان لما كان يلقى من الكرب و شدة الحر و السموم.

[غلات الاهواز و مصنوعاتها]

قالوا: و لنا السُّكَّر و انواع التَّمر. و هم أحذق الامة فى اتخاذ انواع السُّكَّر. و لهم خزّ السوسى

مشهد، ۳۰۸

و الديباج التسترى...

مشهد، ۳۱۰

و عسكر مكرم نُسِبَت إلى مكرم بن [معزاء الحارث] احد بنى جَحَوْنَه بن الحارث بن نُمَيْر. و كان الحجاج بن يوسف وجَّهه لمحاربة خرزاد بن باس حين عصى...

و كانت هناک قرية قديمة، فبناها مكرم، و لم يزل يبنى و يزيد حتى جعلها مدينة و سمّاها عسكر مكرم.

1. **al-Yaʿqūbī,** Abū l-ʿAbbās Aḥmad b. Abī Yaʿqūb b. Jaʿfar b. Wahb b. Wāḍiḥ (d. shortly after 905):

Ya' Bld
Kitāb Al-A'lāk an-Nafīsa VII, Auctore Abū Alī Ahmed Ibn Omar Ibn Rosteh et Kitāb Al-Boldan, Auctore Ahmed Ibn Abī Jakūb Ibn Wādhih Al-Kātib Al-Jakūbī. Edited by Michael Jan de Goeje. Leiden: Lugduni Batavorum Brill, 1892.

کتاب البلدان

هستهٔ اصلی وصف بغداد و سامرا. (بخش بصره در نسخهٔ چاپ شده ناکامل است و اهواز هم نیست، احتمالا بعد از بصره بوده). متفاوت از دیگر کتب ادب به خصو همزمان خودش ابن بقیه، اغلب بخش‌های روایی و حکایی ادبی را دور می‌ریزد و بسنده می‌کند به هستهٔ اصلی جغرافیایی. و تأکید او بر مشاهدات عینی خود و مصاحبه‌هایش با مردم مناطق مختلف. ولی منابعش را ذکر نمی‌کند.

البلدان، ۳۶۱

ذکر ابن ابی یعقوب ان ماءه (نهر الاهواز) یاتی من وادیین احدهما منبعث (ینبعث) من اصبهان و یجری الی این یمرّ بشاذروان تستر و عسکر مکرم و جندی سابور و لها علیه جسر طوله خمسمائة و ثلاث و ستون خطوة و تسمَّی (یسمَّی) السمرقان و آلاخر ینبعث من همذان و یجری الی السوس یسمَّی الهندوان ثم یجریان الی مناذر الکبری و عندها یصب احدهما فی الآخر یسمَّی دجیل الاهواز ثم یجری الی الاهواز ثم یمرُّ حتی یصبُّ فی بحر فارس عند حصن مهدی و هو ینقطع فی الصیف و یصیر موضع جریته طریقا تسلکه القوافل.

al-Yaʿqūbī, Abū l-ʿAbbās Aḥmad b. Abī Yaʿqūb b. Jaʿfar b. Wahb b. Wāḍiḥ (d. shortly after 905):
Ya' Trẖ
Tārīẖ Al-Ya'qūbī. Edited ANON. Beirut: Dār Ṣādir, 1960.

كتاب التاريخ

التاريخ، ١: ١٨٠

و ملک سـابور بن اردشـير فغزا بلاد الروم و فتح منها عدّه بلدان و اسـر خلقا من الروم فبنى مدينة جنديسـابور و أسكنها سبى الروم و هندس له رئيس الروم القنطرة التى على نهر تستسر و عرضه الف ذراع....

Ḫalīfa b. Ḫayyāṭ al-ʿUṣfurī (d. 854)
Ḫal
Tārīḫ Ḫalīfa B. Ḫayyāt. Edited by Hikmat Guli Fawwaz and Mustafa Najib Fawwaz. Beirut: Dār al-Kutub al-ʿIlmīyah, 1995.

خليفــة ابن خياط

تاريخ.

تاريخ، ٧٣

(سنة ست عشرة) «فيها افتتحت الأهواز ثم كفروا»

وحدثنى الوليد بن هشام عن أبيه عن جده قال: سار المغيرة إلى الأهواز فصالحه البيرزان على ألفى ألف درهم و ثمان مائة ألف و تسعين ألف، ثم غزاهم الأشعرى بعد.

تاريخ، ٧٣

(ســنة ســع عشــرة) حدثنا أبوعاصــم قال: ناعمران بن جدير عن أبى مجلز قال: ردَّ عمر الأهواز إلى الجزية بعد ما قُسـموا بين المسـلمين و غشـى نشاؤهم. ثم صالح السبان و أهل نهر تيرى أبو موسى، ثم سار إلى مناذر أهلها ثم انصرف عنها و استخلف الربيع بن زياد الحارث فافتتحها عنوة...

تاريخ، ٨١

(ســنة عشــرين) ... أن أبا موســى لما فرغ من الأهواز و مناذر و نهر تيرَى و جنديسابور و رامَهُرْمز توجَّه إلى تستر، فنزل باب الشرقى، و كتب إلى عمر يستمده...فكتب عمر إلى عمار أن سر إلى تستر....

....أقامو سنة او نحوها، فجاء رجل من أهل تستر فقال لأبى موسى: أسألك أن تحقن دمى و دماء أهل بيتى ... على أن أدلك على المدخل، قال: فذلك لک، قال: فأبغنى أنسـاناً سابحاً ذا عقل يأتيک بأمر بيَّن....فقال مجزأة: اجعلنى ذلک الرجل، فانطلق به فأدخله من مدخل الماء، مدخلاً يضـــيق أحياناً حتى ينطبح على بطنه، و يتَّســـع أحياناً فيمشــى قائماً و يحبو فى بعض ذلک، حتى دخل المدينة. و قد أمره أبوموســى أن يحفظ الباب و طريق الســور و منزل الهرمزان، و قال: لا تســبقنى بأمر، فانطلق به العلج حتى أتى الهرمزان فهمَّ بقتله، ثم ذكر قول أبى موســى لاتســبقنى بأمر، فرجع ألى أبى موســى، فندب أبو موسى الناس معه، فانتدب ثلاث مائة و نيف، فأمرهم أن يلبس الرجــل ثوبين لايزيــد عليهمــا و ســـيفــه، ففعلوا. قال عبدالرحمن: فكبَّر و وقع فى الماء و كبَّر القوم و وقعوا. قال عبدالرحمن: كأنهم البط، فســبحو حتى جاوزوا، ثم انطلق بهم إلى النقب الذى يدخل الماء منه، و كبَّر ثم دخل و معه خمســة و ثلاثون رجلاً أو ســتة و ثلاثون رجلاً. فمضــى بطائفة منهم إلى الباب فوضعهم عليه، و مضى بطائفة ألى السور، و مضى بمن بقى معه حتى صعد السور فانحدر عليه علج معه نيزک،

تاریخ، ۸۲

فطعنه مجزأة فأثْبَتَه[1]، و كبَّر المسلمون على السور و على الباب، و فتحوا الباب، و أقبل المسلمون حتى دخلوا المدينة و تحصَّن الهرمزان فى قصبة له.

قال أبوالحسن ...: أن المسلمين دخلوا المدينة ليلاً و أصبحوا يوم الأربعاء، فقاتلهم الهرمزان فدخل القلعة.

تاریخ، ۱۵۹

(سنة سع عشرة) خرجنا مع ابن عبيس نحواً من عشرين ألفاً فخطبنا ابن عبيس فقال: أيها اناس أنا أنما خرجنا حسبة، فمن كان منكم على رأينا فليمض معنا و من لا فليعقد عنا غير حرج. قال: فخلصنا فى الفين، فلقيناه بدستواء...

تاریخ، ۱۷۰

(سنة خمس و سبعين)...خرج الحجاج عن الكوفة، و استحثَّ الناس فى قتال الأزارقة، و خرج فنزل رُسْتَق أباذ، فخلعوه و بايعوا عبدالله بن الجارود...

تاریخ، ۱۷۲

(سنة سبع و سبعين) مضى شبيب ألى كرمان...ثم رجع ألى الأهواز فبعث الحجاج حبيب ابن عبدالرحمن بن زيد الحكمى و سفيان بن الأبرد الكلبى فلقيهم شبيب على جسر دجيل، فاقتتلوا حتى حجز الليل بينهم، ثم غدا شبيب، فلما صار على الجسر قُطع الجسر، فغرق شبيب...

تاریخ، ص۱۷۸

(سنة اثنتين و ثمانين) ...وانكشف ابن الأشعث من ديرالجماجم، ...فأتى البصرة و تبعه الحجاج «فخرج منها إلى مسكن من أرض الأهواز و اتبعه الحجاج» فالتقوا بمسكن، فانهزم ابن الأشعث، و قتل من اصحابه ناس كثير و غرق ناس كثير.

....افتقد ليلة دجيل بمسكن عبدالرحمن بن أبى اليلى ....

تاریخ، ۱۷۹

«أول وقعة كانت بينهم يوم تستر يوم النحر آخر سنة إحدى و ثمانين...والوقعة الثانية بالزاوية ...والوقعة الثالثة بظهر المربد... والوقعة الرابعة ديرالجماجم، كانت الهزيمة...سنة

تاریخ، ۱۸۰

اثنتين و ثمانين، و الوقعة الخامسة فى شعبان سنة اثنتين و ثمانين ليلة دجيل.

[1] أثبته: أصابه إصابة قاتلة

Ibn Ḫurradāḏbih, Abu l-Qāsim ʿUbaid Allāh b. ʿAbd Allāh (*c.*820–911)
Ḫur
Kitāb Al-Masālik Wa Al-Mamālik. Edited by Michael Jan de Goeje. Beirut: Dār Sādir, 1889.

ابن خردادبه.

المسالک و الممالک

المسالك و الممالك، ۴۲

كورة سـوق الاهواز، و رامهرمز، و ايذج، و عسكر مكرم، و تستر، و جُندَى سابور، و السّوس، و سرّق و هى دورق، و نهر تيرى، و مناذر الكبرى، و مناذر الصـغرى، و خراج الاهواز ثلثون الف الف درهم و كانت الفرس تقسّـط على خوزستان و هى الاهواز خمسين الف الف درهم، و بلاد الاهواز واسعة و هى سبع كور و خبّرنى الفضل بن مروان-

المسالك و الممالك، ۴۳

انه قبّل الاهواز بتسعة و اربعين الف الف درهم و انه انفق على مصالحها سبعين الف درهم

الطريق من سوق الاهواز الى فارس

من الاهواز الى أزم سـته فراسخ، و منها الى عبدين خمسة فراسخ ثم الى رام هرمز سته فراسخ، ثم الى الزط سته فراسخ، ثم الى مخاضة صعبة و قنطرة طويلة على وادى الملح، ثم الى دهليزان ثمانية فراسخ، ثم الى أرّجان ثمانية فراسخ

المسالك و الممالك، ۱۶۲

لا بناء بالخشب ابهى من كنيسة منبج لانها بطاقات من خشب العنّاب و لا بناء بالرخام ابهى من قسيان أنطاكية و لا بناء بطاقات الحجارة ابهى من كنيسة حمص... و لا بناء بالحجارة احكم و لا ابهى من شاذروان تستر لانه بالصخر و اعمدة الحديد و ملاط الرصا و جوب شبداز نقرة فى الجبل و رَدْم ياجوج و ماجوج....

المسالك و الممالك، ۱۷۱

و قالت الحكماء احسـن الارض مخلوقة الرىّ و لها السّـرّ و السـربان، و احسنها مصنوعة جرجان، و احسنها مفروقة طبرستان، و احسنها مستخرجة نيسابور، و احسن الارض قديمة و حديثة جُندَى سابور و لها حسن انهار.....

المسالك و الممالك، ۱۷۲

... و تستر و هى بين اربعة اودية دجيل و المسرقان و مهروبان و الباسيان...

المسالك و الممالك، ۱۷۶

... و مخرج دجيل الاهواز من ارض اصـبهان و يصـبّ فى البحر الشرقىّ و مخرج نهر جُندَيسابور الذى عليه قنطرة الزاب من اصبهان ايضا و يصبّ فى دجيل الاهواز، و مخرج نهر السّوس من الدّينور و يصبّ فى دجيل الاهواز ايضا، و المسرقان يحمل من دجيل فوق شاذروان تستر و يصبّ فى البحر الشرقى

المسالك و الممالك، ۱۹۴

من البصرة الى الابلة اربعة فراسخ و من الابلة الى بيان خمسة فراسخ و من بيان الى حصن مهدى على الظهر ستة فراسخ و فلى الماء على نهر الجديد ثمانية فراسخ و من حصن مهدى الى سوق الاربعاء اربعة فراسخ و من سوق الاربعاء الى المحول ستة فراسخ و من المحول الى دولاب ثمانية فراسخ و من دولاب الى سوق الاهواز فرسخان فذلک من البصرة الى سوق الاهواز ستة و ثلثون فرسخا و من سوق الاهواز الى حويرول (؟) فرسخان و من حويرول الى ازم اربعة فراسخ و من ازم الى سنابل اربعة فراسخ و من سنابل الى قرية الحبارى ثلثة فراسخ و من قرية الحبارى الى العين ثلثة فراسخ و من العين الى رام هرمز اربعة فراسخ و من رام هرمز الى وادى الملح اربعة فراسخ و من وادى الملح الى الزط فرسخان...

المسالك و الممالك، ۱۹۷

... و من اراد ان يأخذ من الاهواز الى اصبهان فمن سوق الاهواز الى عسكر مكرم ثمانية فراسخ ثم الى الميانج سبعة فراسخ و من الميانج الى ايذج ثلثة فراسخ....

المسالك و الممالك، ۲۴۲

فنقول ان الاهواز سبع كور اوّلها من حدّ البصرة كورة سوق الاهواز و مما يلى المذار كورة نهر تيرى ثم كورة تستر و كورة السوس و كورة جندى سابور و كورة رام هرمز و كورة سوق العتيق و ارتفاع هذه الكور على التقريب و التوسّط من الورق ثمانية عشر الف الف درهم

المسالك و الممالك، ۲۴۹

... فهذه الاعمال فى المملكة الاسلام و الذى بيّناه من مبالغ و الارتفاعات فعلى التوسط و ما يرتفع بعض النواحى فى هذا الوقت و ينق البعض نقصانا لا نلتفت اليه....

... الاهواز ثلثة و عشرين الف الف درهم

Ibn Rusta, Abū ʿAlī Aḥmad b. ʿUmar (wrote between 903 and 913)
Rus
Kitāb Al-A'lāk an-Nafīsa VII, Auctore Abū Alī Ahmed Ibn Omar Ibn Rosteh et Kitāb Al-Boldan, Auctore Ahmed Ibn Abī Jakūb Ibn Wādhih Al-Kātib Al-Jakūbī. Edited by Michael Jan de Geoje. Bibliotheca Geographorum Arabicorum, VII. Leiden: Lugduni Batavorum Brill, 1892.

ابن روستا

کتاب الاعلاق النفیسه

ابن روستا، ۸۳

[و من عجائب الارض]... و لا من بناء بالحجارة... احکم و ابهی من شاذروان تستر لانه بالصخر و اعمدة الحدید منصوبة بین الحجرین و ملاط الرصاص، و صورة شبدیز و نقره فی الجبل و ردم یاجوج و ماجوج

ابن روستا، ۹۰

و مخرج نهر جندی سابور الذی علیه قنطرة الرود من جبال اصبهان-

ابن روستا، ۹۱

-و مصبُّه فی دجیل الاهواز، و مخرج نهر السوس، من الدینور و مصبُّه فی دجیل، و المسرقان و هو نهر یحمل من دجیل فوق شاذروان تستر و ینصبُّ فی بحر فارس....

ابن روستا، ۱۸۸

اسماء کور الاهواز و مدنها

سوق الاهواز و هو هُرمُشیر، رامَهُرْمُز، تستر، جندَیْسابور، السوس، دَوْرَق کوره سُرَّق، المناذر الکبری، المناذر الصغری، عسکر مکرم، رستاق الزُّط رستاق سَنْبیل، ایذج، الکبانیه، البُنیان.

المسافات بین کور الاهواز

من عسکر مکرم الی سوق الاهواز ۸ فراسخ و فی‌الماء کذلک و منه الی نهر تیرین ۶ (؟۹) فراسخ، و من عسکر مکرم الی ایذج ۲۲ فرسخا و منها الی مدینة تستر ۸ فراسخ علی الظهر و فی‌الماء، و من تستر الی جندیسابور ۸ فراسخ علی الظهر و منه الی السوس ۸ فراسخ علی الظهر، و من سوق الاهواز الی رامهرمز ۲۰ فرسخا و منها الی الدورق و هی مدینة السرق فی الماء و علی الظهر ۲۴ فراسخا....

ابن روستا، ۱۸۹

الطریق من الاهواز الی فارس

... من سوق الاهواز الی أزم ۶ فراسخ و منها الی العین ۶ فراسخ و منها الی وادی الملح ۶ فراسخ و منها الی الخابران ۵ فراسخ و منها الی الدهلیزان ۴ فراسخ و منها الی أرَّجان ۷ فراسخ و طریق الاخر من سوق الاهواز الی

رامهرمز ۱۸ فرسـخا و من رامهرمز الی الزط ۷ فراسخ و من الزط الی سنبیل ۸ فراسخ و من سنبیل الی ارجان ۴ فراسخ.

الطریق من الاهواز الی شیراز

من سـوق الاهواز الی ازم ۶ فراسـخ و من ازم الی عبدین ۵ فراسـخ ...[۲] و هناک مخاة صـعبة و قنطرة طویلة علی وادی الملح قم الی الدهلیزان ۶ فراسخ ثم الی ارجان ۷ فراسخ...

[۲] lacuna

Qudāma b. Jaʿfar al-Kātib al-Baġdādī, Abū l-Qāsim (*c.*873–932)
Qud
Kitāb Al-Ḫarāj. Edited by Michael Jan de Goeje. Bibliotheca Geographorum Arabicorum 6. Leiden: Brill, 1967.

قدامة ابن جعفر

كتاب الخراج (و صناعة الكتابة)

الخراج و صناعة الكتابة، ٨٨

و من البصـرة الى الابلة أربعة فراسخ، و من الابلة الى بيان خمسة فراسخ، و من بيان الى حصن مهدي على الظهر سـتة فراسـخ، و في الماء على نهر الجديد ثمانية فراسخ، و من حصن مهدي الى سوق الاربعاء أربعة فراسخ، و من سـوق الاربعاء الى المحول سـتة فراسـخ، و من المحول الى دولاب ثمانية فراسـخ، و من دولات الى سوق الاحواز فرسخان. فذلك من البصرة الى سوق الاحواز ستة و ثلاثون فرسخا.

الخراج و صناعة الكتابة، ٨٩

و من سوق الأحواز الى حويرول فرسخان، و من حويرول الى أزم أربعة فراسخ، و من أزم الى سنابك أربعة فراسخ، و من سـنابك الى قرية الحبارى ثلاثة فراسخ، و من قرية الحبارى الى العين ثلاثة فراسخ، و من العين الى رامهرمز أربعة فراسـخ، و من رامهرمز الى وادي الملح أربعة فراسـخ، و من وادي الملح الى الزط فرسـخان، و من الزط الى خابران ثلاثة فراسـخ، و من خابران الى المسـتراح فرسخان، و من المستراخ الى دهليزان فرسخان، و من دهليزان الى كبارستان ثلاثة فراسخ، و من كبارستان الى سنابل ثلاثة فراسخ، و من نسابل الى أرجان خمسة فراسخ، و من مدينة ارجان الى داسين سبعة فراسخ، و من داسين الى بندق [ستة فراسخ و من بندق]، خان حماد ستة فراسخ، و من خان حماد الى أمران تسـعة فراسخ، و من أمران الى النوبندجان ستة فراسخ، و من النوبندجان الى الكركان خمسة فراسخ، و من الكركان الى الخرارة [خمسة فراسخ، و من الخرارة] الى خلان خمسة فراسخ، و من خلان الى جويم أربعة فراسخ، و من جويم الى شيراز خمسة فراسخ، فذلك من الأحواز الى شيراز مائة [فرسخ] و فرسخا

الخراج و صناعة الكتابة، ٩٢

و من أراد أن يأخذ الاحواز الى أصـبهان: فمن سـوق الأحواز الى عسكر مكرم ثمانية فراسخ، ثم الى الميانج سبعة فراسـخ، و من الميانج الى ايذج ثلاثة فراسـخ و من ايذج الى بربابل أربعة فراسـخ، و من بربابل الى رستاكرد و هو حصـن في عقبة سـبعة فراسـخ، ثم الى شـليل خمسـة فراسـخ، و من شـليل الى خوزسـتان تسعة فراسخ، و من خوزسـتان الى اربهشـت‌آباذ أربعة فراسخ، و من اربهشت‌آباذ الى كريركان سبعة فراسخ، و من كريركان الى بابكان سبعة فراسخ، و من بابكان الى الخان سبعة فراسخ، و من الخان الى مدينة أصبهان سبعة فراسخ، فذلك من الاهواز الى أصبهان، خمسة و ثمانون فرسخا على طريق ايذج.

الخراج و صناعة الكتابة، ١٧٠

...فنقول: ان الاهواز، سبع كور، أولها من حد البصرة كورة سوق الأحواز، و مما يلي المذار كورة نهر تيري

الخراج و صناعة الكتابة، ١٧١

ثم كورة تستر، و كورة السوس و كورة جنديسابور، و كورة رام هرمز، و كور سوق العتيق، و ارتفاع هذه الكور على التقريب و التوسط من الورق، ثمانية عشر آلاف ألف درهم...

الخراج و صناعة الكتابة، ١٨١

... و مقاطعة عمان من العين ثلاثمائة ألف دينار، فهذه الاعمال في مملكة الاسلام. و الذي بيناه من مبالغ الارتفاعات فغلى التوسط، و ما يرتفع.

بعض النواحي في هذا الوقت و ينق البعض نقصا لا يلتفت اليه، و لا نعمل عليه لانه وقع بقلة الضبط، و اضاعة الحزم و الباقي الممنوع منه، فهذه سبيله أيضا.

الخراج و صناعة الكتابة، ١٨٢

و جملة ذلك فقد أعدنا ذكره في هذا الموضع، ليجتمع فيقرب على التأمل من العين أربعة آلاف ألف و تسعمائة ألف و عشرون ألف دينار [و ثمانمائة ألف]. يكون صرف العين ورقا، على صرف خمسة عشر درهما بدينار ثلاثة و سبعين ألف ألف و ثماني مائة ألف.

تفصيل ذلك عينا و ورقا

السواد: مائة ألف ألف و ثلاثون ألف دينار [و مائتا ألف درهم].

الاهواز: ثلاثة و عشرون ألف ألف درهم.

الخراج و صناعة الكتابة، ٣٨٣

[فتح] كور الاهواز

قالوا: غزا المغيرة بن شعبة الاهواز في ولاية البصرة حين شخ عنها عتبة بن غزوان في آخر سنة خمس عشرة و أول سنة ست عشرة، فقاتله

الخراج و صناعة الكتابة، ٣٨٤

البيرواز دهقان الاهواز ثم صالحه على مال. ثم انه بعد ذلك نكث، فغزاها أبو موسى الاشعري، حين ولى البصرة بعد المغيرة، فافتتح سوق الاهواز عنوة، و فتح نهر تيري عنوة، و ولي ذلك بنفسه في سنة سبع عشرة، و لم يزل يفتح نهرا نهرا، و رستاقا رستاقا، و الاعاجم تهرب من بين يديه حتى غلب على جميع أرضها الا السوس، و تستر، و مناذر و رامهرمز. و سار أبو موسى الى مناذر، فحاصر أهلها، فأشتد قتالهم فاستخلف الربيع بن زياد الحارثي على فتحها و سار الى السوس ففتح الربيع مناذر عنوة، فقتل المقاتلة، و سبى الذرية، و صارت مناذر الصغرى، و الكبرى، في أيدي المسلمين، و حصر أبو موسى السوس حتى نفذ ما عندهم من طعام، فضرعوا

الى الامان، و سـأل مرزبانها ان يؤمن منهم ثمانين على أن يفتح باب المدينة و يسلمها، فسمي الثمانين، و أخرج نفسـه من العدة فلم يعرض للثمانين و ضرب عنقه، و قتل من سواهم من المقاتلة و أخذ الاموال و سبى الذرية. و هادن أبو موســـى أهل رامهرمز، ثم أنقضـــت هدنتهم فوجه اليهم أبا مريم الحنفي فصـــالحهم على ثمانمائة ألف [درهم] ثم انهم غدروا ففتحت عنوة، فتحها أبو موسى في آخر أيامه.

و كان أبو موســـى قد فتح ســـرق، على مثل صـــلح رامهرمز. ثم انهم غدروا، فوجه اليها حارثة بن بدر الغداني، في جيش كثيف فلم يفتحها، فلما قدم عبد اللّه ابن عامر فتحها عنوة.

الخراج و صناعة الكتابة، ٣٨٥

قالوا: و سار أبو موسى الى تستر و بها شوكة العدو وحدهم، فكتب الى عمر يستمده، فكتب عمر الى عمار بن ياسر يأمره بالمسير اليه في أهل الكوفة، و تخليف مسعود، فقدم عمار، جرير بن عبد اللّه البجلي، و سار عمار بعده حتى أتى تســتر فقاتلهم أهل تســتر قتالا شديدا ثم انهم ألجأوا، الهرمزان الى القلعة و فيها حراسة فطلب الامان حينئذ، فأبى أبو موســـى أن يعطيه ذلك، الا على حكم عمر، فنزل على ذلك، و قتل من كان في القلعة ممن لا أمان له، و حمل الهرمزان الى عمر، فاستحياه و فرض له، و كان من أمره ما كان.

الخراج و صناعة الكتابة، ٣٨٦

و روي الواقدي: عن الزهري قال: افتتح عمر السواد و الاهواز عنوة فسئل قسمة ذلك فقال: فما لمن جاء بعدنا [من المسلمين] و أقر أهلها عن منزلة أهل الذمة. و لم يكن عسكر مكرم مصرا قديما، و انما نسبت الى مكرم بن الفزر، أحد بني جعونة بن الحارث بن نمير، و كان الحجاج وجهه لمحاربة خرزاد بن باس حين عصى و لحق بايذج، فنزل مكرم موضع عسكر مكرم الان. و كان بقرية قديمة فوصل بها البناء ثم لم يزل يزداد فيها حتى كثرت فسمى ذلك أجمع عسكر مكرم.

Ibn Sarābiyūn / Suhrāb (wrote between 902 and 945)
Suh
Das Kitāb ʻağā'ib Al-Aḳālīm as-Sab'a Des Suhrāb. Edited by Hans von Mžik. Leipzig: Harrassowitz, 1929.

سهراب، ابن سراپیون

کتاب عجائب الاقالیم السبعه الی نهایة العمارة

ابن سراپیون ۱۶۲

معرفة نهر جبل الأهواز

و ذلک أنَّ اوّله من جبل بأرض اصــبهان یمرّ بمدن الاهواز و یصــبّ فی البحر الشــرقیّ و یصــبُّ الیه ایضــاً نهر جندیسابور الذی علیه قنطرة الروم (اوّله من) ناحیة اصبهان ثمّ یصبّ فی دجیل الأهواز و یحمل من دجیل الأهواز نهر یقال له المسرقان اوّله فوق الشاذروان و یصبّ فی البحر الشرقیّ.

aṭ-Ṭabarī (ninth–tenth C)
Ṭab
Annales Quos Scripsit Abu Djafar Mohammed Ibn Djarir Al-Tabari. Edited by Michael Jan de Geoje. 11 vols. Leiden: Lugduni Batavorum Brill, 1964.

محمد بن جریر طبری

التاریخ الطبری

التاریخ، ج ۱، جزء ۲، ۸۲۶

... لاحدی عشرة سنة مضت من ملکه ... [شاپور] انه حاصر ملکا کان بالروم یقال له الریانوش بمدینة أنطاکیة فاسره و حمله

التاریخ، ج ۱، جزء ۲، ۸۲۷

و جماعة کثیرة معه و اسکنهم جندی سابور و ذکر انه اخذ الریانوس ببناء شاذروان تستر علی ان یجعل عرضه الف ذراع فبناه الرومی بقوم اشخصهم الیه من الروم و حکّم شابور فی فکاکه بعد فراغه من الشاذروان فقیل انه اخذ منه اموالا عظیمة و اطلقه و ... و قیل انه قتله.

التاریخ، ج ۱، جزء ۵، ۲۵۵۳

فخرج سلمی و حرملة و حُرقو و جزءٌ فنزلوا جمیعاً علی تستر و النعمان علی اهل الکوفة و اهل البصرة متساندون و بها الهرمزان و جنوده من اهل فارس و اهل الجبال و الاهواز فی الخنادق ... فحاصروهم شهرا و اکثروا فیهم القتل...

التاریخ، ج ۱، جزء ۵، ۲۵۵۴

و قد ضاقت بهم المدینة و طالت حربهم خرج الی النعمان رجل فاستأمنه علی ان یدلّه علی مدخل یُوْتَون منه و رُمِیَ فی ناحلة ابی موسی بسهم قد وثِقت بکم و أمنتکم و استأمنتکم عی ان دللتکم علی ما تأتون منه المدینة و یکون منه فتحها... و قال

التاریخ، ج ۱، جزء ۵، ۲۵۵۵

انهدوا من قِبَل مخرج الماء فانکم ستفتحونها فاستثار فی ذلک و ندب الیه فانتدب له..... بشر کثیر فنهدوا لذلک المکان لیلا ... فنهدوا فی بشر کثیر فالتقوا هم و اهل البصرة علی ذلک المخرج ... و فتحت الاوباب فاجلتدوا فیها فاناموا کل مُقاتل و أرز الهرمزان الی القعلة و اطاف به الذین دخلوا من مخرج الماء ...

التاریخ، ج ۲، جزء ۲، ۸۷۳

و فی هذه السنة [۷۵ هـ] خرج الحجاج من الکوفة الی البصرة و استخلف علی الکوفة ابا یَعْفور عروة بن المغیرة بن شعبة فلم یزل علیها حتی رجع الیها بعد وقعة رستقباذ.
و فی هذه السنة ثار الناس بالحجاج بالبصرة

ذکر خبر عن سبب وثوبهم به

... خرج الحجاج بن یوسف من الکوفة ... حتی قدم البصرة فقام فیها بخطبة مثل الذی قام بها فی اهل الکوفة و توعّدهم مثل وعیده ایّاهم فأتی برجل من بین یشکر فیل هذا عا ... قتله ففزع

التاریخ، ج ۲، جزء ۲، ۸۷۴

لذلک اهل البصره فخرجوا حتی تداکّوا علی العارض بقنطرة رامهرمز ... و خرج الحجاج حتی نزل رستقباذ فی اول شعبان سنة ۷۵ فثار الناس بالحجاج علیهم بعدالله بن الجارود فقتل عبدالله بن الجارود و بعث بثنمانیة عشر رأسا فنُصبت برامهرمز للناس فاشتدَّت ظهور المسلمین و ساء ذلک الخوارج و قد کانو رجوا این یکون من الناس فرقة و اختلاف فانصرف الحجاج الی البصرة، و کان سبب امر عبدالله بن الجارود ان الحجاج لما ندب الناس الی اللحاق بالمهلب بالبصرة فشخصوا سار الحجاج حتی نزل رستقباذ قریبا من دستوی فی آخر شعبان و معه وجوه اهل البصرة...

التاریخ، ج ۲، جزء ۲، ۱۰۶۰

[سنة احدی و ثمانین.] و عزم الحجاج رأیه علی استقبال ابن الأشعث فشار بأهل الشام حتی نزل تستر و قدم بین یدیه مطهر بن حر العکی او الجذامی و عبدالله بن رمیثة الطائی و مطهر علی الفریقین فجاءوا حتی انتهوا الی دجیل و قد قطع عبدالرحمن ابن محمد خیلا له علیها عبدالله بن ابان الحارثی... فلما انتهی الیهم مطهر بن حر امر عبدالله بن رمیثة الطائی فأقدم علیهم فهُزمت

التاریخ، ج ۲، جزء ۲، ۱۰۶۱

خیل عبدالله حتی انتهت الیه و جرح اصحابه قال ابو مخنف فحدثنی ابو الزبیر الهمدانی قال کنت فی اصحاب ابن محمد ... فهزمناهما فی سنة ۸۱ ...وأتت الحجاج الهزیمة ... فقال ایها الناس ارتحلو الی البصرة... ثم انصرف راجعا و تبعته خیول اهل العراق...حتی نزل الزاویة...

التاریخ، ج ۲، جزء ۲، ۱۰۶۲

... فسار الحجاج فی جیشه حتی نزل رستقباذ و هی من دَسْتَوی من کور الاهواز فعسکر بها و أقبل ابن الأشعث مبادرا فواقهم ... فیقال انهم قتلوا من اهل الشام الفا و خمس مائة و جاءه الباقول منهزمین...و بلغ اهل البصرة هزیمة الحجاج...

التاریخ، ج ۲، جزء ۲، ۱۲۰۸

[سنة تسعین] و فی هذه السنة هرب یزید بن مهلب و أخوته الذین کانوا معله فی السجن مع آخرین غیرهم فلحقوا بسلیمان بن عبدالملک... ذکر الخبر عن سبب تخلصهم من سجن الحجاج و مسیرهم الی سلیمان

... خرج الحجاج الی رستقباذ للبعث لأن الأکراد کانوا قد غلبوا

التاریخ، ج ۲، جزء ۲، ۱۲۰۹

علی عامة ارض فارس فخرج بیزید و باخوته المفضـل و عبدالملک حتی قدم بهم رسـتقباذ فجعلهم فی عسکره و جعل علیهم کهیئة الخندق و جعلهم فی فسـطاط قریبا من حجرته و جعل علیهم حرسا من اهل الشام و اغرمهم ستة آلاف الف و أخذ یعذبهم و کان یزید یصبر صبرا حسنا و کان الحجاج یغیظه...

التاریخ، ج ۳، جزء ۴، ۱۹۷۴

سـنة ۲۶۷ ارتحل ابو احمد من واسط شاخصا الی اهواز و کورها فنزل باذیین ثم جوخَی ثم الطیب ثم قرقوب ثم درسـتان ثم علی وادی السوس و قد کان عُقد له علیه جسر فاقام به من اول النهار الی آخر وقت الظهر حتی عبّر اهل عسکره اجمع ثم سار حتی وافی السوس فنزلها ...

التاریخ، ج ۳، جزء ۴، ۱۹۷۶

و رحل ابو احمد عن السـوس الی جندیسـابور فأقام بها ثلثا و قد کانت الاعلاف ضاقت علی اهل العسکر فوجّه فی طلبها و حملها و رحل عن جندیسـابور الی تسـتر و امر بجبایة الاموال من کور الاهواز و أنفذ الی کل کورة قائدا لیَروج بذلک حمل الاموال ... و امر مسـرورا البلخی عامله بالاهواز باحضـار من معه من الموالی و الغلمان و الجند لیعرضهم و یأمر باعطائهم الارزاق و ینهضهم معه لحرب الخبیث ... ثم رحل الی عسکر مکرم فجلعه منزلا اجتازه و رحـل منـه فوافی الاهواز ...و اقام ثلثة ایام ینتظر ورود المِیَر...فبحث ابو احمد عن السـبب المؤخر ورودها فوجد الجند قد کانوا قطعوا

التاریخ، ج ۳، جزء ۴، ۱۹۷۷

قنطرة قدیمة أعجمیة کانت بین سـوق الاهواز و رام هرمز یقال لها قنطرة أربک فامتنع التجار و من یحمل المیرة من تطرُّقه لقطع تلک القنطرة فرکب ابو احمد الیها و هی علی فرسخین من سوق الاهواز فجمع من کان بقی فی العسکر من السودان و أمرهم بنقل الحجارة و الصخر لاصلاح هذه القنطرة و بذل لهم الاموال الرغیبة فم یرم حتی اصلحت فی یومه ذلک و رُدَّت الی ما کانت علیه فسلکها الناس و وافت القوافل بالمیر فحَیِیَ اهل العسکر و حسنت احوالهم و امر ابو احمد بجمع السفن لعقد الجسر علی دجیل فجمعت من کور الاهواز و اخذ فی عقد الجسر و اقام بالاهواز ایاما حتی اصـلح اصحابه امورهم و ما احتاجوا الیه من آلاتهم و حسنت احوال دوابّهم و ذهب عنها ما کان نالها من الضـرّ بتخلُّف الاعلاف و وافت کتب القوم الذین کانو تخلّفوا عن المهلّبی و اقاموا بسـوق الاهواز یسـألونه الامان فأمنهم فأتاه نحو من الف رجل لأحسـن الیهم و ضمّهم الی قوّاد غلمانه و أجری لهم الارزاق، و عقد الجسر علی دجیل رحل بعد ان قدَّم جیوشـه فعبر الجسر و عسکر بالجانب الغربیّ من دجیل فی الموضع المعروف بقصر المأمون...

التاریخ، ج ۳، ۱۹۰۸

[سـنة ۲۶۱] و فیها کانت وقعة بین الزنج و احمد بن لَیْثَوَیه فقتل منهم خلقاً کثیراً و أسـر ابا داود الصعلوک و قد کان صار معهم

ذكر الخبر عن هذه الوقعه

ذكر ان مسـرورا البلخى وجّه احمد بن ليثوثه الى ناحية كور الاهواز فلما وصل اليها نزل السوس و كان الصفّار قد قلّـد محمد بن عبيدالله بن أزارمرد الكردى كور الاهواز فكتب محمد بن عبيدالله الى قائد الزنج يطمعه فى الميل اليه و قد كانت العادة جرت بمكاتبة محمد اياه من أول مخرحه و أوهمه انه يتولّى له كور الاهواز و يدارى الصـفّار حتى يستوى له الامر فيها فأجابه الخبيث الى ذلک على ان يكون على بن ابان المتولى لها

التاريخ، ج ٣، ١٩٠٩

و يكون محمد بن عبيد الله يخلفه عليها، فقبل محمد بن عبيد الله ذلك، فوجه على بن ابان أخاه الخليل بن ابان، في جمع كثير من السـودان و غيرهم، و ايدهم محمد بن عبيد الله بابى داود الصـعلوك، فمضـوا نحو السوس، فلم يصـلوا إليها، و دفعهم ابن ليثويه و من كان معه من اصـحاب السـلطان عنها، فانصـرفوا مفلولين، و قد قتل منهم مقتله عظيمه، و اسر منهم جماعه، و سار احمد بن ليثويه حتى نزل جندىسابور.

و سـار على بن ابـان من الاهواز منجدا محمد بن عبيد الله على احمد بن ليثويه، فتلقاه محمد بن عبيد الله في جمع من الأكراد و الصـعاليك، فلما قرب منه محمد بن عبيد الله سـارا جميعا، و جعلا بينهما المسـرقان، فكانا يسيران عن جانبيه، و وجّه محمد بن عبيد الله رجلا من اصحابه في ثلاثمائة فارس، فانضمّ الى على بن ابان، فسار على بن ابان و محمد بن عبيد الله الى ان وافيا عسـكر مكرم، فصـار محمد بن عبيد الله الى على بن ابان وحده، فالتقيا و تحادثا، و انصـرف محمد الى عسـكره، و وجّه الى على بن ابان القاسم بن على و رجلا من رؤساء الأكراد، يقال له حازم، و شـيخا من اصحاب الصفار يعرف بالطالقانى، و أتوا عليا، فسلّموا عليه، و لم يزل محمد و على على الفه، الى ان وافى علىّ قنطرة فارس، و دخل محمد بن عبيد الله تسـتر، و انتهى الى احمد بن ليثويه تضـافر على بن ابان و محمد بن عبيد الله على قتاله، فخرج عن جندىسابور،

التاريخ، ج ٣، ١٩١٠

و صـار الى السـوس و كانت موافاه على قنطرة فارس في يوم الجمعه، و قد وعده محمد بن عبيد الله ان يخطب الخـاطـب يومئذ، فيدعو لقائد الزنج، و له على منبر تسـتر، فأقام على منتظرا ذلك، و وجه بهبوذ بن عبد الوهاب لحضـور الجمعه و اتيانه بالخبر، فلما حضـرت الصـلاة قام الخطيب، فدعا للمعتمد و الصفار و محمد بن عبيد الله، فرجع بهبوذ الى على بالخبر، فنهض على من سـاعته، فركب دوابّه، و امر اصـحابه بالانصراف الى الاهواز، و قدّمهم امامه، و قدم معهم ابن أخيه محمد بن صـالح و محمد بن يحيى الكرماني خليفته، و كاتبه و اقام حتى إذا جاوزوا كسر قنطرة كانت هناك لئلا يتبعه الخيل. قال محمد بن الحسن: و كنت فيمن انصرف مع المتقدمين من اصحاب على، و مر الجيش في ليلتهم تلك مسرعين، فانتهوا الى عسكر مكرم في وقت طلوع الفجر، و كانت داخله في سلم الخبيث، فنكث اصحابه، و أوقعوا بعسكر مكرم، و نالوا نهبا و وافى على بن ابان في اثر اصحابه، فوقف على ما أحدثوا فلم يقدر على تغييره، فمضـى حتى صار الى الاهواز و لما انتهى الى احمد بن ليثويه انصراف على، كر راجعا حتى

وافى تســـتر، فاوقع بمحمد بن عبيد الله و من معه، فافلت محمد، و وقع في يده المعروف بابى داود الصـــعلوك، فحمله الى باب السلطان المعتمد، و اقام احمد بن ليثويه بتستر.

التاريخ، ج ٣، ١٩٣٣

و فيها شخ تكين البخارى الى الاهواز مقدمه لمسرور البلخى.

ذكر الخبر عما كان من امر تكين بالاهواز حين صـار إليها: ذكر محمد بن الحسـن ان تكين البخارى ولاه مسـرور البلخى كور الاهواز حين ولاه ابو احمـد عليها، فتوجه تكين إليها، فوافاها، و قد صـــار إليها على بن ابان المهلبى، فقصـد تسـتر، فاحاط بها في جمع كثير من اصـحابه الزنج و غيرهم، فراع ذلك أهلها، و كادوا ان يسلموها، فوافاها تكين في تلك الحال، فلم يضع عنه ثياب السفر، حتى واقع على بن ابان و اصحابه، فكانت الدبره على الزنج، فقتلوا و هزموا و تفرقوا، و انصرف على فيمن بقي معه مفلولا مدحورا، و هذه وقعه باب كودك المشهوره.

و رجع تكين البخارى، فنزل تسـتر، و انضـم اليه جمع كثير من الصـعاليك و غيرهم، و رحل اليه على بن ابان في جمع كثير من اصحابه، فنزل شرقى المسرقان، و جعل أخاه في الجانب الغربي في جماعه من الخيل، و جعل رجّا له الزنج معه، و قدّم جماعه من قواد الزنج...

التاريخ، ج ٣، ١٩٣٤

فأمرهم بالمقام بقنطرة فارس.

و انتهى الخبر بما دبَّره على بن ابان الى تكين، و كان الذى نقل اليه الخبر غلاما يقال له وصـــيف الرومي، و هرب اليه من عســـكر على بن ابان، فاخبره بمقام هؤلاء القوم بقنطرة فارس، و اعلمه تشـــاغلهم بشـــرب النبيذ و تفرُّق اصـــحابهم في جمع الطعام، فســـار اليهم تكين في الليل في جمع من اصـــحابه، فاوقع بهم، فقتل من قوّاد الزنج انكلويه و الحسين المعروف بالحمامى و مفرج المكنى أبا صالح و اندرون، و انهزم الباقون، فلحقوا بالخليل بن ابان، فاعلموه ما نزل بهم، و سار تكين على شرقى المسرقان حتى لقى على بن ابان في جمعه، فلم يقف له على و انهزم عنه، و أســـر غلام لعلى من الخياله يعرف بجعفرويه، و رجع على و الخليل في جمعهما الى الاهواز، و رجع تكين الى تستر،...

التاريخ، ج ٣، ١٩٣٧

[ســنة ٢٦٦] و فيها ولّى اغرتمش ما كان تكين البخارىُ يليه من عمال الاهواز، فســار اغرتمش إليها، و دخلها في شـهر رمضـان، فذكر محمد بن الحسن ان مسرورا وجَّه اغرتمش و أبا و مطر بن جامع لقتال على بن ابان، فساروا حتى انتهوا الى تســـتر، فأقاموا بها، و اســـتخرجوا من كان في حبس تكين، و كان فيه جعفرويه في جماعه من اصحاب قائد الزنج، فقتلوا جميعا ... ثم ساروا حتى وافوا عسكر مكرم، و رحل اليهم على ابن ابان، و قدَّم امامه اليهم الخليل أخاه، فصـــار اليهم الخليل، فواقفهم و تلاه علىٌ، فلما كثر عليهم جمع الزنج، قطعوا الجســـر و تحاجزوا، و جنّهم الليل، فانصرف على بن ابان في جميع اصحابه، فصار الى الاهواز، و اقام الخليل فيمن معه بالمسرقان و أتاه الخبر بان اغرتمش و أبا و مطر بن جامع قد أقبلوا نحوه، و نزلوا الجانب الشرقى من قنطره اربك ليعبروا اليه،

فكتب الخليل بذلك الى أخيه على بن ابان، فرحل على اليهم حتى وافاهم بالقنطره، و وجَّه الى الخليل يأمره بالمصير اليه، فوافاه و ارتاع من كان بالاهواز من اصحاب على، فقلعوا عسكره، و مضوا الى نهر السدره، و نشبت الحرب بين على بن ابان و قواد السلطان هناك، و كان ذلك يومهم، ثم تحاجزوا.

و انصرف على بن ابان الى الاهواز، فلم يجد بها أحدا، و وجد اصحابه اجمعين قد لحقوا بنهر السدره، فوجه اليهم من يردهم، فعسر ذلك عليه فتبعهم، فأقام بنهر السدره، و رجع قواد السلطان حتى نزلوا عسكر مكرم...

al-Iṣṭaḫrī, Abū Isḥāq Ibrāhīm b. Muḥammad al-Fārisī al-Karḫī: (wrote c.950)
Iṣṭ
Viae Regnorum: Descriptio Ditionis Moslemicae (Kitāb Al-Masālik Wa Al-Mamālik). Edited by Michael Jan de Goeje. Bibliotheca Geographorum Arabicorum 1. Leiden: Lugduni-Batavorum : E. J. Brill, 1927.

الاستخرى

المسالک و الممالک

المسالك والممالك، ٨٨

و امّا حدود خوزستان... و امّا ما يقع فيها من المدن فانّها كور منها الاهواز و اسمها هرمزشهر و هى

المسالك والممالك، ٨٩

الكورة العظيمة الّتى ينسب اليها سائر الكور و عسكر مكرم و تستر و جندى سابور و السّوس و رامهرمز و سرّق و كلّ ما ذكرنا من كورة فهى اسم المدينة غير سرّق فانّ مدينتها الدّورق و هى المعروفة بدورق الفرس و ايدج و نهر تيرى و حومة الزّطّ و الخابران و هما واحد و حومة البنيان و سوق سنبيل و مناذر الكبرى و مناذر الصغرى و جبّى و الطّيب و كليوان فهذه مدن لكلّ مدينة كورة، و من مدنها المعروفة المشهورة بصنّى و أزم و سوق الاربعاء و حصن مهدىّ و باسيان و بيان و سليمانان و قرقوب و متّوث و برذون و كرخا و خوزستان فى مستوى و ارض سهلة و مياه جارية فمن اكبر انهارها نهر تستر و هو النهر الّذى بنى عليه سابور الملك شاذروان بباب تستر حتّى ارتفع ماؤه الى ارض المدينة لانّ تستر على مكان مرتفع من الارض فيجرى هذا النهر من وراء عسكر مكرم على الاهواز حتّى ينتهى على نهر السّدرة الى حصن مهدىّ و يقع فى البحر، و يجرى من ناحية تستر نهر المسرقان حتّى ينتهى الى عسكر مكرم سفلى الاهواز و آخره بالاهواز لا يتجاوزها فاذا انتهى الى عسكر مكرم فعليه جسر كبير نحو عشرين سفينة تجرى فيه السفن العظام و قد ركبته انا من عسكر مكرم الى الاهواز و المسافة ثمانية

المسالك والممالك، ٩٠

فراسخ فسرنا فى الماء ستّة فراسخ ثمّ خرجنا و سرنا فى وسط النهر و كان الباقى من هذا النهر الى الاهواز طريقا يابسا و لا يضيع من هذا الماء شىء و انّما تسقى به اراضى قصب السكّر و ما فى اضعافه من النخيل و الزروع، و ما بخوزستان كلّها على كمال عمارتها بقعة هى اعمر و ارخى من المسرقان، و مياه خوزستان من الاهواز و الدورق و تستر و غير ذلك ممّا يصاقب هذه المواضع كلّها تجتمع عند حصن مهدىّ فتصير هناك نهرا كبيرا و يغزر و يصير له عرض ثمّ ينتهى الى البحر، و ليس بها بحر الا ما تنتهى اليه زاوية من مهروبان الى قرب سليمانان بحذاء عبّادان فانّه شىء يسير و هو من بحر فارس و ليس بجميع خوزستان جبال و لا رمال الا شىء يسير يتاخم نواحى تستر و جندى سابور و بناحية ايذج و اصبهان و الباقى من خوزستان كانّه ارض العراق و امّا هواؤها و ماؤها و تربتها و صحّة اهلها فانّ مياهها طيبة عذبة جارية و لا اعرف بجميع خوزستان بلدا ماؤهم من البئر لكثرة المياه الجارية بها،

و امّا ترابها فانّ ما بعد عن دجلة الى ناحية الشـمال ايبس و اصـحّ و ما كان الى دجلة اقرب فهو من جنس أرض البصـرة فى التسبّخ و كذلك الصحّة و نقاء البشرة فى الناس فيما بعد عن دجلة و امّا المسرقان خاصّة فانّ بها رطبا يسمّى الطّنّ يقال انّ ذلك الرطب اذا اكله الانسان و شرب عليه ماء المسرقان لم تخطئه الحمّى، و ليس بخوزستان موضع

المسالك والممالك، ٩١

يجمد فيه الماء و لا يقع فيه الثلج و لا يخلو من النخل، و العلل بها كثيرة و خاصّـة لمن انتابها، و امّا ثمارهم و زرعهم فانّ الغالب على بلاد خوزسـتان من الاشـجار النخل و لهم عامّة الحبوب من الحنطة و الشـعير و الباقلاء و اكثر حبوبها بعد الحنطة و الشعير الارزّ فيخبزونه و هو لهم قوت و كذلك فى رستاق العراق و ليس من بلد ليس به قصـب سـكّر من هذه الكور الكبار و لكنّ اكثر ما بها من السكّر بالمسرقان و يقع[٣] جميعه الى عسكر مكرم و ليس بعسكر مكرم فى القصبة كثير سكّر و كذلك بتستر و السوس فانّه يتّخذ منه السكّر و القصب فى سائر المواضع انّما هو للاكل دون ان يتّخذ منه السـكّر، و عندهم عامّة الثمار لا يكاد يخطئهم الا الجوز و ما لا يكون الا ببلاد الصرود و امّا لسـانهم فانّ عامّتهم يتكلّمون بالفارسية و العربية غير انّ لهم لسانا آخر خوزيا ليس بعبرانىّ و لا سريانىّ و لا فارسى...

المسالك والممالك، ٩٢

و امّا الخاصّيات بها فانّ عندهم بتستر الشاذروان الّذى بناه سابور و هو من اعجب البناء و احكمه بلغنى انّ امتداده يقرب من ميل قد بنى بالحجارة كلّه حتّى تراجع الماء فيه و ارتفع الى باب تسـتر... و امّا تسـتر فانّ بها يتّخذ الديباج الّذى يحمل الى الدنيا و كسوة مكّة من الديباج يتّخذ بها و بها للسلطان

مسالك والممالك، ٩٣

طراز و امّا السّوس فانّه تعمل بها الخزوز و منها تحمل الى الافاق... و برامهرمز من ثياب ابريسم ما يحمل منها الى كثير من المواضع،...وجندى سابور مدينة خصبة واسعة الخير و بها نخل و زروع كثيرة و مياه ... و نهر تيرى تكون بها ثياب تشـبه ثياب بغداد و تحمل الى بغداد فتدلّس بالبغدادىّ و تقصـر ببغداد و جبّى مدينة و رسـتاق عريض مشتبك العمارة من النخيل و قصب السكّر ...

المسالك والممالك، ٩۴

... تتّصـل زاوية من خوزستان بالبحر فيكون له خور يخاف على سفن البحر اذا انتهت اليه فانّه يعرض، و استجمع مياه خوزستان بحصن مهدىّ فيتّصل بالبحر و يعرض هناك حتّى ينتهى فى طرفه المدّ و الجزر و يتّسع حتّى كانّه من البحر و تتّخذ بالطّيب تكك تشـبه الارمنىّ قلّ ما تتّخذ فى مكان من الاسـلام بعد ارمينية احسـن منها فيما علمته و اللّور بلد خصـب الغالب عليه هواء الجبل و كان من خوزسـتان الا انّه أفرد فى اعمال الجبل ... و الزّطّ و

[٣] و يرفع

الخابران هما کورتان عامرتان علی نهرین جاریین و البنیان متاخمة للسّردان من ارض فارس و لاصبهان و هواؤها هواء الصرود و لیس بخوزستان رستاق یقارب الصرود غیر البنیان ...

المسالك والممالك، ۹۵

...و امّا مناذر الکبری و الصغری فانّهما کورتان عامرتان بالنخل و الزروع و لهما ارتفاع کثیر و اما المسافات بها فانّ من فارس الی العراق طریقین شارعین احدهما الی البصرة ثمّ الی بغداد و الاخر الی واسط ثمّ الی بغداد فامّا طریق البصرة فانّك تاخذ من ارّجان الی آسك قریة مرحلتین خفیفتین ثمّ الی زیدان مرحلة و زیدان قریة ثمّ منها الی الدّورق مرحلة و الدورق مدینة کبیرة و هی مدینة سرّق ثمّ من الدورق الی خان مردویه و هو خان تنزله السابلة مرحلة و من خان مردویه الی باسیان مدینة وسطة فی الکبر عامرة یشقّ النهر فیها فتصیر نصفین مرحلة و من باسیان الی حصن مهدیّ مرحلتین فیها منبر و یسلك بینهما فی الماء و کذلك من الدورق الی باسیان یسلك فی الماء و هو ایسر من البرّ و من حصن مهدیّ الی بیان مرحلة علی الظهر و بیان فیها منبر و قد انتهیت الی آخر حدود خوزستان، و بیان علی دجلة فارکب منها الماء ان شئت الی الابلّة و ان شئت علی الظهر الی ان تحاذی الابلّة ثمّ تعبر و امّا الطریق الی واسط ثمّ الی بغداد فانّ من ارّجان الی سوق سنبیل مرحلة ثمّ الی رامهرمز مرحلتین ثمّ من رامهرمز الی عسکر مکرم ۳ مراحل و من عسکر مکرم الی تستر مرحلة و من

المسالك والممالك، ۹۶

تستر الی جندی سابور مرحلة و من جندی سابور الی السوس مرحلة و من السوس الی قرقوب مرحلة و من قرقوب الی الطیب مرحلة و یتّصل بعمل واسط، و من العسکر الی واسط طریق اخصر من هذا فلا یدخل تستر و لکنّا ذکرنا هذا المسلك لانّ قصدنا ذکر مسافة ما بین المدن و لم نرد نفس الطرق الی بغداد فکان هذا اجمع لما اردنا ان نذکره و من العسکر الی ایذج ۴ مراحل و من العسکر الی الاهواز مرحلة و من الاهواز الی أزم مرحلة و من الاهواز الی الدورق ۴ مراحل و من عسکر مکرم الی الدورق نحو هذا، و من الاهواز الی رامهرمز نحو ۳ مراحل ایضا لانّ الاهواز و عسکر مکرم فی سمت واحد و رامهرمز منهما کاحدی زوایا المثلّث، و من عسکر مکرم الی سوق الاربعاء مرحلة و جبّی تحاذی سوق الاربعاء و من سوق الاربعاء الی حصن مهدیّ مرحلة، و من الاهواز الی نهر تیری یوم، و من السوس الی بصنّی اقلّ من مرحلة و من السوس الی برذون مرحلة خفیفة و من السوس الی متّوث مرحلة.

Ibn Ḥawqal, Abū l-Qāsim b. ʿAlī an-Naṣībī (d. after 988)
Ḥaw
Ibn Ḥawqal. *Kitāb Ṣūrat Al-Arḍ*. Edited by Johannes Hendrik Kramers. 2 vols. Beirut: Dār Sādir, 1938.

ابن حوقل

كتاب صورة الارض

صورة الارض، ج۲، ۲۴۹

[خوزستان]

و أمّا حدود خوزستان و محلّها ممّا يجاورها من البقاع المضافة اليها و المصاقبة لنواحيها فإنّ شرقيها حدّ فارس و اصبهان و بينها «۳» و بين حدّ فارس من حدّ اصبهان نهر طاب و هو الحدّ الى قرب مهروبان و لهذا النهر رستاق كبير و ناحية واسعة و هو نهر عميق عليه جسر من خشب معلّق بين السماء و الماء و بينه و بين الماء نحو عشر أذرع يعبر عليه سيارة تلك الناحية و المجتازون بها، ثمّ يصير الحدّ بين الدورق و مهروبان على الظهر الى البحر، و غربيها حدّ رستاق واسط و أعمالها و دور الراسبى، و شماليها حدّ الصَيمَرة و الكرج[۴] و اللور حتّى يتّصل على حدود الجبال الى اصبهان على أنّه يقال أنّ اللور و أعمالها كانت من خوزستان فحوّلت الى الجبال، و حدّ خوزستان ممّا يلى فارس و اصبهان و حدود الجبال من واسط على خطّ مستقيم فى التربيع إلا أنّ الحدّ الجنوبىّ من حدّ عبّادان الى رستاق واسط يصير مخروطًا فيضيق فى التربيع عمّا قابله و فيه من حدّ الجنوب أيضا من حدّ عبّادان على البحر الى حدّ فارس تقويس يسير فى الزاوية و ينتهى هذا الحدّ آخذا الى المغرب ذاهبا الى الدجلة حتّى يجاوز بيان ثمّ ينعطف من وراء المفتح و المذار الى أن يتّصل برستاق واسط من حيث ابتدائه،

و الصورة التى فى بطن هذه الصفحة صورة خوزستان،

صورة الارض، ج۲، ۲۵۱

إيضاح ما يوجد فى صورة خوزستان من الاسماء و النصوص، قد رُسم البحر فى الزاوية اليسرى من أعلى الصورة على شكل نصف دائرة و يصبّ فى البحر نهر دجلة آتيا من اليمين و على هذا النهر ابتداء من اليمين مدينة واسط و فى الجانب الاخر واسط مرّة ثانية، ثمّ تتشعّب من أعلى النهر شعبة كتب عندها نهر معقل و يمرّ على خطّ مدوّر بمدينة البصره الى أن تصبّ فى البحر عند عبادان فى موضع مصبّ دجلة، و يأخذ من حذاء البصرة نهر الابله الذى ينتهى الى عمود دجلة عند مدينة الابله المشكّلة من جانبيه، و تجاه الابلّة على دجلة مدينة بيان ثمّ عند مصّها سليمانان، و كتب ابتداء من عند بيان حدّ خوزستان على خطّ مستطيل يأخذ أوّلا الى وسط الطرف الايمن ثمّ يوازى هذا الطرف الى أسفل الصورة ثمّ يوازى الطرف الاسفل ثمّ يعطف الى الاعلى راجعا الى البحر، و يوازى كلمة

[۴] والكرخ

حدّ عن أعلى يمينه كتابة صـورة خوزستان، و تبتدئ من عند واسط الى الاسفل كتابة سواد واسط و الراسبى، ثمّ يوازى القسم الاسفل من الحدّ حدود الجبال و بعد ذلك موازيا لاخر الحدّ الى الفوق نواحى فارس، و يأخذ من وسط أسـفل الصـورة نهر تسـتر واردا الى البحر و كتب عند مصبّه «١٥» الدجلة الهوزا، و عن يمين هذا النهر فى أسفل الصورة مدينة كرجه ثمّ على النهر تستر ثمّ جندى سابور ثمّ هرموز ثمّ جبى، و بحذاء تستر يتشعّب من هذا النهر نهر المسـرقان مارّا بمدينة عسـكر مكرم ثمّ يعطف الى اليمين راجعا الى عمود نهر تسـتر عند النصـف الايسر من هرموز و كتب مقابلا لهرموز الى الاسفل الشاذروان، ثمّ من أعلى هرموز على عمود النهر سوق الاربعاء، و يوازى نهر تسـتر فى القسم الايمن من الصورة نهر السوس عليه مدينة السوس و عن يسار نهايته نهر تيرى، و يقع عن يمين نهر السوس من المدن قرقوب، الطيب، متوث، برذون، بصنى، و يصبّ فى نهر تستر بقرب فوّهته نهر آخر يأتى من اليسـار عليه الباسـيان من الجانبين ثمّ الدورق، و على الطريق الاخذ من الدورق الى اليسـار ديرا واسـك، و يمتدّ الطريق الاخذ من الطيب عند الحدّ الايمن على قرقوب و السوس و جندى سابور

صورة الارض، ج٢، ٢٥٢

و عسـكر مكرم الى رام هرمز ثمّ الى سـنبيل على الحدّ الايسـر، و فى الساحة من تحت هذا الطريق مدينتا اربق و ايذج، و هذه مواقع خوزسـتان و ما ارتفع فى كورها من مدنها و الاهواز مدينة تُعرف بهرموز شـهر و هى الكورة العظيمة و الناحية الجسيمة التى يُنسب اليها سائر المدن و الكور [و الان فقد خرب أكثرها و انجلى أهلها و صارت مدينة عسـكر مكرم أكثر عمارةً منها] و عسكر مكرم و تستر و جندى سابور و السوس و رامُ هرمز و السُرَّق و كلّما ذكرته من كورة فهو اسم المدينة غير السرق فإنّ مدينته الدَورَق و هى المعروفة بدورق الفرس و ايذج و نهر تيرى و حومة الزُطّ و الجايزان و هما واحد و حومة التّينان و سـوق سـنبيل و مناذر الكبرى و مناذر الصـغرى و جبّى و الطيب و كليوان فهذه مدن و لكلّ مدينة كورة، و من مدنها المشهورة المعروفة فى جميع الارض بصنّى المذكورة على سـتورها المجلوبة الى جميع أقاليم الدنيا، و ازم و سوق الاربعاء و حصن مهدىّ و الباسيان و بيان و سليمانان و قرقوب و متوث و برذون و كرجه و هى جميع ما لها من المنابر،

و خوزسـتان أجمعها فى مسـتواة من الارض سـهلة ذات مياه جارية و أكبر أنهارها نهر تُستَر و هو النهر الذى بنى عليه سـابور الملك الشـاذروان بباب تسـتر حتّى ارتفع ماؤه الى المدينة لانّ تسـتر على نشز مرتفع عمّا داناها من الارض فيجرى هذا النهر من وراء عسـكر مكرم على الاهواز حتّى ينتهى الى نهر السـدرة الى حصـن مهدىّ و يقع فى البحر، و يجرى من ناحية تستر نهر المسرقان حتّى ينتهى الى عسكر مكرم [و يشقّها بنصفين]

صورة الارض، ج٢، ٢٥٣

و يتّصـل بالاهواز و آخره الاهواز لا يجاوزها و إذا انتهى الى عسـكر مكرم فعليه جسـر كبير نحو عشرين سفينة [و على نهر المسـرقان فى وسط عسكر مكرم قنطرة حسنة محكمة البناء بالج و الاجرّ عريضة جدّا و فى هذه القنطرة سـوق و دكاكين و مسـجد حسن نزه،] و تجرى فيه السفن العظام و ركبتُه من عسكر مكرم الى الاهواز و المسافة عشـرة فراسخ فسرنا فى الماء ستّة فراسخ ثمّ خرجنا و سرنا فى وسط النهر و كان الباقى من هذا النهر الى الاهواز

طريقا يابسا لانّ ذلك كان فى آخر الشهر و القمر فى نقصانه فنق الماء عن ملء النهر من قبل المدّ و الجزر اللذين ينقصان و يزيدان بزيادة القمر، و لن يضيع من هذا الماء شىء بوجه من الوجوه بل يسقى به أراضى قصب السكّر و ما فى أضعافه من النخيل و الزروع و غير ذلك، و ليس بخوزستان كلّها على كمال عمارتها بقعة هى أعمر من المسرقان، و مياه خوزستان من الاهواز و الدورق و تستر و غير ذلك ممّا يصاقب هذه المواضع كلّها تجتمع عند حصن مَهدىّ فيفيض هناك بعد أن يغزر و يكثر و يصير له عرض ما يقارب الفرسخ و ينتهى الى البحر، و ليس بخوزستان بحر إلا ما ينتهى اليها من زاوية من حدّ مهروبان الى قرب سليمانان بحذاء عبّادان و هو شىء يسير من بحر فارس،

و ليس بجميع خوزستان جبال و لا رمال إلا شىء يسير يتاخم نواحى تستر و جندى سابور و ناحية ايذج و اصبهان و باقى خوزستان كأرض العراق، فأمّا هواؤها و تربتها و صحّة أهلها فإنّ مياهها طيبة عذبة جارية و لا أعرف بجميع خوزستان بلدا ماؤه من البئر لكثرة المياه الجارية بها، و أمّا تربتها فما بَعُد من الدجلة الى ناحية الشمال فهو أيبس و أصحّ و ما كان الى الدجلة أقربَ فهو من جنس أرض البصرة فى التسبّخ و كذلك الصحّة و نقاء البشرة فى أهلها فيما بعد عن الدجلة، و أمّا المسرقان

خاصّة ففيه رطب يعرف برطب الطن و يقال أنّ ذلك الرطب إذا أكله الانسان و شرب عليه ماء المسرقان لم يخطئه رائحة فيه من رائحة الخمر العتيق، و ليس بخوزستان موضع يجمد فيه الماء و لا يقع فيه الثلج و لا يخلو من النخيل، و العلل بها كثيرة و خاصّة لمن انتابها و طرأ عليها، و ثمارهم و زروعهم فالغالب منها فى غلاتهم النخل و لهم عامّة الحبوب كالحنطة و الشعير و الفول و يكثر عندهم الارزّ حتّى أنّهم ليطحنونه و يخبزونه و يأكلونه و هو لهم قوت [و فيهم من تعوّد أكل خبز الارزّ طول السنة حتّى إذا أكل خبز الحنطة أخذه المغس و وجع البطن و ربّما يموت منه] و كذلك رساتيق العراق، و ليس من بلد ليس به قصب سكّر فى جميع هذه الكور الكبار التى تقدّم ذكرها و أكثر ذلك بالمسرقان و يقع أكثره الى عسكر مكرم، و ليس بالعسكر فى القصبة كثير سكّر و لا بتستر و يتّخذ الكثير منه بالسوس و فى سائر المواضع للاكل من القصب ما يسدّ الحاجة و يزيد و عندهم عامّة الثمار، و لا يكاد يخطئهم من الثمار غير الجوز و ما لا يكون إلا ببلاد الصرود،

و أمّا لسانهم فإنّ عامّتهم يتكلّمون بالفارسية و العربية غير أنّ لهم لسانا آخر خوزيا ليس بعبرانىّ و لا سريانىّ و لا فارسىّ، و زيهم زىّ أهل العراق فى الملابس من القم و الطيالسة و العمائم و فى أضعافهم من يلبس الازر و الميازر، ...، و الغالب على خلقهم صفرة الالوان و النحافة ... و أمّا ما ينتحلونه من الديانات و المذاهب فالغالب عليهم الاعتزال و الغلبة لاهله دون سائر النحل ...

صورة الارض، ج۲، ۲۵۵

... و من الخاصّـيات عندهم ما تقدّم ذكره من الشـاذروان الذى بناه سابور و هو من أعجب البناء و أحكمه و طوله نحو الميل قد رُ بالحجارة و رُصِـف كلّه حتّى تراجع الماء فيه و ارتفع الى باب تسـتر، و بنهر السوس تابوت دانيال النّبى عليه السلم ...

صورة الارض، ج۲، ۲۵۶

.... و يُتَّخذ بتسـتر الديباج الذى يحمل الى جميع الافاق و كان تُعمل بها كسوة الكعبة للبيت الحرام الى أن افتقر السـلطان و حلّت به الرحمة فسـقطت عنه عند ذلك فريضته و يكون بتستر لجميع من ملك العراق طراز و صاحب يسـتعمل له ما يشتهيه، و يُعمل بالسوس الخزوز الثقيلة و منها تُحمل الى الافاق،... و بقرقوب السوسن جرد الذى يحمل الى الافاق و بالسوس و بها طُرز للسلطان، و ببصنَّى تُعمل الستور المشهورة فى جميع الارض المرقوم عليها عمل بصنّى و قد تعمل ببرذون و كليوان و غيرهما من المدن ستور يكتب عليها بصنّى و تدلّس [فى ستور بصنّى]، و برامهرمز من ثياب الابريسـم ما يُحمل الى كثير من المواضع ...، و جندى سابور مدينة خصبة واسعة الخير و بها نخل و زرع كثير و مياه و قطنها .... بنهر تيرى ثياب تشبه ثياب

صورة الارض، ج۲، ۲۵۷

بغداذ و تُحمل اليها فتُدلَّس بها و تُقصَـرُ هناك و تُحمل جهازًا الى جميع الافاق فلا شكّ فيها و هى حسنة، و جُبّى مدينة و لها رستاق عريض مشتبك العمارة بالنخيل و قصب السكّر و غيرهما و منها أبو علىّ الجبّائىّ [الشيخ الجليل إمام المعتزلة و رئيس المتكلّمين فى عصره]،

ثمّ تتّصـل زاوية من خوزسـتان بالبحر فيكون لها خور [يخاف] على سـفن البحر إذا انتهت اليه و ربّما غرق فيه الكثير منها و ذلك لما يسـتجمع من مياه خوزسـتان بحصن مهدىّ فيتّصل بالبحر و يعرض هناك حتّى ينتهى فى طرفه المدّ و الجزر و يتّسـع حتّى كأنّه البحر و إذا عصفت فيه الرياح محن و اضطرب و يزيد على الفرسخ، و يُتَّخذ بالطيب تِكَكٌ تشـبه الارمنىّ و قلّ ما تتَّخذ بمكان من الاسلام بعد ارمينيه أحسن أو أفخر منها و إن كان ما يُعمل بسـجلماسه من جنسها لكنّه لا يبلغ القيمة و لا يدانيها و لا يقاربها فى الحسن و هى مدينة طيبة مقتصدة يُعمل بها الاكسـية و البرّكانات، و اللور بلد بذاته خَصِـبٌ و الغالب عليه هواء الجبل و كان من خوزستان فضمّ الى أعمال الجبال و له بادية و إقليم و رسـاتيق الغالب عليه الاكراد و هو بجوارهم خَصِبٌ و بمصاقبتهم رّطْبٌ، و سنبيل كورة متاخمة لفارس و كانت مضـمومة اليها من أيام محمّد بن واصـل الى آخر أيام السـجزية فحوّلت الى خوزستان، و الزطّ و الجائزان كورتان متجاورتان كثيرتا الدخل، و الثِّينان متاخمة للسـردن من أرض فارس و حدّ اصـبهان و هواؤها هواء الصرود و ليس بخوزستان رستاق يقارب الصرود غير الثينان، و آسك قرية ليس بها منبر و حولها نخيل كثيرة ...

صورة الارض، ج۲، ۲۵۸

... و الدوشاب الآسكى الذى يُحمل الى العراق مشهور بالجودة و يفضل على كلّ دبسٍ من الرجانىّ و غيره، و أمّا مناذر الكبرى و الصغرى فكورتان عامرتان أيضًا بالنخيل و الزروع و لهما ارتفاع كثير و لاربابهما فى الديوان محلٌّ ليس يدانَى رفْعُهُ و جلاله،

و أمّا المسافات بها فإنّ من خوزستان الى العراق طريقين شارعين أحدهما الى البصرة ثمّ الى بغداذ و الاخر الى واسط ثمّ الى بغداذ، فأمّا طريق البصرة فإنّك تأخذ من الرجان الى آسك قرية مرحلتين خفيفتين ثمّ الى ديرا مرحلة و ديرا قرية ثمّ منها الى الدورق مرحلة و الدورق مدينة كثيرة الاهل و هى مدينة الرستاق المعروف بسرق ثمّ من الدورق الى خان من دونها ينزله السابلة يعرف بخان مزدويه ثمّ الى الباسيان مدينة وسطة فى الحال عامرة يشقّها نهر فتصير نصفين مرحلة و من الباسيان الى حصن مهدىّ مرحلتان و فيها منبر و يسلك بينهما فى الماء و كذلك من الدورق الى الباسيان فيسلك فى الماء و هو أيسر من البرّ و من حصن مهدىّ الى بيان مرحلة على الظهر و ببيان منبر و قد انتهيت الى آخر حدود خوزستان و بيان على دجلة فيركب منها الى حيث أراد المرء فإمّا الى الابلّة فى الماء و من شاء على الظهر الى أن يحاذى الابلّة ثمّ يعبر اليها، و أمّا الطريق على واسط الى بغداذ فإنّ من الرجان الى سوق سنبيل مرحلة و منها الى رامهرمز مرحلتان ثمّ من رامهرمز الى عسكرمكرم ثلث مراحل و من عسكر مكرم الى تستر مرحلة و من تستر الى جندى سابور مرحلة و من جندى سابور الى السوس مرحلة و من السوس الى قرقوب مرحلة و من قرقوب الى الطيب مرحلة و يتّصل بعمل واسط،

صورة الارض، ج۲، ۲۵۹

و من العسكر الى واسط طريق أخصر من هذا الطريق و لا يمرّ على تستر و إنّما ذكرت هذا المسلك لانّى قصدت ذكر المسافة ما بين المدن و لم أرد نفس الطرق الى بغداذ فكان هذا أجمع لما أردته، و من العسكر الى ايذج أربع مراحل و من العسكر الى الاهواز مرحلة و [من الاهواز] الى ازم مرحلة و من الاهواز الى الدورق أربع مراحل و من عسكر مكرم الى الدورق نحو أربع مراحل [و من الاهواز الى رامهرمز نحو ثلاث مراحل أيضا] لانّ الاهواز و عسكر مكرم فى سمت واحد ورام هرمز منهما كإحدى زوايا المثلثة، و من عسكر مكرم الى سوق الاربعاء مرحلة و من تعدّى سوق الاربعاء الى حصن مهدىّ سار مرحلة، و من الاهواز الى نهر تيرى يوم، و من السوس الى بصنّى أقلّ من مرحلة، و من السوس الى برذون مرحلة خفيفة، و من السوس الى متّوث مرحلة، [فهذه جميع المسافات بها،] و أمّا ارتفاعها فإنّى حضرتها سنة ثمان و خمسين و هى بيد أبى الفضل الشيرازىّ بثلثين ألف ألف درهم دون زيادة الصنجة و حقّ بيت المال..

Ḥamza l-Iṣfahānī (c.893–after 961)
Ḥmz
Hamzae Ispahanensis annalium libri X (Tarīḫ sinī mulūk al-arḍ wa-l-anbiyā'). Edited by I. M. E. Gottwaldt. Vol. 2. St.-Petersburg: In commissis apudLeopoldum Voss, 1844.

حمزه الاصبهانی

تاریخ سنی ملوک الارض و الأنبیاء

التاریخ، ۴۷

و أمّا هرمز اردشیر فاسم لمدینتین کان اردشیر لما اختطهما سمی کل واحد باسم متترکب من اسمه و من اسم الله عزوجل فانزل احدیهما السوقیین و الاخری عظماء الناس و الاشراف منهم و صار المدینة السوقیین اسم آخر و هو هوجستان واجار فعربوه و قال سوق الاهواز و عربو الاسم الاخر فقالو هرمشیر و لما ورد العرب خوزستان خربوا مدینة العظماء و ترکوا مدینة السوقیین قم خربوا بعد ایام حروب الحجاج مع القرا مدینتین اخرتین من مدن خوزستان احداهما کانت تسمی رستم کواذ و عربو الاسم فقالوا رسیقاباد و الاخری جواستاد ...

التاریخ، ۴۸

و أمّا قسم [اردشیر] ایضا میاه وادی خوزستان و حفر لمائه انهار منها لمشرقان و هو بالفارسیة اردشیر کان...شابور بن اردشیر بنی شاذروان تستر و هو احد عجائب المشرق ...

al-Muqaddasī, Šams ad-Dīn Abū ʿAbd Allāh Muḥammad b. Aḥmad (finished after 990)
Muq
Aḥsan at-taqāsīm fī maʿrifat al-aqālīm. Edited by Michael Jan de Geoje. Cairo: Maktab al-Madbuli, 1991.

المقدسی

احسن التقاسیم

احسن التقاسیم فی معرفة الاقالیم، ۱۹

و اما الانهار الفائضة فی المملکة فالمشهور منها فیما رایتُ و میَّزتُ اثنا عشر دجلة و افرات و النیل و نهر الشاش و جیحان و بَرَان و مِهْران و نهرالرَّسّ و نهر الملک و نهر الاهواز یجری فیها السفن و دونها خمسة عشر اخری...

احسن التقاسیم فی معرفة الاقالیم، ۴۷

.. فلاقالیم اربعة عشر ستّة عربیّة.... و ثمانیة عجمیّة المشرق ثم الدیلم ثم الرحاب ثم الجبال ثم خوزستان ثم فارس ثم کرمان ثم السند، و لابدَّ لکلّ اقلیم من کور ثم لکلّ کورة من قصبة ثم لکلّ قصبة من مدن الا الجزیرة و المشرق و المغرب فان لکلِّ واحد مصرَیْن و المصر قصبةکورته و لیس لکلٌّ قصبة مصراً ثم الامصار اسم کورها ایضاً....

فالامصار ... الاهواز...

احسن التقاسیم فی معرفة الاقالیم، ۴۸

و بقیة القصبات سبع و سبعون ... السوس جندیسابور تستر العسکر الدورق رامهرمز...

احسن التقاسیم فی معرفة الاقالیم، ۵۱

و للسوس البذان بصنَّا بیروت قریةالرمل کرخة و لجندی سابور الدز الروناش بایوه قاضبین اللور و لم ار لتستر مدینة البتَّة و للعسکر جوبک «۲۰» زیدان سوقالثلثاء حُبک ذوقرطم و الاهواز نهر تیری جوزدک بیروه

احسن التقاسیم فی معرفة الاقالیم، ۵۲

سوقالاربعاء حصن مهدی باسیان شوراب بندم دورق خانطوق سنة مناذر الصغری و للدورق ازم بخساباد الدز اندبار آزر جُبَّی میراقیان میراثیان و لرامهرمز سنبل ایذج تیرم بازنک لاذ غروة بافج کوزوک.

احسن التقاسیم فی معرفة الاقالیم، ۴۰۲

اقلیم خوزستان

هذا اقلیم أرضه نحاس نباتها الذهب ، کثیر الثمار و الارزاز و القصب، و فیه الانجا و الحبوب و الرطب، و الاترنج الفائق و الرمّان و العنب، نزیه طیب أنهاره عجب،، بزُّه الدیباج و الخزّ، و الرقاق من القطن و القزّ،، معدن السکَّر، و القند و الحلواء الجیدة و عسل القطر،، به تُسْتَر التی اسمها فی المشرقین، و العسکر التی تمیز الدولتین، و الاهْواز

المشـهورة فی الخافقَین،، و بَصِنّا الّتی ستورها فی الدنیا الی سدْرة المنتهی ، و مثل خزّ السّوس لا تری، و مع هذا به معادن النفط و القار، و مزارع الریاحین و الاطیار ،، ثم واسـطة بین فارس و العراق به کانت وقائع الاسـلام و ثمّ معارك القوم و قبر دانیال لا یخلو من فقیه و اسـتاذ و لا فی الثمانیة أفصـح منهم لغات، به الدوالیب الظریفة، و الطواحین الغریبة، و الاعمال العجیبة، و الخصـائ الکثیرة، و المیاه الغزیرة،، دخله کان یعضد الخلیفة، و له آئین و طیبه،، لم یطب لی فی الثمانیة

احسن التقاسیم فی معرفة الاقالیم، ۴۰۳

غیره، فما اجلّه من إقلیم لو لا اهله، و ما أحسـن قصـباته لو لا مصره،، لانَّه یعنی الاهواز مزبلة الدنیا، و اهله فمن شـرّ الوری... و الخوز ما علا عن الاهواز لانّ أکثر اهل الاهواز ناقلة من البصـرة و فارس و کنت یوما اسـیرُ مع ابی جعفر بن محسـن بالاهواز فشاجره بعض السوقة فقال له أنتم معاشر الخوز لا خیر فیکم فقال له السوقیٌّ الخوز ما کان فوق الاهواز مثل العسکر و جُندَی سابور و السّوس و امّا نحن فعراقیون...

احسن التقاسیم فی معرفة الاقالیم، ۴۰۴

اعلم انّ هذا الاقلیم کان یعرف قدیما بالاهواز و سبع کورها و الان قد تعطّلت بعض تلك الکور و اختُلف فی بعض و ناقض اصولنا بعض و قد قلنا انّ مثل الملوك فی علمنا مثل الصحابة فی علم الشریعة إذا قال أحدهم قولا لم یعْلَم له مخالف من الصـحابة عُمل بقوله و کان حجَّةً و کان عضـد «۸» الدولة من اجلّة ملوك زمانه لانَّ له فی الاسلام آثارا ًو عجائب ألا تری الی مدنه التی بناها و أنهاره التی کراها و الاسـماء التی اخترعها و الاشیاء التی ابتدعها و قد کان یسـمّی هذا الاقلیم سبع الکور و تعارف الناس ذلك «۱۱» فاتَّبعناه فی ذلك إذ لم نجد له مخالفًا فاوَّلها من قبَل الجبال السّـوس ثم جُندَی سـابور ثم تُسْـتَر ثم عَسْـکَرمُکْرَم ثم الأهْواز ثم رامَ هُرْمُز ثم الدَّوْرَق هذه الاسامی تجمع الکور و القصبات و هنّ قلیلات المدن و الاقلیم قریب الاطراف

احسن التقاسیم فی معرفة الاقالیم، ۴۰۵

فاما السّـوس فانها کورة من تخوم العراق و حدّ الجبال بها مزارع الرزّ و الاقصـاب و یطبخ بها سکَّر کثیر، من مدنها بَصِـنّا متُّوت بَیْروت البذان قریةُ الرَّمْل کَرْخة و اما جُندَی سـابور فانها کورة عمرها سـابور بن فارس و اضـافها الی نفسـه متَّصـلة بتخوم الجبال نزیهة و یقال انها کانت مرکز الملوك «۵» فی القدیم یطبخ بها سکَّر کثیر، من مدنها الدز الرُّوناش بایوه قضبین[۵] اللّور و اما تستر فانها کورة کثیرة الفواکه و الاعناب و الاترنج و الثمار عامَّتها تحمل الی الاهواز و البصـرة لم ار لها مدینة بعد البحث و لذلك قدّمنا الاحتجاج فی بابها و ذکرنا انها تخالف أصلنا لانه لا بدَّ لکلّ قصـبة من مدن کما انه لا بدَّ لکلّ قائد من جند ... هذه تسـمَّی کورة و الاسـماء فی هذا الباب للملوك و اما العسکر فإنها کورة جلیلة یشقُّها و یحیط بها ثلاثة انهار و بها رستاق المَشْرُقان، لها من المدن جوبك و زَیدان سوق الثلثاء حُبك ذوقرطم برجان خان‌طوق و سوق العسکر یوم الجمعة ثم الی

[۵] قاضبین

احسن التقاسيم فی معرفة الاقاليم، ۴۰۶

خان طوق ستٌّ مدائن علی أسامی ايّام الجمعة لكلّ يوم سوق[۶] و اما الاهواز فان سابور لما بناها جانبَيْن سمَّی احدهما باسم اللّه عزَّ و جلَّ و الآخر باسمه ثم جمعهما باسم واحد فاسمها هرمزداراوشير ثمَّ طرح اسمه و بقی داراواشير ثم سمَّتها العرب الاهواز و هی كورة يدخل فيها ما خرب و تعطَّل من الكور القديمة و هی مَناذِرُ الكبری و نهر تِيرَی .. و الَّذی عرفتُ من مدن الاهواز نهر تيری مناذر الكبری مناذر الصغری جوزدك بيروه سوق الاربعاء حصن مَهدی باسيان شوراب بندم الدَوْرَق[۷] و سنة جُبَّی و اما الدّورق فانها كورة

احسن التقاسيم فی معرفة الاقاليم، ص: ۴۰۷

تتاخم العراق علی القرنة من مدنها آزَر أجَم بخساباذ الدز اندبار ميراقيان ميراثيان و اما رامهرمز فإنها كورة تتاخم فارس نزيهة عامرة الجبال كثيرة النخيل و الزيتون و الحبوب لا حظَّ لها فی السهل الا اليسير و لا مزارع فيها لقصب السكَّر و لا يبلغ اليها انهار الاقليم و لهم نهر علی حدة، من مدنها سَنْبِل إيذج تيرم بازنك لاذ غروة بابج كوزوك كلّهنَّ جليلات جبليات

السُّوس قصبة عامرة طيبة و لهم فی الخير رغبة بها أسواق بهيَّة و اخباز حسنة و مياه جارية تدير فی البلد الارحية و لها حمّامات جيدة و حلاوات رخيصة و ضياع نزيهة و نعم كثيرة ... و المدينة خربة و الناس يسكنون الربض و قد كانت حصينة علی نشزة عجيبة الا ان جيوش عمر حاربوهم حرباً عظيماً فهدموها و قبر دانيال فی نهر خلف المدينة...

احسن التقاسيم فی معرفة الاقاليم، ۴۰۸

... و بصنا صغيرة غير انها عامرة رجالهم و نساؤُهم ينسجون الانماط و يغزلون الصوف و لهم نهر يسمُّونه دجلة فيه سبعة ارحية فی السفن ... و بَيْروت كبيرة بها نخل كثير يسمُّونها البصرة الصغری، و يقال انها كانت قصبة كورة فیالقديم و رايتُها من البعد و انا سائر من البذان اريد بصنا ...

جُندَيسابور كانت قصبة عامرة جليلة و بلدة قديمة و كانت مصر الاقليم و الان قد اختلَّت و غلب عليها الاكراد، و ظهر فيها الجور و الفساد،، غير انها كثيرة السكَّر و سمعتُهم يذكرون ان عامّة سكَّر خراسان و الجبال منها و هم أهل سنَّة و لهم نهران و طُرُز كثيرة و ضياع جليلة و مزارع الارزاز و الرخص

احسن التقاسيم فی معرفة الاقاليم، ۴۰۹

و الخيرات و بها فقهاء و مياسير و اللّور علی حدّ الجبال و يقال انّها مضافة منها الی هذا الاقليم و بها طُرُز كثيرة غير ان سكَّرها ليس بالجيِّد، و لم ادخل بقية المدن

تستر ليس بالاقليم. أطيب و لا أحصن و لا اجلُّ من هذه يدور حولها النهر و يحدق بها البساتين و النخل معدن كلِّ حاذق فی عمل الديباج و القطن قد جمعت الاضداد، و فاقت البلاد، و اشتهرت فی العباد، و هی التی «۷» قيل

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[۶] ثم كل يوم سوق فی مدينة تسمی باسم اليوم

[۷] الدورق كورة و مدينة و قرية بخوزستان ص۱۶

انها جنّة ترعاها الخنازير و لا تسأل عن الفواكه و الخيرات و لقد استطبتُها و استحسنتُها ترى اسواقًا سويَّة و خصائ كثيرة يرحل اليها من المشرق و المغرب و لهم مياه باردة تجرى تحت الارض الاَّ ان جامعهم لطيف و الحرَّ عندهم شـديد و جسـرهم طويل و ليس غيره طريق و كثيراً ما يضـلُّ فى أسواقها الغريب و بالجانب الاخر عمارة يسيرة و مقابرهم وسـط البلد و الجامع وسط الاسواق فى البزَّازين و على باب البلد سوق بزّ آخر و عند الجسر موضع نزيه به القصّارون و من أراد ركوب السفينة الى العسكر احتاج ان يمشى نحو فرسخ و لها يا لک من قرى بلا منابر[8]

العَسْـكَرُ كان للحجَّاج بن يوسف غلام اسمه مُكْرَم نزل بعسكره هذا الموضع فاستطابه و انحاش الناس اليه و غمر فسمى عسكر مكرم و هى قصبة لا يرى

احسن التقاسيم فى معرفة الاقاليم، ۴۱۰

بالاعاجم أنظف منها ثمر طيب بهىٌّ الاسـواق كثير الخير رخى الحلواء حسـن الاخباز ... دخلتُها صـلاة الغداة و خرجتُ منها المغرب و هى جانبان اعمرهما الّذى يلى العراق و به الجامع و معظم الاسواق و بين الجانبين جسران من سـفن، و سـائر المدن على انهار و بهنَّ طُرُز كثيرة بخاصّـيَّة المَشْـرُقان و ما يُدريك ما المَشْرُقان، و الاصوب ان تكون خان طوق من مدن الاهواز

الاهواز هو مصـر الاقليم ... فى الليل دبس و فى النهار حرٌّ السـموم،، ...يُجبى اليه الفواكه من مكان سـحيق، و من البعد يُجلب اليه دقيق،، ثم سواد يابس، و جبل عابس، و سوق طَفِس[9]،، و تراب سبخ...

احسن التقاسيم فى معرفة الاقاليم، ۴۱۱

...، الا انه خزانة البصـرة و مطرح فارس و أصـفهان و به قياسير حسنة و اخباز نظيفة و آدام و به تجتمع الخزوز و الديباج و اليه تحمل البضـائع و الاموال و هو مغوثة و فرجة للتجّار، و منهل عامر لكلّ مارّ ، و اسـمه كبير فى الاقاليم و الامصـار،، شـتاؤُه طيب و الخريف لو لا الذُباب، و الربيع أيضـاً لولا براغيث كالذئاب، و هو مع ذلك رفق بالضـعيف فى الثياب،، يكون مثل الرملة ذو جانبَيْن الا ان الجامع و معظم الاسواق فى الجانب الفارسىّ و الجانب العراقىّ جزيرة خلفها عمود النهر على ما ذكرنا من فسـطاط مصـر بينهما قنطرة هِنْدُوان من الآجرّ عليها مسـجد يشـرف على النهر حسـن و قد كان عضد الدولة هدمها و بناها مع المسجد بناء عجيبا لتضاف اليه فأبى الناس ان يسـمّوها الا قنطرة هندوان و على هذا النهر دواليب عدّة يديرها الماء تسـمَّى النَّواعير ثمّ يجرى الماء فى قنّى متعالية الى حياض فى البلد و بعض يجرى الى البساتين و يمدّ العمود من خلف الجزيرة نحو صيحة الى شاذْرُوان قد بُنى من الصـخر عجيب يتبحّر الماء عنده و ثمّ فوّارات و عجائب و الشـاذروان يردّ الماء و يفرّقه ثلاثة انهار تمدّ الى ضـياعهم و تسـقى مزارعهم و هم يقولون لولا الشـاذروان ما عمرت الاهواز و لا انتفع بانهارها و فى الشاذروان

[8] و ديباجها يحمل الى مصـر و الشام و اهلها فى نعمة و لها فى الصيف ماء بارد فى قنّى تحت الارض الاَّ ان جامعهم لطيف و حرَّها شديد و العلم بها قليل و النهر عليها مثل الخندق و الجسـر من نحو جنديسـابور طويل من سفن و من ذلک الجانب عمارة قليلة و الجامع وسط البلد فى البزَّازين و على باب البلد سوق بزّ ايضا و يحيط بها قرى جليلة بلا منابر.

[9] ضيق

أبواب تفتح إذا كثر الماء لولاها لغرقت الاهواز و تسمع للماء المنحدر صوتًا يمنع من النوم أكثر السنة و زيادته تكون فى الشتاء لانَّه من الامطار لا من الثلوج[١٠] و نهر المشرُقان يشقُّ فى أسفل البلد الاّ انه يجفُّ[١١] عامّة السنة و يتبحّر الماء بموضع يسمّونه الدَّوْرَق و الاهواز بهذه الانهار

احسن التقاسيم فى معرفة الاقاليم، ۴۱۲

طيبة و السفن تذهب و تجىء و تعبر مثل بغداد و يفترق الانهار فى أعلى البلد و تجتمع بأسفله فى موضع يقال له كارشنان و من ثمّ تركب السفن الى البصرة و لهم طواحين على الماء عجيبة و سوق الاربعاء على شعبة من هذا النهر ذات جانبين بينهما قنطرة من خشب تجرى تحتها السفن و الجانب العراقى اعمر و فيه الجامع و حِصْنُ مهدىّ عامرة بها تجتمع انهار الاقليم كلّها ثم تفيض الى البحر و بها حصن بناه مهدىّ و هى ثغر لقربها من البحر و هناك رباطات و عبّاد الجامع على الشطّ و بها مجتمع الطرق، و سائر المدن على انهار لها جزر و مدّ و بها نخيل و مزارع و اعمر سواد الاهواز نحو سوق الاربعاء و ما يدخل فى ذلك الصقع

الدَّورق قصبة عامرة متطرّفة من نحو العراق على نهر ذات رستاق واسع و سوق كبير و خصائ و خيرات حسنة الوضع و معدن الخيش و هى أصغر من السوس و سوقها متشعّب و الجامع على طرفه شربهم من النهر و اليها يقصد حجّاج فارس و كرمان[،] ميراثيان ذات جانبين و لها أسواق عامرة فى كلّ جانب جامع [،] و ميراقيان لها رستاق واسع على نهر يصل اليه المدّ و الجزر و به قرى كثيرة و اعمال نفيسة [،] و جبّى عمل واسع ذو قرى عامرة و انهار و نخيل و منها كان ابو على رأس المعتزلة و من الناس من جعل عَبَّادان من هذه الكورة و انّما هى من العراق فان قيل انَّما جعلناها من هذا الاقليم لاتفاقهم فى اللسان ...

احسن التقاسيم فى معرفة الاقاليم، ۴۱۳

اما اتِّفاقهم فى اللسان فليس بحُجَّة لان سواد البصرة كلّهم عجم .... رامَ هرمز قصبة كبيرة بها أسواق عامرة و خيرات كثيرة و جامع بهىّ عنده أسواق فى غاية الحسن بناها عضد الدولة ما رأيتُ اعجب منها نظيفة ظريفة قد زُوِّقت و بُرْبِقَت و بُلِّطت و ظُلِّلت و جُعل عليها دروب تُغْلق فى كلّ ليلة يسكنها البزّازون و العطّارون و الحصّارون و فى سوق البزّ قياسير حسنة شربهم من نهر و آبار و النهر بالنُّوَب و قد حفَّت بها النخيل و البساتين و بها دار كتب كالتى بالبصرة...

احسن التقاسيم فى معرفة الاقاليم، ۴۱۴

... و إيذج هى اجلُّ مدن الكورة و سلطانها يقوم بنفسه تكون مثل أسَدَاواذ وسط الجبال يقع بها ثلج كثير يحمل الى الاهواز و النواحى و شربهم من عين شعب سليمان و مزارعهم على الامطار و لهم ماء آخر كثيرة البطّيخ و الخيرات و هى فى هودة و كوزوك جبليَّة أيضًا لا ينقطع منها العنب كثيرة البنفسج و الريحان طيبة و غروة من

[١٠] يكون من (الماء) المطر فىالشتاء

[١١] يخف

المذکورات علی ما ذکرنا من العمارات و لاذ جبلیة أیضـا و کلٌّ مدن هذه الکورة من هذا الجانب الواحد و سـائر الوجوه بواد

جمل شئون هذا الاقلیم

هو إقلیم حارٌّ میاهه معتدلة الا ماء جُندیسـابور فانّه مع صـحَّته خشن و هواء السوس غیر صحیح و کلّما قرب من دجلة بغداد فهو اصحُّ و به نخل کثیر و لیس به جبل شاهق و لا رمل دهس الا بین البذان و نهر تِیرَی و لایقع به ثلج و لا یتجلَّد الماء الا بسـواد رامهرمز و یشـقّ أکثره الانهار یجری فی جمیعها السـفن، قلیل النصاری غیر کثیر الیهود و المجوس ...

احسن التقاسیم فی معرفة الاقالیم، ۴۱۵

... و مذاهبهم مختلفة هو أکثر الاقلیم معتزلة اما العسـکر فکلّهم و أکثر أهل الاهواز و رام هرمز و الدورق و بعض أهل جُندیسـابور [،] و اما السوس و اجنادها فحنابلة و حبّیَّة و نصف الاهواز شیعة و به أصحاب ابی حنیفة کثیر و لهم فقهاء و ائمَّة و کبراء و بالاهواز مالکیُّون ....

احسن التقاسیم فی معرفة الاقالیم، ۴۱۶

... و یکثرون خبز الارزّ و رکوب البقر و وضـع حباب الماء فی الشـوارع و الطرق بین الاجناد علی کلّ فرسخ و ربَّما حمل الیها الماء من بُعد،...

و التجارات به مفیدة لانَّ کلَّ سکَّر تراه ببلدان الاعاجم و العراق و الیمن فمن ثَمَّ یُحْمَل و یرتفع من تستر الدیباج الحسن و الانماط و ثیاب مرویَّة حسنة و فواکه کثیرة و من السوس السکَّر الکثیر و بزٌّ و الخزوز و من العسکر مقانع القزُّ تُحْمل الی بغداد و بزٌّ جید له بقاء و ثیاب القنَّب و المنادیل و غیر ذلك ممَّا یرتفق به أهل الاهواز و ستور بصنّا و أنماط قرقوب معروفة و تعمل بنواحی واسـط سـتور یکتب علیها ممَّا عُمل ببصـنَّا و تخرج (؟) خروجها و لیست مثلها و یعمل بالاهواز فوط من القزِّ حسـنة تلبسـها النسـاء و یعمل بنهر تیری أُزُر کبار و لهم خصـائ لیس مثل مُری جندیسـابور و حلواء الاقلیم و خزّ السـوس غیر العمائم لانَّ سَـکْب الکوفة لا نظیر له و سـکَّر العنب و ببصنَّا الانماط

احسن التقاسیم فی معرفة الاقالیم، ۴۱۷

و الستور الجیدة و بقول حسنة و دَسْتَنْبُوی تستر و قصب السوس و رطب نهر تیری فی غایة الجودة...

احسن التقاسیم فی معرفة الاقالیم، ۴۱۸

... و خراج الاهواز ثلاثون ألف ألف درهم و کانت الفرس تقسّط علی جمیع الاقلیم خمسین ألف ألف درهم

و اما المسافات تأخذ من السوس الی قُرقُوب مرحلة ثم الی الطِّیب مرحلة، و تأخذ من السوس الی بصنَّا بریدَیْن ثم الی البِذان مثلها، و تأخذ من جندیسابور الی اللُّور مرحلة ثم الی الدِز مرحلتین ثم الی رایکان مرحلة ثم الی کل بایکان ۴۰ فرسخا مفازة ثم الی کرج ابی دلف مرحلة، و تأخذ من تستر الی قریة الرمل مرحلة ثم الی بصنّا مرحلة، و تأخذ من العسکر

الی الحصن مرحلة ثم الی الحصن أيضًا مرحلة ثم الی رام هرمز مرحلة، و تأخذ من العسكر الی تستر أو الی الاهواز مرحلة مرحلة، و تأخذ من جنديسابور الی السوس أو الی تستر مرحلة مرحلة و من بيروت الی السوس أو البذان مرحلة مرحلة، و تأخذ من الاهواز الی شوراب بريداً ثم الی مندم مرحلة ثم الی قصبة الدورق مرحلة، و تأخذ من الاهواز الی سوق الاربعاء مرحلة ثم الی حصن مهدیّ مرحلة ثم الی فم العَضُدیّ مرحلة ثم أنت فی دجلة العراق ، و تأخذ من حصن مهدیّ الی بيان فی سبخة علی الظهر مرحلة و اعلم انَّ نهر الاهواز و دجلة يفيضان الی بحر الصين بينهما هذه السبخة و كان الناس فی القديم يذهبون فی النهر الی البحر ثم يعودون فيدخلون من البحر الی دجلة ثم الی الابلَّة و كانوا علی خطر و فی تعب حتّی شقَّ عضد الدولة نهراً عظيمًا من نهر الاهواز الی نهر دجلة طوله اربعة فراسخ و الطريق اليوم فيه و تأخذ من الاهواز الی أجم مرحلة ثم الی آزر مرحلة ثم الی رامهرمز مرحلة، و تأخذ من الاهواز الی الدورق مرحلة ثم الی خان مرحلة ثم الی بصنَّا مرحلة ثم الی قرية الرمل مرحلة ثم الی قرقوب مرحلة، و لها طريقان أُخراوان، و تأخذ من الاهواز الی نهر تيری مرحلة ثم الی نهر العبّاس مرحلة ثم الی الخوزية مرحلة ثم تركب الماء

الی الابلَّة مرحلة، و تأخذ من الاهواز الی الاسْحاقيَّة مرحلة ثم الی الجسر المحترق مرحلة ثم الی حصن مهدیّ مرحلة، و تأخذ من نهر العبَّاس الی عسكر ابی جعفر مرحلة ثم تعبر الی الابلّة و هی طريق الدوابّ، و تأخذ من رام هرمز الی سَنْبل مرحلتين ثم الی أرَّجان مرحلة، و تأخذ من رام هرمز الی تيرم مرحلة ثم الی غروة مرحلة ثم الی البازير بريدين ثم الی إيذج مرحلة ثم الی الدز مرحلة و من الدز الی الدَّوْلاب مرحلة و من الرام الی الزُّط مرحلة، و تأخذ من رام هرمز الی بده مرحلة ثم الی جسر جهنَّم مرحله.

Author ANON (written 982 CE)
Ḥud
Ḥudūd al-ʻālam min al-mašriq ila al-Maġrib. Edited by Manuchihr Sutudah. Tehran: Dānishgāh-i Tihrān, 1961.

حدود العالم من المشرق الی المغرب

حدود العالم، ۴۵

و دیگر رود شوشتر است اندر ناحیت خوزستان و ابتدا او از حدود شهر جبال‌رود و بر شوشتر و سوق‌الاربعاء و اهواز و جبیّ و باسیان بگذرد تا بدهنهٔ شیر و حصن مهدی رسد، آنگه بدریای اعظم افتد.

حدود العالم، ۴۶

۳۸. و دیگر رود مَسْرُقان اندر خوزستان، رودیست کی از رود شوشتر بردارد و تا اهواز برود و همه کشتها را آب دهد و آنچ بماند باز رود شوشتر افتد بنزدیکی اهواز و شهر عسکر و مَکْرُم[۱۲] اندر میان این دو رود افتد.

۳۹. و دیگر رودیست هم از رود شوشتر بردارد از حد باسیان و کستیهاء[۱۳] باسیان، و خان مُردونه، و دَورق را آب دهد تا بحد رام اورمزد.

۴۰. و دیگر رود شوشست از حد کرخه بردارد از شاخی از شاخهاء کوه ناحیت جبال و همی رود تا سواد شوشتر را و شوش را آب دهد و میان شوش و بدوشاوور برود تا بحد بُصنی رسد همه اندر کشتها بکار شده باشد.

حدود العالم، ۱۳۷

ناحیتیست مشرق وی پارس است و حدود سپاهان، و جنوب وی دریاست، و بعضی از حد عراق، و مغرب وی بعضی از حدود عراق است و سواد بغداد و واسط، و شمال وی شهرهاء ناحیت جبال است، و این ناحیتیست آبادان و بسیار نعمت‌تر از هر ناحیتی که بدو پیوسته است و اندر وی رودهای عظیم و آبهای روانست و سوادهاء خرم و کوههاء با نعمتست و از وی شکر و جامهای گوناگو [ن خیزد] و پردها و سوزن‌کردها و شواربند و ترنج شمامه و خرما خیزد و مردمان این ناحیت مردمانی‌اند بسود، ور...وبخیل.

۱. دز مهدی، شهریست خرم و آبادان میان عراق و خوزستان، برلب رود نهاده.

۲. باسبان، خان مردونه، دورق-شهرکهاییست آبادان و خرم و تونگر و بانعمت بسیار و بر لب رود نهاده.

۳. دَیرا، شهرکیست بنزدیکی کوه با نعمت بسیارو

۴. اَسک، دهیست بزرگ ببراکوه نهاده و بر سر آن کوه آتشیست کی دایم همی درفشد شب و رود و حرب رقیان (ارزقیان) آنجا بوده است اندر قدیم.

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[۱۲] عسکر مکرم

[۱۳] شاید: کشتهاء

حدود العالم، ۱۳۸

۵. جُبَّی، شهرکیست بر لب رود شوشتر خرم و بسیار نعمت...

۶. سوق الاربعا، شهریست بر لب این رود با نعمت بسیار و آبادان.

۷. اهواز، شـهریست سخت خرم و اندر خوزستان شهری نیست از این خرم‌تر با نعمتهای بسیار و نهادی نیکوی و مردمانی زردروی...

۸. اُزم؟، شهرکیست خرد با نعمت بسیار.

۹. رامهر، شهرکیست بر لب رود نهاده و مانی را آنجا کشتند.

۱۰. عسکر مکرم، شهریست با سواد بسیار و خرم و آبادان و با نعمت و همه شکرها [ء] جهان سرخ و سپید و قند ازنجا افتد.

۱۱. مَسرُقان، شهرکی خرم است با نعمت و اندر وی خرماء تر باشد سخت نیکو.

۱۲. رام اورمزد، شهریست بزرگ و خرم و آبادان و با نعمت بسیار و جای بازرگانان برحد میان پارس و خوزستان.

۱۳. بازار سمبیل، شهرکیست با نعمت.

حدود العالم، ۱۳۹

۱۴. ایذه، شـهریسـت با سـوادهای سـخت خرم و آبادان و با نعمت و خواسـتهٔ بسـیار و بر لب رود نهاده و از وی دیباهای بسیار خیزد، و دیبای پردهٔ مکه آنجا کنند.

۱۵. وندوشاور، شهریست آبادان و با نعمت بسیار و گور یعقوب لیث آنجاست.

۱۶. شـوش، شهریست تونگر و جای بازرگانان و بارکدهد خوزستان است و از وی جامه و عمامه خز خیزد و ترنج دستانبودی خیزد، و تابوت دانیال پیغمبر علیه‌السلام آنجا یافتند.

۱۷. منوب، بردون، دو شهرکست خرم و آبادان و با نعمت بسیار و کشق و برز.

۱۸. بصنَّی، شهریست خرم و با خواسته و پردهاء نیکو کی بهمه جهان به برند ازنجا خیزد.

۱۹. طیب، شهریست خرم و آبادان و از وی شلواربند خیزد سخت نیکوهم چون ازمنی[۱۴].

۲۰. شهر قرقوب شهریست خرد و آبادان و از وی جامهای سوزن‌کرد خیزد.

[۱۴] ارمنی

Abū Dulaf Misʿar b. al-Muhalhil al-Ḫazrajī l-Yanbuʿī (tenth century)
Dlf
Abu Dulaf Travels in Iran (ar-Risāla). Edited by Minorsky, Vladimir. Cairo: Cairo University Press, 1955.

ابودلف

الرسالة

الرسالة ٢٧

و بينها (اصـــبهان) و بين الاهواز قنطرة إيذج. و هى من العجائب المذكورة لانها مبينة (منبتة) بالصـــخر على واد يابس بعيد القعر. و إيذج كثيرة الزلازل و بها معادل كثيرة...

الرسالة ٢٨

و دونها بفرسـخين مما يلى البصـرة.... و لايجاورها المدَ و الجزر. و هى سفلى أرض الاهواز منخفضة عنها بكثير. و مائية قصـب سـكرها تزيد على سـائر قصـب السـكر فى سـائر الاهواز أربعة فى كل عشـرة. و فانيذها يعمل عمل السَجزى.

و سوق الاهواز تخترقها مياه المختلفه منها الوادى الاعظم و هو ماء (مدينة) تستر يعمر على جانبها

و منه يأخذ واد عظيم يدخلها و على هذا الوادى قنطرة عظيمة عليها مسجد واسع حسن. و عليه أرحاء عجيبة و نواعير بديعة و ماؤه فى وقت المدود يحمرٌ و يصـب الى الباسـيان و البحر. و يخرقها وادى المسرقان و هو من ماء تستر ايضاً. و يخترق عسكر مكرم. و لون مائه فى سائر ايام نقصان المياه ابيض و يزداد فى (الشتاء و) اوقات المدود بياضاً. و سكرّها أجود سكر الاهواز.

و على الوادى الاعظم شاذروان حسن عجيب متقن الصنعة معمول من الصخر المهندم يحبس الماء على أنهار عدة. و بإزائه مسـحد لعلى بن موسـى الرضـا خطَّه فى اجتبازه بى و هو مقبل من المدينة يريد خراسان. و بها نهر آخر يمرّ على حافتها من جانب المشرق يأخذ من وراء واد يعرف بسوراب. و بها آثار كسروية يسيرة.

الرسالة ٣٠

و نهرالمسرقان يشق أعمالا كثيره و يسقى ضياعاً واسعه و مبدؤه من تستر. و تسر ذات آثار و أعاجيب و خوا و بها قبر دانيال عليه السلام. و قد قيل (أنّه) بالسوس، و لها قناطر و شاذروان ما رأيت فى شىء من البلدان مثلها. و بها معـادل كثيره، و اكثر ابنيتها لفرد جشـــنس (؟) بن شـــاه مرد و كان من عظماء الفرس، آكثرَ همته فى البناء و إحكامه و تشديده. و هناک قنطرة عجيبة مشهورة بنتنها اخته خوراذ ام اردشير.

الرسالة ٣٠

و هى أيضا صاحبة القنطرة المعروفة بقنطرة خرَّزاد التى بين إيذج و الرباط و هذه القنطرة من عجائب الدنيا و ذلک أنهـا مبينة على واد يابس لا مأء فيه إلا فى أوان المدود من الامطار فإنه حينئذ يصـــير بحراً عجاجاً و فتحه على

وجه الارض أكثر من ألف ذراع و عمقه مائة و خمسون ذراعاً و فتح أسفله فی قراره نحو عشرة أذرع و قد ابتدئ بعمل هذه القنطرة من أسفلها إلی أن بلغ بها وجه الارض بالرصا و الحدید کلما علا البناء ضاق و جعل بین وجهه و جنب الوادی حشو من حبث الحدید و صُب علیه الرصا المذاب حتی صار بینه و بین وجه الارض نحو أربعین ذراعا و صار فتحه هناک مائة و اثنتی عشرة ذراعا فعقدت القنطرة علیه فهی علی وجه الارض و حُشی ما بینها و بین جنبی الوادی بالرصا المصلب بنُحاتة النحاس و هذه القنطرة طاق واحد عجیب الصنعة محکم العمل.

الرسالة ۳۰

و کان المسمعی قطعها فمکثت دهراً لا یتسع أحد لبنائها فأضر ذلک بالسابلة و من کان یجتاز علیها لا سما (سمی؟) فی الشتاء و مدود الادویة. و کان ربما صار إلیها قوم ممن یقرب منها فیحتالون فی قلع حشوها من الرصا بالجهد الشدید فلم تزل علی ذلک دهراً حتی أعاد ما انهدم منها و عقدها أبو عبدالله محمد بن احمد القمی المعروف بالشیخ وزیر الحسن بن بویه فانه جمع الصناع و المهندسین و استفرغ الجهد و الوسع فی أمرها و کان الرجال یحطّون إلیها بالزُّبل فی البَکَر و الحبال فإذا استقرّوا علی الاساس أذابوا الرصا و الحدید و صبورا علی الحجارة و لم بمکنه عقد الطاق إلا بعد سنین فیقال إنه لزمه علی ذلک سوی أجرة الفعلة، فإن أکثرهم کانو مسخرین من رساتیق أیذج و أصفهان، ثلاثمائه ألف دینار و خمسون ألف دینار.

al-Masʿūdī, Abū l-Ḥasan ʿAlī b. al-Ḥusain (d. 956)
Mur
Les Prairie D'or (Murūj Aḏ-ḏahab). Edited by Charles A. C. Barbier de Meynard and Abel J. B. Pavet de Courteille. Paris: Imprimerie impériale, 1861.

المسعودی، وفات ۹۵۷ م.

مُروج الذهب

مروج الذهب، ۲۸۲

و سار سابور نحو بلاد الشام، فافتتح المدن، و قتل خلائق من الروم،ثم طالبته نفسه بالدخول أرض الروم متنكرا ليعرف اخبارهم و سيرهم، فتنكر، و سار الى القسطنطنيه، فصادف وليمة لقيصر (....داستان مشابهت شاپور و تصویر شاپور که به امر قیصر روی کاسه نقاشی شده بود، هویت او معلوم می‌شود)

مروج الذهب، ۲۸۳

...فقال [سابور] أنا من أساورة سابور استحققت العقوبة لأمر كان منى، فدعانى ذلک على الدخول إلى أرضكم، فلم يقبل ذک منه، و قدم إلى السيف فأقرَّ، فجلعه فى جلد بقرة، و سار قيصر فى جنوده حتى توسط العراق، و افتتح المدائن... و إنتهى إلى مدينة جنديسابور و قد تحصن بها وجوه فارس....(در شبی که جندیسابور را محاصره می‌کنند و فردا قصد حمله دارند، مصادف با یکی از أعیاد رومی است، سپاهیان مشغول میگساری می‌شوند و از شاپور و ایرانیان غافل می‌شوند، شاپور تعدادی از اسرای ایرانی را که در نزدیکی او بودند تهییج می‌کند که یکدیگر را از بند برهانند و بعد او را، بعد به قلعه می‌رود و درهای خزائن اسلحه را باز می‌کنند و ایرانیان لشکر روم را غافلگیر می‌کنند و قیصر هم دستگیر می‌شود...) فأتوه بقيصر اسرا، فاستحياه و أبقى عليه... و بنا شاذروان مدينة تستر لنهرها، و الشاذروان هو المسنّاه العظيمة و الكر من الحجر و الحديد و الرصا و عمر ما أخرب، فى اخبار يطول ذكرها، و انصرف قيصر نحو الروم...

as-Samʿānī, Abū Saʿd ʿAbd al-Karīm b. Muḥammad at-Tamīmī (1113–1167)

Sm’

al-Ansāb li-l-imām Abī Sa’d “Abd al-Karīm b. Muḥammad b. Manṣur at-Tamīmī s-Sam”ānī (Kitāb al-Ansāb). Edited by ʿAbdullāh ʿUmar Barudi. Beirut: Dār al-Ǧinān, 1988.

السمعانى

كتاب الانساب

الانساب، جزء ٥، ٣٤٧

الدَّسْتُوَائى

بفتح الدال وسكون السين المهملتين وضم التاء ثالث الحروف وفتح الواو وفي آخره الألف [ثم الياء آخر الحروف، هذه النسبة إلى بلدة من بلا الأهواز يقال لها دستوا، وإلى ثياب جلبت منها، فالمنتسب إليها جماعة، منهم أبوإسحاق إبراهيم بن سعيد بن الحسن الدستوائى، البزاز الحافظ التستري، من أهل دستوا، سكن تستر، وحدث بها عن **الحسن** ابن على بن عفان، روى عنه أبوبكر محمد بن إبراهيم بن المقرئ الأصبهاني الحافظ والمشهور بهذه النسبة أبوبكر هشام بن أبى عبدالله- واسمه سنبر- المعروف بالدستوائى، وهو ربعي، من بكر بن وائل، من أهل البصرة، يروى عن قتادة بن دعامة وأبى الزبير الملكي، روى عنه شعبة ويحيى القطان، ودستوا-

الانساب، جزء ٥، ٣٤٨

-الموضع الّذي ذكرناه من كور الأهواز، وهشام كان يبيع الثياب التي تجلب منها فنسب إليها، مات سنة ثلاث أو أربع وخمسين ومائة وابنه معاذ بن هشام بن أبى عبدالله الدستوائى، كان من سادات المتقنين وسيد المحدثين بالبصرة، ممن لم يكن يحدث إلا من كتابه، حتى لا يكاد يوجد له خطأ في حديثه، لما كان فيه من الضبط والإتقان، انتقل في آخر عمره إلى اليمن، ومات بها في شهر ربيع الآخر سنة مائتين وإبراهيم بن معاوية الدستوائى، يروى عن هشام بن يوسف صاحب معمر باليمن، روى عنه عبدان بن أحمد ابن موسى العسكري الحافظ.

الانساب، جزء ٩، ٢٩٧

العسكري

بفتح العين وسكون السين المهملتين وفتح الكاف وفي آخرها الراء، هذه النسبة إلى مواضع وأشياء، فأشهرها المنسوب إلى عسكر مكرم، وهي بلدة من كور الأهواز يقال لها بالعجمية «لشكر مكرم»

والّذي ينسب إليه البلد وهو: مكرم الباهلي[١٥]، وهو أول من اختطها من العرب فنسبت البلدة إليه، فمنها أبو أحمد الحسن بن عبد الله بن سعيد العسكري[١٦]، صاحب التصانيف الحسنة المليحة، وأحد أئمة الأدب، وصاحب الأخبار والنوادر وأخوه أبو على محمد بن عبد الله العسكري، يرويان عن عبد الله ابن أحمد بن موسى العسكري عبدان[١٧] وأبو أحمد صاحب كتاب الزواجر والمواعظ، قدم أصبهان مع أبى بكر الجعابيّ سنة تسع وأربعين وثلاثمائة، ثم قدم أصبهان أيضا سنة أربع وخمسين وثلاثمائة- هكذا قال أبو بكر بن مردويه وأبو مسعود سهل بن عثمان بن فارس العسكري، [ثقة] من عسكر مكرم، قدم أصبهان سنة ثلاثين ومائتين، وخرج منها سنة اثنتين إلى الري، ثم رجع إلى العراق، ومات بعسكر مكرم، صنف التفسير والمسند وأبو محمد عبد الله بن أحمد بن موسى العسكري المعروف بعبدان، من علماء المسلمين وأئمتهم، كان حافظا فاضلا رحل إلى العراق والشام، وصنف التصانيف، وسمع منه الحفاظ والأئمة كأبى على النيسابوريّ وأبى القاسم الطبراني وأبى حاتم بن حبان وأبى الشيخ الأصبهاني وأبى أحمد بن عدي الجرجاني ومن لا يعد كثرة وجماعة

[١٥] هو مكرم بن معزاء الحارث، أحد بنى جعونة بن الحارث بن نمير بن عامر ابن صعصعة، صاحب حجاج بن يوسف، وقيل غير ذلك، انظر معجم البلدان لياقوت.

[١٦] وفات ٩٩٣/٣٨٢ منبع شرح تأليفات در مكتبة الشاملة

[١٧] مات عبد الله بن احمد عبدان الجواليقي بعسكر مكرم في أول سنة ست وثلاثمائة ومولده سنة ست عشرة ومائتين (تاريخ بغداد، بيروت، جزء ٩، ٣٧٨)

al-Idrīsī, Abū Abd ʿAllāh Muḥammad b. Muḥammad b. ʿAbd Allāh b. Idrīs al-ʿĀlī bi-Amr Allāh (d. *c.*1165)
Idr Nzh
Opus Geographicum Sive Liber Ad Eorum Delectationem Qui Terras Peragrare Studeant (Nuzhat Al-Muštāq Fi-ḫtirāq Al-āfāq). Edited by A. Bombaci, U. Rizzitano, L. Rubinacci, and L. Veccia Vaglieri. Napoli-Roma: Istituto universitario orientale di NapoliIstituto universitario orientale di Napoli-Istituto italiano per il Medio ed Estremo oriente, 1970.

الادریسی

نزهت المشتاق فی اختراق الآفاق

نزهت المشتاق، ۳۹۲

و فی شـرقی موضـع دجلة فی بحر عبادان أرض خوزستان و منها الأهواز و مدینة الأهواز تعرف بهرموزشهر و هی القطر الکبیر و المصر المعمور و الناحیة الحسنة التی ینسب إلیها سائر الکور....

نزهت المشتاق، ۳۹۳

و بأرض خوزستان میاه جاریة و أودیة غزیرة و أنهار سائلة و أکبر أنهارها نهر تستر و یسمی دجیل الأهواز و هو نهر عجیب منبعه من جبال ناحیة اللور و علیه الشـاذروان الذی أمر بعمله سابور الملک و هو من العجائب المشهورة و ذلک أنه بنی أمام تسـتر من الضِّـفتین بنیانا وثیقا عالیا و أقام فی صـدر مجری الماء سدا موثقا بالحجر العظیم و العمد الحجازیة حتی سـاواه مع ضـفتی بنائه و ارتدع به الماء حتی صـار بأزاء تستر و ذلک أن تستر فی نشز من الأرض عال و الماء مرتدع بین یدیها و یجری هذا النهر من وراء عســکر مکرم و یمر بالأهواز حتی ینتهی إلی نهر السدرة إلی حصن مهدی و یقع هناک فی البحر و یخرج من نهر تستر نهر یسمی بنهر المسرقان فیمر مغربا حتی ینتهی إلی مدینة عسکر مکرم و علیه هناک جسر کبیر نحو من عشرین سفینة و تجری فیه السفن الکبار و یتَّصل بالأهواز و بین عســکر مرکم و الأهواز ثلاثون میلا فی الماء فإذا کان الماء فی المد و زیادته فی أول الشــهر عبر هناک بالمراکب و إن کان الجزر لم یمکن المراکب الســیر فیه لأن الماء به یجف و لا یبقی منه إلا عدد منقطعة عن اتصال الجری و هذا النهر لا یضیع من مائه شیء و إنما یتصرف کله فی سقی الأرضین هناک تسقی به غلات القصوب و ضروب الحبوب و النخل و البساتین و سائر المزارع المعمورة ...

نزهت المشتاق، ۳۹۴

و مدینة المسرقان مدینة عامرة بأهلها و الصادرون عنها و الواردون لعیها کثیر و لهم معایش و أرزاق کثیرة و أکثر شـجرهم النخل و فیها الرطب الموصـوف المسـمی الطن إذا أکله الإنسـان و شـرب علیه ماء المسرقان وجد علیه رائحة الخمر سـواء و عندهم من الحنطة و الشـعیر الشیء الکثیر و سائر أنواع الحبوب موجودة بها و أکثر الحبوب عندهم الأرز و هم یطحنونه و یتخذون منه خبزا یأکلونه و یفضـلونه علی الحنطه و بالمســرقان من غلات قصــب الشیء الکثیر الذی یفوق ما بسائر الآفاق من ذلک.

و السـوس مدينة جليلة حاضـرة بكل خير جامعة لكل فضل و أهلها أخلاط و هى من بلاد السكر و يصنع بها منه كل شـيء كثير و يتنجهز به إلى كل الآفاق و يصـل فاضله إلى اقضى خراسان و ينسب إليها و يصنع بها من الخز العتيق كل جليلة و بها فواكه كثيرة.

نزهت المشتاق، ٣٩٥

و مدينة عسكر مكرم مدينة كبيرة حسنة على نهر المسرقان و لها جسر قدمنا و صفة و هى عامرة بالتجار و أخلاط الناس و بها أسواق و أرزاق و صناعات و لها مزارع متصلة ....

و الـدورق مـدينـة عـامرة بـأهلها و بها من أخلاط الناس جمل و متاجرها كثيرة...و بغربيها مدينة باســيان على مرحلتين منها.

و باستان مدينة وسطة فى الكبر عامرة يشقها نهر ....

و مدينة تستر هى كما قدمنا ذكره مرتفعة عن وجه الأرض و الماء يرتفع فى الشاذروان إلى بابها .....

نزهت المشتاق، ٣٩٦

و يصنع بتستر الديباج العجيب المنظر المتقن الصنعة و كان قبل هذا يعمل بها كسوة الكعبة فأما الآن فإن الكسوة تعمل بالعراق و منها تحمل كل سـنة و من العسـكر إلى ايذج فى جهة المشـرق أبع مراحل و هى مدينة عجيبة فرجة الرقعة بسيطة المكان متاخمة للجبل المتصل بإصبهان و بها متاجر و صنائع و أموال متصرفة و أسواق نافقة مما جلب أليها و من مدينة تستر إلى مدينة جندى سابور مرحلة كبيرة.

و مدينة جندى سابور فى نشز من الأرض حسنة حصينة منيعة و هى تمير (تميّز؟) من جاورها بخيرها و بها نخل و زروع كثيرة و مياه و لها عمارات و خصـب و فواكه و أسـواق جامعة لضروب من البضائع نافقة المتصرفات و من جندى سابور إلى السوس مرحلة.

و السـوس مدينة لسـت بالكبيرة جدا لكنها متحضرة و لها بساتين و جناب و نخل و قصب كثير يعمل منه السكر الكثير كما قدمنا وصفها.

و منها إلى قرقوب مرحلة و هى المدينة التى ينسب إليها الرقم القرقوبى فى جميع الأرض و يعمل بها ديباج معين بالذهب يسمى خرد و قليلا ما يوجد

نزهت المشتاق، ٣٩٧

مثله بالآفاق و هو الديباج القرقوبى و بمدينة قرقوب مثل ما بمدينة السـوس من الطرز للسـلطان لنسـيج الحلل و الديباج و الخزوز و سائر الثياب النفيسه الغالية الثمن.

و يتصل بمدينة قرقوب فى جهت الشمال مدينة الطيب على مرحلة و ليست بكبيرة و انما هى حسنة الذاث كثيرة الخيرات...و يصنع بها تكك تشبه التكك الأرمنية لايوجد فى بلاد الإسلام مثلها بعد تكك أرمنية...

و يتصـل بها فى جهة الشـرق مدينة صـغيرة تسـمى متوث و هى فى مسـتو من الأرض... و بين مقوث و السوس مرحلة و متوث منها غربا

نزهت المشتاق، ۴۰۳

و الطريق من سوق الأهواز إلى شيراز من سوق الأهواز إلى أزم ثمانية عشر ميلا ثم إلى عبدين و قرية خمسة عشر ميلا ثم إلى الزط ثمانية عشر ميلا ثم إلى قنطرة على وادى الملح ثمانية عشر ميلا ثم إلى أرجان ثمانية عشر ميلا و هى من أرض فارس...

نزهت المشتاق، ۶۷۶

و من نهاوند إلى لاشــتر ثلاثون ميلا و من لاشتر إلى الشابرخاست إلى اللور تسعون ميلا لا مدينة فيها و لاقرية و من اللور إلى قنطرة اندامس إلى جندى سابور ستة أيام....

al-Idrīsī, Abū Abd ʿAllāh Muḥammad b. Muḥammad b. ʿAbd Allāh b. Idrīs al-ʿĀlī bi-Amr Allāh (d. *c.*1165)
The entertainment of hearts and meadows of contemplation = Uns al-muhaj wa-rawḍ al-furaj. Frankfurt am Main: Inst. for the History of Arab.-Islam. Science, 1984.

الادریسی

أنس المهج و روض الفرج

أنس المهج، ١٠٧

مسـافات بلاد خوزسـتان ... من الاهواز المسـمّاه بهرمز على النهر خمسة عشر فرسخا من الأهواز الى عسكر مكرم عشـرة فراسـخ و من عسـكر مكرم الى رامهرمز سـته و عشـرون فرسخا و هى ثلث مراحل من راهمرهز الى سوق سـنبيل ثمانيه عشر فرسخا و هى مرحلتان و من عسكر مكرم الى مدينة تستسر مرحله و من تسترت الى مدينة جندى شـابور مرحله و جندى سابور الى السوس مرحله و من مدينة السوس الى قرقوب مرحله و من قرقوب الى طيب مرحله من الاهواز الى الدورق اربع مراحل و من الدورق الى عسكر مكرم ثلث مراحل و من عسكر مكرم الى سوق الاهواز ثلث مراحل و من سوق الاهواز الى حصن مهدى مرحله...و من العسكر الى ايذج اربع مراحل...

أنس المهج، ١٩٥

... طريق آخر من سـوق الاهواز الى الازم سـته فراسـخ ثم الى عبدين خمسة فراسخ الى الزط سته فراسخ ثم الى قنطرة وادى الملح ستة فراسخ الى الديملرسته (؟) سته فراسخ الى الرجان ثمانيه فراسخ....

... الطريق من الزّجان الى واسـط... من الرّجان الى سـوق سنبيل مرحله سم الى رام هرمز مرحلتان ثم الى مدينة عسـكر مكرم ثلاث مراحل الى دسـتر مرحله ثم الى جندى سابور مرحله و نصف ثم الى مدينة قرقوب مرحله.... الطريق من سوق الاهواز الى ايذج من سوق الاربعا الى عسكر مكرم ثم الى مدينة تستر مرحله ثم الى مناذر مرحله ثم الى خان مارق مرحله ثم الى ايذج مرحله

أنس المهج، ١٩٥

الطريق من همدان إلى جنديشـابور: و من همدان الى الرودان مدينة تسـعة فراسـخ ثم الى نهاوند مدينة سـبعة فراسخ الى مدينة الأيسر عشرة فراسخ الى السابرخاس مدينة اثنى عشر فرسخا الى اللور مدينة ثلثون فرسخا مفاره ثم الى قنطرة اندامش مدينة اربعة فراسـخ و من القنطرة الى مدينة جنديشـابور عشـرون فرسخا الجمله خمسة و سبعون فرسخا.

Yāqūt, Šihāb ad-Dīn Abū ʿAbd Allāh Yaʿqūb b. ʿAbd Allāh al-Ḥamawī (1179–1229)
Yāq
Mu'jam Al-Buldān. Edited by ANON. 7 vols. Beirut: Dar Sadir, 1955.

یاقوت الحموی

معجم البلدان

معجم البلدان، ج۱، ۲۸۴

و قال أبو زيد: الاهواز اسمها هرمزشهر و هی الكورة العظيمة التی ينسب إليها سائر الكور، و فی

معجم البلدان، ج۱، ۲۸۵

الكتب القديمة أن سابور بنی بخوزستان مدينتين سمّی إحداهما باسم الله عز و جل، و الاخری باسم نفسه ثم جمعهما باسم واحد و هی هرمزدادسابور، و معناه عطاء للّه لسابور، و سمّتها العرب سوق الاهواز ... كور الاهواز: سوق الاهواز و رامهرمز و إيذج و عسكر مكرم و تستر و جُندَی سابور و سوس و سرّق و نهرتيری و مناذر، و كان خراجها ثلاثين ألف ألف درهم، و كانت الفرس تقسّط عليها خمسين ألف ألف درهم، و قال مسعر بن المهلهل (ابودلف):

سوق الاهواز تخترقها مياه مختلفة، منها: الوادی الاعظم و هو ماء تستر يمرّ علی جانبها و منه يأخذ واد عظيم يدخلها، و علی هذا الوادی قنطرة عظيمة عليها مسجد واسع، و عليه أرحاء عجيبة و نواعير بديعة، و ماؤه فی وقت المدود أحمر يصبّ إلی الباسيان و البحر، و يخترقها وادی المسرقان (و هو من ماء تستر أيضا و يخترق عسكر مكرم، و لون مائه فی جميع أوقات نقصان المياه أبيض و يزداد فی أيام المدود بياضا، و سكّرها أجود سكّر الاهواز، و علی الوادی الاعظم شاذروان حسن عجيب متقن الصنعة معمول من الصخر المهندم يحبس الماء علی أنهار عدّة، و بازائه مسجد لعلی بن موسی الرضا رضی اللّه عنه، بناه فی اجتيازه به و هو مقبل من المدينة يريد خراسان، و بها نهر آخر يمرّ علی حافاتها من جانب الشرق يأخذ من وراء واد يعرف بشوراب، و بها آثار كسروية...

(شرح فتح شوشتر...)

معجم البلدان، ج۱، ۲۸۶

... أن طعام أهلها خبز الارز... و سكّرها جيد و ثمرها كثير لا بأس به، و كلّ طيب يحمل إلی الاهواز...

معجم البلدان، ج۲، ۲۹

تُستَر:

بالضم ثم السكون، و فتح التاء الاخری، و راء: أعظم مدينة بخوزستان اليوم، و هو تعريب شوشتر؛ و قال الزّجّاجی: سمّيت بذلك لان رجلا من بنی عجل يقال له تستر بن نون افتتحها فسميت به و ليس بشیء، و الصحيح ما ذكره

حمزة الاصبهانى قال: الشوشتر مدينة بخوزستان، تعريب شوش بإعجام الشينين، قال: و معناه النزه و الحسن و الطيب و اللطيف، فبأى الاسماء و سمتها من هذه جاز، قال: و شوشتر معناه معنى أفعل، فكأنه قال:
أنزه و أطيب و أحسن، يعنى أن زيادة التاء و الراء بمعنى أفعل، فإنهم يقولون للكبير بزرك، فإذا أرادوا أكبر قالوا بزرگتر مطرد، قال:
و السّوس مختطّة على شكل باز، و تستر مختطّة على شكل فرس، و جندى سابور مختطّة على شكل رقعة الشطرنج، و بخوزستان أنهار كثيرة، و أعظمها نهر تستر، و هو الذى بنى عليه سابور الملك شاذروان بباب تستر حتى ارتفع ماؤه إلى المدينة، لان تستر على مكان مرتفع من الارض، و هذا الشاذروان من عجائب الابنية، يكون طوله نحو الميل، مبنى بالحجارة المحكمة و الصخر و أعمدة الحديد و بلاطه بالرصاص، و قيل: إنه ليس فى الدنيا بناء أحكم منه

معجم البلدان، ج٢، ٣١

التُّستَرِيون:

جمع نسبة الذى قبله: محلّة كانت ببغداد فى الجانب الغربى بين دجلة و باب البصرة؛ عن ابن نقطة، يسكنها أهل تستر، و تعمل بها الثياب التّسترية

معجم البلدان، ج٢، ٤٠٥

قال أبو زيد: و ليس بخوزستان جبال و لا رمال إلا شىء يسير يتاخم نواحى تستر و جُندَى سابور و ناحية إيذج و أصبهان، و أما أرض خوزستان فأشبه شىء بأرض العراق و هوائها و صحتها، فإن مياهها طيبة جارية و لا أعرف بجميع خوزستان بلدا ماؤهم من الابار لكثرة المياه الجارية بها و أما تربتها فإن ما بعد عن دجلة إلى ناحية الشمال أيبس و أصحّ، و ما كان قريبا من دجلة فهو من جنس أرض البصرة فى السّبخ و كذلك فى الصحة، قال: و ليس بخوزستان موضع يجمد فيه الماء و يروح فيه الثلج، و لا تخلو ناحية من نواحيها المنسوب إليها من النخل، و هى وخمة و العلل بها كثيرة خصوصا فى الغرباء المتردّدين إليها، و أما ثمارهم و زروعهم فإن الغالب على نواحى خوزستان النخل و لهم عامة الحبوب من الحنطة و الشعير و الارز فيخبزونه و هو لهم قوت كرستاق كسكر من واسط، و فى جميع نواحيها أيضا قصب السكر إلا أن أكثره بالمسرقان و يرفع جميعه إلى عسكر مكرم، و ليس فى قصبة عسكر مكرم شىء كثير من قصب السكر و كذلك بتستر و السوس و إنما يحمل إليها القصب من نواح أخر، و الذى فى هذه الثلاثة بلاد إنما يكون بحسب الاكل لا أن يستعصر منه سكر، و عندهم عامّة الثمار إلا الجوز و ما لا يكون إلا ببلاد الصّرود.

و أما لسانهم فإن عامتهم يتكلمون بالفارسية و العربية، غير أن لهم لسانا آخر خوزيا ليس بعبرانى و لا سريانى و لا عربى و لا فارسى... و تتصل زاوية خوزستان هذه بالبحر فيكون له هور، و الهور كالنهر يندّ من البحر ضاربا فى الارض تدخله سفن البحر إذا انتهت إليه، فإنه يعرض و تجتمع مياه خوزستان بحصن مهدى و تنفصل منه إلى البحر فتتصل به و يعرض هناك حتى ينتهى فى طرفه المدّ و الجزر ثم يتسع حتى لا يرى طرفاه، قالوا: و غزا سابور

ذو الاكتاف الجزيرة و آمد و غير ذلك من المدن الرومية فنقل خلقا من أهلها فأسكنهم نواحى خوزستان فتناسلوا و قطنوا بتلك الديار، فمن ذلك الوقت صار نقل الديباج التّسترى و غيره من أنواع الحرير بتستر و الخزّ بالسوس و السّتور و الفرش ببلاد بصنا و متّوث إلى هذه الغاية، و اللّه أعلم.

معجم البلدان، ج۲، ۴۴۳

دجيل» اسم نهر فى موضعين أحدهما مخرجه من أعلى بغداد .... و دجيل آخر: نهر بالأهواز حفره أردشير بن بابک أحد ملوک الفرس و قال حمزة: كان اسمه فى أيام الفرس ديلدا كودک و معناه دجلة الصغيرة فعرَّب على دجيل، ... و كانت عند دجيل هذا و قائع اللخوارج، و فيه غرق شبيب الخارجى.

معجم البلدان، ج۲، ۴۵۵

و قال حمزة:

المنسوب إلى دستبى دستفائى و يعرّب على الدستوائى، و فى أخبار نافع بن الازرق لما خرج إليه مسلم بن عبيس:

نزل نافع رستقباذ من أرض دستوا من نواحى الاهواز، و قال السمعانى: بلدة بالاهواز، و قد نسب إليها قوما من العلماء، و إليها تنسب الثياب الدّستوائية، منها أبو إسحاق إبراهيم بن سعيد بن الحسن الدستوائى الحافظ، سكن تستر، روى عن الحسن بن على بن عثمان، روى عنه أبو بكر بن المقرى الاصبهانى، و أما أبو بكر هشام بن أبى عبد اللّه الدستوائى البصرى البكرى فهو بصرى، كان يبيع الثياب الدستوائية فنسب إليه.

معجم البلدان، ج۳، ۴۳

رستقباذ: فى أخبار الأزارقة: لما خرح مسلم بنى عبيس من حبس أهل البصرة لقتالهم انتقل نافع إلى رستقباذ من أرض دستوا فقتل نافع و ابن عبيس هناک.

معجم البلدان، ج۳، ۷۹

رُوستُقْبَاذ:

بضم أوّله، و سكون ثانيه، و سين مهملة ساكنة التقى فيها ساكنان، و لا يكون ذلك في كلام العرب، و تاء مثناة من فوق مضمومة، و قاف ساكنة، و باء موحدة، و آخره ذال معجمة:

و هو طسّوج من طساسيج الكوفة في الجانب الشرقي من كورة استان شاذقباذ، و كانت عنده وقعة للحجاج، و هو بين بغداد و الأهواز، و الحجاج نزله لما ولي العراق ليقرب من المهلب و يقصده بالرجال في قتال الخوارج، فقال يوما و هو هناك: أ لا و إن الملحد ابن الزبير قد زادكم في عطائكم مائة مائة، أ لا و إني لا أمضيها، فقال له عبد اللّه بن الجارود العبدي: ليست بزيادة ابن الزبير إنّما هي زيادة عبد الملك أمير المؤمنين أمضاها منذ قتل مصعبا و إلى الآن، فأعجب قوله المصريين فخرجوا معه على الحجاج و واقعوا فجاء عبد اللّه بن الجارود سهم فقتله و استقام أمر الحجاج في قصة فيها طول.

معجم البلدان، ج۴، ۳

طابُ:

آخره باء موحدة، و الطاب و الطيب بمعنى، قال مقابل الاعرابى: الطاب الطيب، و عذق ابن طاب: نوع من التمر، و طاب: قرية بالبحرين لعلّها سمّيت بهذا التمر أو هى تنسب إليه. و طاب:

من أعظم نهر بفارس مخرجه من جبال أصبهان بقرب البرج حتى ينصبّ فى نهر مسن، و هذا يخرج من حدود أصبهان فيظهر بناحية السّردن عند قرية تدعى مسن ثم يجرى إلى باب أرّجان تحت قنطرة ركان، و هى قنطرة بين فارس و خوزستان، فيسقى رستاق ريشهر ثم يقع فى البحر عند نهر تستر.

معجم البلدان، ج ۴، ۱۲۳

عَسْكَرُ مُكْرَم:

بضم الميم، و سكون الكاف، و فتح الراء، و هو مفعل من الكرامة: و هو بلد مشهور من نواحي خوزستان منسوب الى مكرم بن معزاء الحارث أحد بني جعونة بن الحارث بن نمير بن عامر بن صعصعة، و قال حمزة الأصبهاني: رستقباذ تعريب رستم كواد، و هو اسم مدينة من مدن خوزستان خربها العرب في صدر الإسلام ثم اختطت بالقرب منها المدينة التي كانت معسكر مكرم بن معزاء الحارث صاحب الحجاج بن يوسف، و قيل:

بل مكرم مولى كان للحجّاج أرسله الحجاج بن يوسف لمحاربة خرزاد بن باس حين عصى و لحق بإيذج و تحصن في قلعة تعرف به، فلما طال عليه الحصار نزل مستخفيا ليلحق بعبد الملك بن مروان فظفر به مكرم و معه درّتان في قلنسوته فأخذه و بعث

معجم البلدان، ج۴، ۱۲۴

به إلى الحجاج، و كانت هناك قرية قديمة فبناها مكرم و لم يزل يبني و يزيد حتى جعلها مدينة و سماها عسكر مكرم، و قد نسب إليها قوم من أهل العلم، منهم العسكريان أبو أحمد الحسن بن عبد اللّه بن سعيد بن إسماعيل بن زيد بن حكيم اللغوي العلاّمة، أخذ عن ابن دريد و أقرانه، و قد ذكرت أخباره في كتاب الأدباء، و الحسن بن عبد اللّه بن سهل بن سعيد بن يحيى بن مهران أبو هلال العسكري و هو تلميذ أبي أحمد بن عبد اللّه الذي قبله، و قد ذكرته أيضا في الأدباء، و قال بعض الشعراء...

معجم البلدان، ج۵،: ۱۲۵

مَسْرُقانُ:

... هو نهر بخوزستان عليه عدّة قرى و بلدان و نخل يسقى ذلك كله و مبدؤه من تستر، كان أول من حفره أردشير بهمن بن إسفنديار و هو أردشير الاقدم، و قال حمزة: مسرقان اسم نهر حفره سابور ابن أردشير و سماه أردشير، و هو النهر الممتد الجارى بباب تستر المتوسط لعسكر مكرم و المنحدر إلى قرب مدينة هرمشير.

معجم البلدان، ج۵، ص: ۱۲۶

المَسْرُقانان:

نهران بالبصرة، كانت لابى بكرة قطيعة سميت بالمسرقان الذى بخوزستان.

al-Qazwīnī, Zakariyyā’ b. Muḥammad b. Maḥmūd Abū Yaḥyā (*c.*1203–1283)
Qaz Āṯār
Kitab Aṯār Al-Bilād Wa Aḫbār Al ‘ibād = El-Cazwini’s Kosmographie. 1, Zweiter Theil, Die Denkmäler Der Länder. Edited by Ferdinand Wüstenfeld. Islamic Geography. Frankfurt am Main: Institute for the History of Arabic-Islamic Science at the Johann Wolfgang Goethe University, 1994.

زکریاء بن محمد القزوینی

آثار البلاد و اخبار العباد

آثار البلاد و اخبار العباد، ۱۰۲

الاهواز ناحیة بین البصـرة و فارس و یقال لها خوزسـتان بها عمارات و میاه و اودیة کثیرة و انواع الثمار و السکر و الرّز الکثیر...

آثار البلاد و اخبار العباد، ص: ۱۱۴

تستر مدینة مشهورة قصبة الاهواز الماء یدور حولها بها الشاذروان الذی بناه شابور و هو من اعجب البناء و احکمها امتداده یقرب من میل حتی یُردَّ الماء الی تســتر و هی صــنعة عجیبة مبنی بالحجارة المحکمة اعمدة الحدید و ملاط الرصـا و انّما رجع الماء الی تسـتر بسـبب هذا الشاذروان و الاّ لامتنع لانه علی نشز من الارض و انها مدینة آهلة عناق کثیرة الخیرات و افرة الغلاّت و غزا بعض الکاسرة الروم و حمل الاساری الی تستر اسکهنم فیها فظهرت فیها صـنایع الروم و بقیت فی اهلها الی زماننا هذا یجلب منها انواع الدیباج و الحریر و الخزّ و السـتور و البسـط و الفرش....

آثار البلاد و اخبار العباد، ۱۳۰

دورقسـتان جزیرة بین بحر فارس و نهر عسکر مکرم خمسة فراسخ فی خمسة فراسخ یرفا الیها مراکب البحر التی تقـدم من ناحیة الهند لاطریق لها الاّ الیها و بها الجزر و المدّ فی کلّ یوم مرّتین و ماءها عذب فاذا ورد المدُّ علیها یبقی ملحاً کثیراٍ ...و بها مدّ و جزر آخر بحسب زیادة نور القمر و نقصانه فیزداد کل یوم الی منتصف الشهر ثم ینق کل یوم الی آخر الشهر...

آثار البلاد و اخبار العباد، ۱۴۸

عســکر مکرم مدینة مشــهورة بارض الاهواز بناها مکرم بن معویة بن الحرث ابن تمیم و کانت قریة قدیمة بعث الحجّاج مکرم بن معویة لقتال خورزاد لما عصـی و تحصّن بقلعة هناک فنزل مکرم هناک و طال حصاره فلم یزل یزید بناء حتی صارت مدینة...

Abū l-Fidā' (1273–1331)
Fid
Géographie d'Aboulféda (*Taqwīm al-Buldān*). Edited by Joseph T. Reinaud and William Mc.C. Slane. Paris: Imprimerie royale, 1840.

عمادالدین اسماعیل بن محمد بن عمر أبی الفداء

تقویم البلدان

تقویم، ۵۷

دجلة الاهواز تنبعث من الاهواز...

تقویم، ۵۸

و تمرّ الی جهة الغرب الی عسکر مکرم ...و دجلة الاهواز المذکورة تقارب دجلة فی الکبر و علیها متنزهات کثیرة و مزدرعات عظیمة من قصب السکر و غیره ... نهر المسرقان و هو نهر فی بلاد خوزستان یجری من ناحیة تستر ... و هو نهر کبیر عظیم و یمرّ علی عسکر مکرم ...و علیه عند عسکر مکرم جسر کبیر نحو عشرین سفینة و لا یضیع من هذاالنهر شیء و انما یسقی بجمیعة النخیل و الزروع و قصب السکر نهر تستر یخرج من وراء عسکر مکرم و یمرّ علی الاهواز ثم ینتهی الی نهر السدرة الی حصن مهدی ... و یقع هناک فی بحر فارس...

تقویم، ۳۱۱

ذکر خوزستان

...و من کور الاهواز جُرخان قال فی اللباب .... و هی بلدة بقرب السوس من کور الاهواز... و من تلک بلاد دستوا من اللباب...

تقویم، ۳۱۱

... و هی ایضا بلدة من بلاد الاهواز ...

تقویم، ۳۱۵

الاوصاف و الاخبار العامة

و تستر تسمَّیها العامة ششتر و لها نهر کبیر معروف بها بنی فیها سابور الملک سکراً [؟] عظیما مقدره نحو میل حتی ارتفع الماء الی المدینة علی مرتفع من الارض قال فی اللباب و هی مدینة من من کور الاهواز ...و لیس ببلاد الاهواز خطط الا بتستر فان بها خططاً للقبائل و قیل ان تستر مدینة لیس علی وجه الارض اقدم منها.

ad-Dimašqī, Šams ad-Dīn Abū ʿAbd Allāh Muḥammad b. Abī Ṭālib al-Anṣārī aṣ-Ṣūfī (d. 1327)
Dim
Cosmographie de Chems-Ed-Din Abou Abdallah Mohammed Ed-Dimichqui (Nuḫbat Ad-Dahr). Edited by A. F. Mehren. St.-Petersburg: Académie impériale des sciences, 1866.

الدمشقی

نخبة الدهر فی عجائب البر و البحر

نخبة الدهر، ۳۸

و من المبانی العجیبة شادروان تستر بناه سابور ذوالأکتاف بالصخر و أعمدة الحدید و ملاط الرصا جعله سکرا یربو الماء عنده إذ وصل إلیه من نهر دُجَیل حتی یطفو علیه و یدخل المدینة و طول هذا الشادروان میل ...

نخبة الدهر، ۹۷

و یصب فی شرقی نهر العرب نهر الجزیرة ثم نهر تستر ثم الاهواز و تشق منه نهر صعصعة و الجویث و غیرهما و کلٌّ هذه الأنهار تمد و تجزر فی کل یوم و لیلة مرتین فإذا مدالبحر جری الماء فی شطّالعرب شمالا و زاد و ارتفع فآمتلأت جمیع الأنهار و السواقی و من أراد أن یسقی أرضه و بستانه فتح و أسقی ثم سد و لا یزال کذلک ألی مضی

نخبة الدهر، ۹۷

ستّ ساعات ثمّ یقف الماء قلیلا و یجزر فیعود جریانه جنوبا کما کان أولا و ینق و تغیض الأنهار و تخلو اللسواقی و لایزال کذلک إلی أکثر من ست ساعات فإنّ زمان الجزر أکثر من زمان المدّ (ثم یقف و یعود إلی المدّ هکذا ابدا و یدور المدّ و الجزر فی الأیام و الَّلیالی مثلا ... و کذلک تجزر و یکون خروج الناس إلی المستنزهات و البساتین و ترددّهم الی الضیاع و قضاء الحوائج منهم کل ذلک فی المراکب ...

نخبة الدهر، ۱۱۵

و نهر تِیرَی و نهر المسرقان نهران یجریان فی بلد خوزستان و یصبّان فی بحر فارس و بجبال الأکراد أربعة أنهار کبار تنبعث من جبال اصفهان و علیه جسر طوله خمس مأیة و ثلاث و خمسون خطوة و عرضه خمس عشرة خطوة فیصبّ فی دجیل فیصیر نهرا واحدا، و نهر السوس یخرج من الدینور و یصب فی دحیل فیمرّ بشادروان تستر و یصبّ فی البحر

نخبة الدهر، ۱۱۹

و بمدینه رامهر[مز] من بلاد خوزستان صخرة فیها عین تنبع بالنفظ الأبیض فی لون الماء راجراجا لا یستقرّ فی إ ناء و لیس له معدن غیرها و النفظ الأسود ینبع من عین فی مدینه عسکر مکرم من خوزستان و إذا استقطر النفط الأسود صار أبیض

نخبة الدهر، ۱۷۹

بلاد خوزستان و معناه بلاد خوز و كانت تسمّى الأخواز فعرّبت بالأهواز و تجتمع على سبع كور سوق الأهواز و هى من بناء أردشير و كورة سوق دورق تسمّى دورق الفرس بناها قباد بن فيروز و كورة شستر بناها شستر بن فارس و عرّبت بتستر (و كورة سوس بناها سابور ذوالأكتاف و كورة جندى سابور و كورة رام هرمز بناها هرمز و كورة عسكر مكرم كانت قبل قرية فنزل فيها مكرم بن الفرز الباهلى لمّا غزا البلاد فما رحل عنها حتى صـارت بلد ... و فى هدا الكور من البلاد غيرالذى ذكرنا و هى مناذر الكبرى و ....و مناذر الصغرى و باشيان و جوخان و عبدجان و دَسْتوَا و أيدج و سـليمانان و يوق سـنبل و ذولاب و جبّى و بصنّى و قرقوب و طيب و حصن مهدى و هو على البحر و فيه من الاهواز نهر تيرى و المسرقان و بينهما قرى كثيرة و حيّز الزطّ...

Ibn Baṭṭūṭa, Šams ad-Dīn Abū ʿAbd Allāh Muḥammad b. ʿAbd Allāh (1304–1369)
Baṭ
Tuḥfat an-nuẓẓār fī ġarā'ib al-amṣār wa "ajā"ib al-asfār=Riḥla. Edited by C Defremery and B. R Sanguinetti. Paris: Imprimerie nationale, 1854.

ابن بطوطه

رحله (تحفة النظار فی غرائب الامصار و عجائب الاسفار)

رحله، ج ۲، ۲۲

و وصلنا الی بلدة ماجول.. و ارضها سبخة لا شهر فیها و لا نبات و لها سوث العظیم من اکبر الاسواق و اقمت بها یوما واحدا ثم اکتریت (؟) دابَّة من الذین یجلبون الحبوب من رامز الی ماجول و سِرنا ثلاثا فی صحراء یسکنها الاکراد فی بیوت الشعر و یقال إن أصلهم من العرب ثم وصلنا إلی مدینة رامز و أول حروفها راء و آخرها زای و میمها مکسورة، و هی مدینة حسنة ذات فواکه و أنهار ...

رحله، ج ۲، ۲۳

و أقمت بمدینة رامز لیلة واحدة ثم رحلنا منها ثلاثا فی بسیط فیه قری یسکنها الاکراد و فی کل مرحلة منها زاویة فیها للوراد الخبز و اللحم و الحلواء و حلواءهم من رُبِّ العنب مخلوطا بالدقیق و السمن...

ثم وصلت إلی مدینة تستر و هی آخر البسیط من بلاد أتابك و أول الجبال مدینة کبیرة رایقة نضیرة و بها البساتین الشریفة و الریاض المنیفة و لها المحاسن البارعة و الاسواق الجامعة و هی قدیمة البناء افتتحها خالد بن الولید و ولی هذه المدینة ینسب إلی سهل بن عبد الله

رحله، ج ۲، ۲۴

و یحیط بها النهر المعروف بالازرق و هو عجیب فی نهایة من الصفاء شدید البرودة فی أیام الحرِّ و لم أرکُزْ رَقته إلا نهر بلخشان و لها باب واحد للمسافرین یسمّی دروازة دسبول و الدّروازة عندهم الباب و لها أبواب غیره شارعة إلی النهر و علی جانبی النّهر البساتین و الدّوالیب و النهر عمیق و علی باب المسافرین منه جسر علی القوارب کجسر بغداد و الحلة.

انظر لشاذِروان تستر و اعتجبْ//من جمعه ماءً لرَی بلاده//ملیکِ قوم جُمِّعت امواله//فغدا یفرَّقها علی اجناده

رحله، ج ۲، ۲۵

الفواکه بتستر کثیرة و الخیرات متیّسرة غزیرة، و لا مثل اسواقها فی الحسن....

رحله، ج ۲، ۲۸

حکایة لمَّا دخلتُ هذا المدینة اصابنی مرض الحُمَّی و هذه البلاد یحمُّ داخلها فی زمان الحرّ کما یعرض فی دمشق و سواها من البلاد الکثیرة المیاه و الفواکه...

رحله، ج ۲، ۲۹

... ثم سـافرنا من مدينة تسـتر ثلاثا فى جبال شـامخة و بكل منزل زاوية كما تقدم ذكر ذلك، و وصلنا إلى مدينة إيذج، و ضبط اسمها بكسر الهمزة و ياء مدّ و ذال معجم مفتوح و جيم، و تسمى أيضا

رحله، ج ۲، ۳۰

مال الامير و هى حضرة السلطان اتابک...

ذكر ملك إيذج و تستر و ملك إيذج فى عهد دخولى إليها

رحله، ج ۲، ۳۰

السلطان أتابك أفراسياب ابن السلطان أتابك أحمد، و أتابك عندهم سمة لكل من يلى هذه البلاد من ملك، و تسمى هذه البلاد بلاد اللّور...

Mustawfī, Ḥamd Allāh (fourteenth century)
Nuz D
Nuzhat-al-qulūb. Edited by Muhammad Dabir Siyaqi. Qazwin: Hadith-e Emruz, 2002.

حمدالله مستوفی

نزهت القلوب

نزهت القلوب، ۱۶۵

در ذکر بلاد خوزستان

درو دوازده شهرست و بغایبت کرم....حقوق دیوانیش در زمان خلفاء زیادت از سیصد تومان این زمان بوده است و در این عهد سی و دو تومان و نیم بر روی دفترست اما توفیری نیکو دارد و دارالملکش شهر تستر است.

تستر

در تلفظ شوشتر خوانند...هوشنگ پیشدادی ساخت و خراب شده بود. اردشیر بابکان تجدید عمارت آن کرد....شاپور ذوالاکتاف چون از روم به ایران رسید و بر قیصر غلبه کرد و پادشاهی یافت قیصر را الزام نمود تا بعد از تدارک خرابی که درین ممکلت کرده بود آب شوشتر را مثالثه گردانید و بر این سدی عظیم بست، و جوی دشت‌آباد که مدار ولایت تستر بر آنست بسبب آن بند جاری شد و در مسالک و ممالک گویند که از آن محکمتر بندی بر هیچ آب نبسته‌اند، اما بند امیر که بعد از تألیف مسالک و ممالک در فارس-

نزهت القلوب، ۱۶۶

-عضدالدوله دیلمی بر آب کر بسته است از آن عظیم‌تر است و شاپور ذوالاکتاف در ششتر عمارات عالیه کرد. دور آن شهر پانصد گام است و چهار دروازه دارد و هوایش بغایت گرم است و اکثر بهار و تابستان درو باد سموم وزد ...آب آبش نیک هاضم است... و زمینش مرتفع تمام است و از نیکوئی زمین شخم به یک درازگوش کافی بود. غلّه و پنبه و نیشکر درو نیک می‌آید و پیوسته در آنجا ارزانی بود چنانکه موسم تنگی آنجا هنوز بهتر از فراخی شیراز بود و مردم آنجا اکثر سیاه‌چهره و لاغر باشند و بر مذهب ابو حنیفه باشند و نیکو اعتماد و سلیم طبع و به خود مشغول و در ایشان هیچ فتنه و فضولی نبود، و کم سرمایه باشند و در ایشان متمول به نادر افتد. شکارگاههای بسیار دارد و در رسالهٔ ملکشاهی گوید: چهار شکارگاهست بزرگ: یکی رخش آباد، پانزده فرسنگ در دوازده فرسنگ؛ دوم دورق و هندویان، بیست فرسنگ در ده فرسنگ؛ سیم مشهد کافی؛ ده فرسنگ در شش فرسنگ؛ چهارم حویزه، بیست فرسنگ در دوازده فرسنگ. و علفزارهای بغایت خوب دارد. و از غایت گرما مردم غریب در آن دیار بعد از بهار اقامت نتوانند کرد. و هر غلّه که در ثور نبریده باشند چون آفتاب به جوزا رسد نتوانند برید و تلف شود و حقوق دیوانی آن شهر به تمغا مقرّرست و بر ظاهر شهر قلعه‌ایست محکم.

نزهت القلوب، ۱۶۷

دزفول

آن را اندیمشک گفته‌اند...اردشیر بابکان ساخت بر دو جانب آب جندیشاپور نهاده است و پلی بر آن آب بسته‌انند به چهل و دو چشمه، و درازای آن پل پانصد و بیست گام است و عرضش پانزده گام و آن را پل اندیمشک خوانند و آن شــهر را بدان پل بازخوانند. و بر جانب شــرقی بالای شــهر جویی در ســنگ بریده‌اند و در زیر شــهر با رود رســانیده‌اند و دولایی بزرگ بر آن جوی ســاخته چنانکه پنجاه گز آب بالا می‌اندازد و مدار شــهر بر آن آبســت. شهری وسطست...مواضع بسیار از توابع اوست....

نزهت القلوب، ۱۶۸

عسکر مکرم...بر دو جانب آب دو دانگه تستر نهاده است... و لشکر بن طهمورث دیوبند ساخته....

Nuz S

Ḥamd Allāh Mustawfī. *The Geographical Part of the Nuzhat-Al-Qulūb*. Edited by LeStrange. Gibb Memorial Series 23. London: Brill, 1919.

Nuz S, P107

The name is commonly pronounced sushtar.

Nuz S, P207

Dujayl (the Little Tigris or Kārūn river) of Tustar. This rises in the Zard Kūh (Yellow Mountains) of the range in Great Lur, and after flowing some 30 odd leagues it reaches the city of Tustar. Now the distance hither is so short that its wates are still quite cold, and they greately aid digestion…. Below Tustar king Sapor II built the Weir (Shādravān) across the river, and divided the stream into three parts, (two of which) he caused to flow round and about Tustar. One of these, called the Chahār Dānik (Four-sixth), in its upper channel flowed to the west of the city; while the other, namely the Dū Dānik (Two-sixths) canal, in a newly dug channel flowed to the east of the town. Both channels came together again near Lashkar, and here they were joined by the Dizfūl and Karkhah rivers, after which the united streams flowed out to the Shatt-al-ʻArab (Tigris Estuary). The length of the Tustar river is 80 leagues.

Dizfūl River. This is also known as the Junday Shāpūr river. It rises in the mountains of Greater Lur, and passing by (the towns of) Jundi Shāpūr and Dizfūl it joins the Tustar river in the Masruqan country, and flows out to the Tigris Estuary. Its total length is 60 leagues.

Ḥāfiẓ Abrū, Šahab ad-Dīn ʿAbdullah Ḫawāfī (fifteen century)
Juġ
Juġrāfiyā-Yi Ḥāfiẓ Abrū. Edited by Sadiq Sajjadi. 2 vols. Tehran: Bunyān, Daftar-i Našr-i Mīrāṣ-i Maktūb, 1997.

شهاب الدین عبدالله خوافی حافظ ابرو

جغرافیای حافظ ابرو

جغرافیا ج۱، ۱۵۷

فاما آنچه بر جانب شرقی [دجله] است نهر اهواز است و غیر انهار زیادت شهرتی ندارند. فاما آنچه بر جانب غربی است انهار بسیار است.

جغرافیا ج۱، ۱۶۱

دجلة الاهواز و منبع این نهر از اهواز است ...می‌گذرد به جانب غرب و شمال تا عسکر مکرم ...

جغرافیا ج۱، ۱۶۲

و دجلة الاهواز در وقتی که آبش بسیار بُوَد نزدیک به دجله باشد و مزروعات از نی‌شکر و غیره و بساتین بسیار [بر این][۱۸] آب است.

نهر المَسْرُقان و این نهری است در بلاد خوزستان که از نواحی تستر می‌آید... و این آبی است بزرگ و می‌گذرد بر عسکر مکرم...

جغرافیا ج۱، ۱۶۳

نهر تستر مخرج این نهر از ورای عسکر مکرم است و می‌گذرد بر اهواز و منتهی می‌شود به نهر سدره نزدیک حصن مهدی...و از آنجا به بحر فارس می‌ریزد.

جغرافیا ج۲، ۹۱

ذکر بلاد خوزستان

خوزستان را اهواز نیز خوانند. گویند عرب خوز را جمع کردند بر اخواز، و اخواز را معرب ساختند به اهواز....انواع ثمار از نخستان و قصب نیشکر و غیره و انواع حبوبات فراوان باشد به تخصصی برنج.

جغرافیا ج۲، ۹۳

تستر قصبهٔ بلاد خوزستان است که حالا عوام آنرا ششتر خوانند. نهری عظیم برگرد تستر می‌گردد و بر آن نهر بندی به عظمت بسته‌اند و شاپور بسته است، چنانکه آنرا از عجایب ابنیهٔ عالم می‌شمارند. گویند درازی آن بند مقدار ثلث فرسنگی است از سنگ و گچ و خشت پخته. تا آب بر زمین تستر نشسته است، و آنرا شادروان

[۱۸] [] از مصحح است.

می‌خوانند. این آب چون به شهر می‌رسد دوبخش می‌شود. چنانکه چهار دانگ به یک طرف می‌رود و دو دانگ به طرف دیگر. باز آن چهار دانگ دو قسم می‌شود. یک قسم تا به این دودانگ متصل شود از شهر گذشته، گوییا تستر به مثل جزیره‌ای است. طراز تستری منسوب به این موضع است. گویند که بعضی اکاسرهٔ فرس به غزاء روم رفتند و از آنجا اسیر بسیار آوردند و آن اساری را در تستر ساکن گردانیدند. ایشان صنعت حریر و دیباج که به طراز تستری مشهور شد ظاهر کردند.

جغرافیا ج۲، ۹۴

... در تاریخ سنهٔ خمس و تسعین و سبعمایه [۷۷۵] به وقتی که حضرت امیر صاحبقران-انارالله برهانه- عزیمت شیراز فرمود، از راه تستر گذشت. چون بدانجا رسید برکنار آب در ظاهر شهر نزول فرمود. اهالی آن مواضع به اذعان و انقیاد تلقی نمودند. حضرت صاحبقرانی آن شهر را به خواجه مسعود سبزواری سپرد. بعد از فتح، تمامت خوزستان را داخل فارس گردانیده به فرزند ارجمند، عمر شیخ بهادر سیورغال فرمود. بعد از آن فرزندان امیرزاده سعید بر آن دیار حاکم بودند. بعد از آن در انقلابات عراق، بقیهٔ فرزندان امیر شیخ حسن بدان ولایت آمدند. چون حضرت سلطنت شعاری-خلدالله تعالی ملکه و سلطانه-در تاریخ سنهٔ سبع عشر و ثمنمأیه به اصفهان و شیراز رسید، اظهار مطاوعت و انقیاد نموده ایلچیان فرستادند. حضرت سلطنت شعاری-خدالله ملکه و سلطانه-رحمت فرموده برایشان مسلّم فرمود. تا حالا شهور سنهٔ احدی و عشرین و ثمانمأیه است برقرار. حاکم آن طرف ایشانند و پیوسته ایلچی و هدایا و خدمتی بدین حضرت فرستند و با گماشتگان این حضرت که در آن نواحی‌اند، معاش به طریق ادب و تواضع و انقیاد کنند.

حویزه از قصبات مشهوره خوزستان است...

جغرافیا ج۲، ۹۵

و در تاریخ سنة خمس و تسعین و سبعمأیه، چنانچه در حکایت تستر گذشت، امیرزادهٔ سعید شهید، امیرزاده عمر شیخ بهادر-نورالله مرقده-به وقت توجه به فارس به حویزه رسید. در آن ایام شخصی اسلام نام از قبل شاه منصور آنجا حاکم بود. چون آوازه رسیدن عساکر منصوره شنید، ترک حصار و شهر گفته بگریخت، و امیرزادهٔ مرحوم مغفور به حویزه رسید و آن دیار را ضبط کرده برعقب رایات همایون حضرت صاحبقرانی-انارالله برهانه- متوجه فارس شد.

عسکر مکرم مدینه ای مشهور است از بلاد خوزستان، و گویند در قدیم قلعه‌ای بود. در وقت

جغرافیا ج۲، ۹۶-۹۹

حجاج بن یوسف، خورزاد[۱۹] در آن قلعه با حجاج یاغی شد. حجاج بن یوسف، مکرم بن حارث بن غنم را با لشکری به جنگ او فرستاد. او با آن لشکر که آمده بود مدتی آنرا محاصره کرد تا آنرا فتح کرد. در وقت محاصره آنجا بناها

[۱۹] خوز را

نهادند و عمارات کردند. چنانچه شهری شد و به عسکر مکرم مشهور شد. و در بلاد خوزستان شهری که در زمان اسلام بنا نهاده باشند این عسکر مکرم است باقی همه شهرهای قدیمی است.

طیب شـهری است...سوس شهری قدیم است...جبی مدینه‌ای است... اهواز کورهٔ خوزستان است. بعضی گویند که اهواز اسمی است که مشتمل است بر تمام دیار خوزستان. این قصبه را سوق‌الاربعاء خوانند و بعضی سوق الاهواز نیز گویند. جرجان و دسـتوا و سـوق الاربعاء، مجموع از قصـبات اهواز اسـت... قرقوب نزدیک طیب است...جندی شـابور مدینه‌ای اسـت... باسـیان مدینه‌ای میانه اسـت... متوث از مدینه‌های خوزستان است. میان قرقوب و اهواز واقع شده است. حصن مهدی آبهای خوزستان... همه در حصن مهدی جمع می‌شود و نهری بزرگ می‌گردد و از آنجا به دریا می‌ریزد... نهر تیری شـهری است از جمله قصبات اهواز... دورق مدینه‌ای است از نواحی خوزستان و دو دورق اسـت دورق علیا و دورق سفلی... مهرویان مدینه ای کوچک است... رامهرمز از قصبات اهواز است... بلاد اللور شهری چند است و اکثر در کوه واقع است. در قدیم لور داخل خوزستان بوده است. حالا لورستان را علیحده می‌گیرند... رستاق زط این موضع کوره‌ای معمور است.

جغرافیا ج۲، ۲۵۳

...بعد از چهار روز [شـاه شـجاع] از آنجا [خرم‌آباد] «۱۰» کوچ کرد و به طرف دزبول و شـوشتر روانه شد و راهی ناخوش و کوهسـتانی سخت بود. زمستان، لشکر را زحمت بسیار رسید تا به شوشتر رسیدند، در کنار آب شوشتر فرود آمدند. در آن ایام بنیاد بارندگی شـد. پنج شـبانه روز متصـل بارید که یک ساعت نایستاد...از آن طرف آب، شـاه منصـور با هفتصد سوار مکمل آراسته فرود آمد. یک هفته بر این بگذشت و هیچکدام را مجال آب گذشتن نبود.

جغرافیا ج۲، ۲۸۱

ذکر احوال سـلطان زین العابدین در قلعهٔ شوشتر بعد از عزیمت شاه منصور به شیراز چون شاه منصور از شوشتر عازم شـیراز شد. جماعت کوتوالان قلعهٔ سلاسل که سلطان زین العابدین را محافظت می‌نمودند با او متفق شدند و او را از قلعه بیرون آوردند و به ولایت بروجرد پیش ملک عزّالدین رسانیدند.

Šaraf al-Dīn ʻAlī Yazdī (fifteen century)
Ẓaf
Ẓafarnāmah. Edited by Muhammad ʼAbbasi. Tehran: Amirkabir Press, 1957.

شرف الدین علی یزدی

ظفرنامه

ظفرنامه ج ۱، ۵۸۸

والی فارس زین‌العابدین چون خبر [حملهٔ تیمور به سمت شیراز] شنید ...رو به گریز نهاد و در تستر پسر عم او شاه منصور حاکم بود....چون به کنار آب دو دانگه رسید شاه منصور مردم او را فریب داده، به جانب خود دعوت

ظفرنامه ج ۱، ۵۸۸

نمود....و زین العابدین با اندک نفری بماند. شاه منصور جمعی را بفرستاد تا او را به شهر آورده، در قلعهٔ سلاسل به اغلال و سلاسل مقید گردانیدند...

ظفرنامه ج ۱، ۷۰۰

ملک عزالدین (اتابک لرستان) چون توقف نیارست به ضرورت و اضطرار فرار اختیار کرد، صاحب قران کامگار یک شب به سعادت آنجا (خرم‌آباد) بگذرانید و روز دیگر به جهت محاصرهٔ قلعه جماعتی را از سپاه تعیین فرمود و امیرزاده عمر شیخ را طلب داشته، به تکامشی ملک عزالدین فرستاد... و به نفس مبارک از خرم‌آباد نهضت نموده روی توجه به صوب تستر آورد....

ظفرنامه ج ۱، ۷۰۱

... صاحب قران گیتی ستان امیرزاده عمر شیخ را با لشکرها به جانب دست راست روان گردانید... و چون به حویزه رسیدند...داروغا اسلام نام که از قبل شاه منصور آنجا بود از بیم جان بگریخت. امیرزاده عمر شیخ به ضبط و نسق حویزه مشغول شد و حضرت صاحب قران کامگار شب شنبه شانزدهم ماه به سعادت سوار شده چاشتگاه از فول گذشته در اندرون دزفول نزول فرمود.

و در السنه و افواه شیوعی دارد که آن قنطرهٔ بدیع الاوصاف پرداخته و برافراختهٔ معمار همت موفور شاپور ذوالاکتاف است؛ طرح اساس آن بر بیست و هشت طاق بزرگ واقع شده ...

ظفرنامه ج ۱، ۷۰۲

...و در میان هر دو طاق از آن طاق‌های بزرگ، طاقی خرد بر بالای آن انداخته، چنانچه تمام اصول و فروع آن پنجاه و پنج طاق باشد... (شرح و بسط سمبلیسم عدد)

ظفرنامه ج ۱، ۷۰۲

... همان روز [حضرت صاحب قران] از شهر (دزپل) بیرون فرموده، پیشینگاه متوجه تستر گشت...سحرگاه به تستر رسید و کنار آب چهاردانگه مخیّم نزول همایون ساخت. علی کوتوال و اسفندیار نامی که از قبل شاه منصور متصدی ضبط و محافظت تستر بودند، از آوازهٔ توجه عساکر گردون مآثر گریخته بودند و رو به شیراز نهاده، اکابر و اشراف آنجا کمر بندگی بر میان جان بسته به قدم اطاعات و انقیاد بیرون شتافتند و از آب گذشته به درگاه عالم‌پناه آمدند....

ظفرنامه ج ۱، ۷۰۳

و روز چهارشنبه بیستم ماه، از آب چهاردانگه عبور فرموده به ظاهر شهر در میان نخلستان فرودآمد....

ظفرنامه ج ۱، ۷۰۴

از سنه تسعین و سبعمائه ...(که تاریخ بازگشت تیمور از جنگ سه ساله بود) تا سنهٔ خمس و تسعین و سبعمائه- که صاحب قران کامگاز از مازندران باز متوجه فارس و عراق شد-میان آل مظفر بسی وقایع دست داد.... از آن جمله سلطان زین‌العابدین که در قلعهٔ کریکرد-که به چهار فرسخی تستر واقع است-در بند بود، به معاونت احمدشاه ترمتاشی و محمود شاه خویش او از بند خلا یافته، متوجه وروجرد شدند...

al-Ḥimyarī, Abū ʿAbd Allāh Muḥammad b. Abī ʿAbd Allāh Muḥammad b. Abī Muḥammad ʿAbd Allāh IbnʿAbd al-Munʿim b. ʿAbd an-Nūr al-Ḥimyarī (d. *c.*1494)
Ḥim
Ar- Rauḍ al-miʻṭār fī ḫabar al-aqṭār: muʻğam ğuġrāfī maʻa fahāris šāmila. Edited by Ihsan ʾAbbas. Beirut: Maktabat Lubnān, 1984.

محمد بن عبدالمنعم الحميرى

الروض المطار فى خبر الأقطار

الروض، ٢٢٥

و بأرض خوزستان مياه جارية و أودية غزيرة و أنهار سائلة، و اكبر انهارها نهر تستر، و يسمى دجيل الأهواز، و هو نهر عجيب منبعه من جبال هنالک و عليه الشاذروان الذى أمر بعمله سابور الملک، و هو من العجائب المشهورة فإنه بناء أمام تستر وثيق عال أُقيم فى سدر الماء سدّا وثيقا بالحجر و العمد، فارتدع به الماء حتى صار أمام تستر، لأن تستر فى نشز من الأرض عال [والماء] مرتدع بين يديها، و يجرى هذاالنهر من وراء عسكر مكرم و عليه هناک جسر كبير و تجرى فيه السفن الكبار و يتصل بالأهواز....

الروض، ٢٧٢

رستقباذ: موضع بين الكوفة و البصرة، قريب من دستوا، كان الحجاج خرج إليه فثار الناس به هناک مع عبدالله بن عبدالله بن الجارود، و ذلک سنة خمس و سبعين، فاقتتلوا، فقتل عبدالله بن الجارود،.....

الروض، ٤٢٠

عسكر مكرم: مدينة بقرب الأهواز كبيرة عامرة على نهر مسرقان، و فيها التجار و أخلاط من الناس، و فيها أسواق و أرزاق و صناعات، و لها مزارع متصله... و بين عسكر مكرم و تستر مرحلة، و بينها و بين رامهرمز مرحلتان، و بينها و بين الاهواز مرحلة.

و كان الحجاج قد بعث مكرم بن جعونة فنزل موضع عسكر مكرم اليوم، فبه سمى الموضع.

Mīrzā ʻAbd al-Laṭīf Abd Allāh ibn Nūr al-Dīn Mūsawī **Shūshtarī** (written c. 1801)
Taz
Tazkirah-I Šūštar. Bibliotheca Indica 206, 1924.

میرزا عبداللطیف موسوی شوشتری

تحفة العالم

تحفة العالم ۳۴

وجه تسمیهٔ شوشتر، به معنای بهتر از شوش، هوشنگ پیشدادی

تحفة العالم ۴۱

و کیانیان را به عمارت شـوشـتر التفاتی بود، و چون آب کرن به کار زراعت نمی‌آمد قنوات بسـیاری از گلوگرد احداث نمودند که آب آنها به دو قریه از قراء بعیدهٔ شوشتر، گُتْوَند و جوبَند، می‌رسید و مُزارعان به آب آن قنوات در آن قری

تحفة العالم ۴۲

زراعت صـیفی بعمل می‌آوردند. و در حوالی شـهر باغ و بوستان نبود، و رودخانه از حوالی شهر تخمیناً نیم فرسخ دور بود و مردم قرای و قوافل به کشتی از رودخانه عبور می‌نمودند و به این سبب زحمت بسیاری می‌کشیدند تا اینکه دارای اکبر نهر داریان را ابتدا نموده فرصت اتمام نیافت. دارا بن دارا به اتمام آن کوشید و آب از میان شهر به صحرای عسکر جاری ساخت، و این قبل از اسکندر ذوالقرنین بوده است. در آن ایام بنحوی که احوال آن شهر را نوشـته‌اند، از تمامی بدان عراق و فارس متمایز بوده اسـت، تا اینکه به مرورو دهور رودخانه عمیق و آب از نهر منقطع گردید و به این سـبب مزارع فاریابی موقوف، و آن قنوات هم بایر گردیدند و احدی از ایشان باقی نماند و سال‌های دراز بدین منوال خراب و ویران بود حتی «یحیی الارض بعد موتها».

و در شـوشـتر در اغلب ازمنه که بی آبی گذشـته و می‌گذرد، نرخ علات گران و اطعمه کمیاب و مدار زراعات به باران، که در اکثر سـنین نیز خشـکسـالی اسـت. و قوت مردم منحصـر اسـت به آنچه از بلاد قریبه به آنجا جلب نمایند، مانند خرما از بصره و برنج از حویزه و رام‌هرمز و گندم و جو از دزفول و بختیاری؛ و اگر آبی بهم رسد که زراعت مائی توانند کرد گندم و برنج و سایر حبوب نیکو بعمل آید. و در زراعات برکت و ریع بسیار است، و زمین آنجا بحدی سـبک است که به یک گام شخم توان کرد، و فواکه مانند انگور و خربزه و انار و مرکبات و سایر ثمار از فواکه عراق عجم پست‌تر و از تمامی عراق عرب و بعضی بلدان فارس بهتراند....

و نمک شوشتر از نمک اثر ممالک ممتاز است، بغایب لطیف و شور که در او

تحفة العالم ۴۳

تلخی نیست. اگر در طعام زیاده ریزند شور گردد، بخلاف نمک سایر اماکن که اگر زیاده از آنچه باید در طعامی ریزند آن طعام تلخ گردد. و ماهیت نمک شوشتر کف آبی است که هرگاه از روی آب گرفتند در عرض یک ساعت مانند سنگ سخت گردد، و مکرّر کوبیدهٔ آن به قند مکرّر مشتبه شده است.

تحفة العالم ۴۴

شوشتر از بلاد عظیمه و کمابیش دوازده هزار خانه‌وار در آنجا ساکن‌اند، و در اعصار سابقه از این بیشتر بوده است.... و شهر را کنون پنج دروازه است: دروازه گرگر، دروازهٔ دزفول، دروازهٔ عسکر، دروازهٔ مافاریان، دروازهٔ آدینه. و طول شهر از قلعهٔ سلاسل است الی مقامی که مشهور است به امامزاده عبدالله، و عرض آن از دروازهٔ آدینه است الی دروازهٔ گرگر...

و سابقاً رقمزد کلک وقایع‌نگار گردید که مدت‌ها شوشتر خراب و ویران و غیرمسکون بود، تا ظهور دولت ساسانیان...

تحفة العالم ۴۵

... و اردشیر بن بابک بن ساسان که بر تخت سلطنت قرار گرفت، اولا کمر همت به دفع ملوک طوایف بست و مداین را طرح ریخته مقرّ سلطنت کرد و ایشان را مقهور گردانید. و بعد از آن به فکر تجدید بنای شوشتر افتاد و از هرجا جمعی به آنجا کوچانیده، حکم فرمود تا خانه بسازند، و در این باب تشدّد بسیار نمود و در اندک زمانی عمارات و برج و باروی شهر به اتمام رسید. و مرکوزِ [خاطرِ] او چنین بود که پایین دهنهٔ داریان، که الحال زیر پل دزفول واقع است، به عرض رودخانه شادروانی بنا نماید تا آب مرتفع گردد و به نهر داریان جاری شود، از اجل مهلت نیافت و درگذشت. باز مردم به همان مشقّت و تعب روزگاری بسر می‌بردند و در این فترت اعراب از بادیه حرکت کرده آن حدود را الی خراسان بتاختند و انواع خرابی در آن بلاد نمودند. کسی نبود که از جور اعراب به ستوه نیامده باشد. و قیصر نیز فرصت یافته، بر بعض بلاد ایران تاخت آورد و از خرابی و ویرانی آنچه توانست کرد؛ تا اینکه نبیرهٔ اردشیر، شاپور که در صغر سن به سلطنت نشست ظهور کرد و او پادشاهی بود ضابط و صاحب عزم بلند. اولا بر سر اعراب راند و در هر تاخت و شبخون خلقی عرضهٔ تیغ بلا و جمعی کثیر یسیر می‌کرد و اسرا را شانه‌ها سوراخ کرده، دو به دو ریسمان بر یکدیگر می‌بست و همراه در اردو می‌گردانید، و به این سبب عرب او را ذوالاکتاف گویند. و بعد از قلع و قمع اعراب به حرب قیصر کمر بسته، او را مغلوب و یسیر کرد و به ایران

تحفة العالم ۴۶

مقید داشت و پس از مؤاخذه و مصادره به او فرمود که اگر نجات خود را می‌خواهی ممالکی را که از قلمرو من خراب کرده‌ای بساز. و چون شاپور را به عمارت و آبادی شوشتر رغبتی موفور بود، به قیصر الزام نمود که ابتدا شادروان شوشتر را بساز و چنان کن که در حوالی شهر زرع مائی توانند کرد.

قیصر چون بر جان خود ایمن گشت ... بفرمود تا مهندسان و معماران دانشمند با فرهنگ از روم و فرنگ بیامدند و مال و خزائن بسیاری برای این کار بیاوردند. و مهندسان بعد از آنکه ترازوی آب را برآورد نمودند، دیدند که به سبب بسیاری رودخانه و شدت جریان آب، ساخت شادوران محال و زمین رودخانه را سنگْبست نمودن، که دیگرباره عمیق نشود، ممکن نیست مگر اینکه آب را اولاً به طرفی دیگر جاری نمایند که آب از رودخانه منقطع گردد، بعد از ساختن زمین رودخانه و شادروان باز آب را به این طرف سر دهند و آن رخنه را ببندند. رأی دانشمندان فرنگ و روم به این قرار گرفت که از زیرکوهی که بقعهٔ سید محمد گیاهخوار واقع است و آب رودخانه از زیر آن کوه به طرف مغربی شهر جاری بود، رخنه‌ای نمایند که رودخانه به طرف جنوب میل نماید. و چنان کردند که از زیرکوه مذکور الی بند قیر، که دوازده فرسخ کامل است، به کلند بردند و آب را بدان طرف سردادند تا شادروان و بند میزان تمام شد، و هنوز اثار کلند در اطراف رودخانه الی بندقیر نمایان است.... پس مردمان قیصر شروع به کار نمودند و قیصر بفرمود که از ممالک رودم روزی هزار گوسفند و شبی هزار گوسفند روانه نمایند، که در گردن هریک بقدر طاقت آن قدری از طلا یا نقره یا مس یا آهن باشد، که هر صبح و شام دو هزار گوسفند می‌رسید و به شیر آنها نوره و گچ و گل تر می‌کردند و به کار می‌بردند. گویند شاپور به قیصر فرمود گلی که در این کار به مصرف می‌رسد باید از خاک قسطنطنیه باشد، قیصر بفرمود تا به عرابه آنقدر خاک بیاورندند و در خارج از شهر ریختند که تا حال تل‌های عظیم از آنها هست.....

بالجمله نوره و گچ را به شیر گوسفند خمیر کرده، سنگ‌های گران که به جرالثقیل به کار می‌بردند، دو دو طوق آهنین به یکدیگر بسته، از دهنهٔ مافاریان

الی زیر پل به یک ترازو فرش کردند و به سرب آب کرده رخته‌های سنگ‌ها را استوار کردند-و به این سبب آن را بند میزان گویند-و شادروانی به همین اساس به عرض رودخانه کشیدند و پلی عظیم بالای شادروان برای سهولت تردد انسان و حیوان در نهایت استواری بساختند. و آن رخنه‌هایی را که از زیر بقعهٔ سید محمد کرده بودند از همین نورهٔ با شیر گوسفند و سرب به همان دستور مسدود نمودند و آب را به این طرف به اعمال سردادند. و چنان کردند که چهار دانگ آب به رود قدیم از زیر پل می‌گذشت و دو دانگ آب به رودخانهٔ گرگر از بعض فرجه‌های قیصری برای مصرف باغات به طرف جنوبی شهر جاری بود... و باغات و بساتین به عمل آوردند و زرع صیفی آنقدر بعمل آمد که تا بلاد بعیده از شوشتر می‌رفت. و چنان آباد شد که صحرای عسکر و اراضی داریان را به زمین مینو تسمیه نمودند و تا به حال به همان اسم مسمی است....

شادروان به ضم دال ابجد، سراپرده و فرش منقّش و بساط گرانمایه را گویند، و چون زمین رودخانه را به زیبایی از سنگ رخام فرش کرده بودند شادروان گفتند، و به معنی جدول و راهروی آب هم به نظر آمده است.

...(چون تمام خزائن قیصر کفاف مخارج کار را نمی‌داد، به فکر چاره‌جویی افتادند و پیشنهاد دادند که مفرحات بسیار از کنیزان سیمین تن و می و باده و نقل و مزه فراهم کنند و به مردمان وعده دهند...)

... مردم از اطراف و جوانب آنقدر به مزدوری آمدند که به اندک زمانی آن کار پرآزار به انجام رسید... و مجمع آن قمرطلعتان کنار رودخانه بود و به این سبب آن رود را رود ماهپارگان گفتند و کنون از کثرث استمال به مافاریان رسیده است...

تحفة العالم ۴۹

مجملاً اینکه بعد از اتمام بند و شادروان و پل، شاپور قیصر را نوازش نموده رخصت انصراف داد و رومیان به اوطان خود مراجعت نمودند. بعضی را از آب و هوای شوشتر خوش آمده، از قیصر اجازت خواسته در آنجا ماندند و از آنها کارهای غریبه و آثار عجیبه به ظهور رسید:

...دیگر دیبای شوشتری که از پنبهٔ جوزق قلبلب بعمل می‌آوردند. و قلبلب درختی است که به هندی آن را آکهه می‌گویند، و در اراضی بنارس و لکهنو دیده‌ام... و مشهور است که پنبهٔ قلبلب را رومیان با بعض ادویه طبخ می‌دادند که به رشتن می‌آمد، و اکنون آن نیز منسوخ و کسی علاج رشتن آن را نمی‌داند.

و اما دیبا پارچه‌ای بود که از حریر خال به مراتب نرم‌تر و بهتر، آن را به زر و سیم و نقوش بدیعهٔ دلکش می‌بافتند و در آن زمان مخصو دستار ملوک و سلاطین بود و به خوبی آن پارچه مثلزد. و همه جا بلغاء و شعرای شیرین گفتار هرچیز را که خواسته‌اند در تعریف و زیبایی آن مبالغه نمایند تشبیه به دیبای شوشتری کرده‌اند...

تحفة العالم ۵۰

دیگر دولاب رومی است که چرخاب نیز گویند. به سهولت و آسانی بی اعانت آدم و حیوان آب را از قعر زمین به اوج برین می‌رساند؛ و تا اوانی که این خاکسار از آن بلده بر آمدم معدودی از آن دولاب‌ها در بعض باغات طرف گرگر بود. حالیا شنیدم که آنها هم بالمره بایر و اثری از آنها نیست.

....

و این پل قیصری همچنان به حال خود برقرار بود تا اینکه در عهد دولت بنی امیه، شبیب خارجی خروج نمود و شوشتر را مقر سلطنت خود گرداند. مکرّر

تحفة العالم ۵۱

عساکر از دمشق و شام به جنگ او آمدند و مغلوب گردیدند تا اینکه نوبت دولت به عبدالملک مروان بن الحکم رسید. او حجاج بن یوسف ثقفی را از جانب خود والی خراسان و عراقین گردانید، و حجاج با لشکری انبوه بر او رانده، شبیب تاب مقابلهٔ او نیاورده محصور شد و هر روزه با سپاه خود از شهر برآمده با حجاج محاربه می‌کرد و شب به شهر برمی‌گشت. روزی به عادت معهود آخر روز از جنگگاه برمی‌گشت، و در آن روزها آب رودخانه طغیان نموده بود. شبیب به تماشای سیلاب به کنار پل اسب می‌راند. یکی از عمله بر مادیانی سوار و پیش روی شبیب می‌رفت. اسب شبیب به آن مادیان رغبت نمود. او به دهن اسب زد. نریان میل کشیده، مرد و مرکب هر دو به رودخانه پریدند و در غرقهٔ بحر فنا گردیدند. صبحی حجاج داخل شهر گردید و سپاه را جابجا نگاه داشت که مردم ولایت مفسده برپا نکنند. آنگاه مردم را به جا دادن و اعانت شبیب معاتب کرد. رعایا به زبان نیازمندی

عرض کردند که ما را از شـبیب و آمدن او خبری نبود. در نیمشـب خود با سپاه بی حد و مرز ناگاه داخل ولایت شـــد و ما را قدرت محاربه و بیرون کردن او نبود. حجاج این معذرت قبول نمود و بفرمود تا پل را خراب کنند و مردم به دستور قدیم بر کشتی عبور نمایند تا دیگر کسی بی‌خبر داخل ولابت نگردد. فرمانبران بدان نحو کردند، و آنچنان خراب رود تا فتحعلی‌خان آن را تعمیر نمود...

تحفة العالم ۵۶

...(شرح تابستان و پناه‌گاه‌های آن از جمله شوادان‌ها) سابقاً که آب نهر داریان بود هرکس در خانهٔ خود از رودخانه نهری احداث کرده بود که آب به خانهٔ او می‌آمد و در شبستان‌ها نیز آب از همان قنوات می‌بردند...

تحفة العالم ۵۷

...(شرح آب و هوای شوشتر) و باران در موسم زمستان سالی دو ماه می‌آید آنهم بسیار کم، و گاه باشد که در تمام موســم دو مرتبه باران ببارد و به ســبب اعانت آب و هوا به همان دو باران زراعت نیکو به عمل میآید. و در اکثر سنوات خشکسالی است که تمامی زراعات سوخته می‌شوند و چیزی به دست نمی‌آید،...

تحفة العالم ۵۸

از عهد پادشاه گیتی ستان، شاه عباس صفوی، انار الله برهانه، که بنابر بعض مصالح سلطنت رسم حیدری نعمتی را در هریک از بلاد ایران شیوع و به این سبب الی الان در ایام هرج و مرج انواع فتنه و فساد به وقوع می‌آید، شهر شـوشـتر را نیز به دو محله نمودند: دسـتوا و گرگر، و هریک از این دو محله مشتمل بر محلات جزء. و دستوا نه محله اسـت و گرگر هفت‌محله...(شرح محلات و نام آنها)... و محلاتی که قریب به دوازهٔ عسکراند آنها را دستوا، و آنچه قریب به دروازهٔ گرگراند گرگر خوانند. و لفظ دستوا عربی فصیح است... و اینکه بعض دست‌آباد و

تحفة العالم ۵۹

دشـت‌آباد گویند و نویسـند اشتباه است. و ممکن است که در ازمنهٔ سالفه دستوا دهی بوده است متصل به شهر، بعد از آن رفته رفته داخل شهر شده است و به همان اسم مانده است.

و مردم حیـدری خانه چون به کنار رود دودانگه بودند، هرکس در خانهٔ خود گرگری نصـــب کرده بود که آب از رودخانه می‌کشـید، به این سـبب آن محله را گرگر گویند. این اسـت آنچه مورخین در وجه تسمیهٔ آن محله به گرگر نوشته‌اند....(فرضیه‌های دیگر)...

و باروی شهر از طرف گرگر همان رود دودانگه بوده است که اکنون تمامی رودخانه به آن طرف است و آن مقدار عمیق شـده است که نصب گرگر و آب برداشتن از رودخانه متعذر است. و از اطراف دیگر حصاری است عظیم ... اکنون حصار شهر را از خوف اعراب همسایه هرساله مرمتی می‌کنند و الا آن هم خراب شده بود.

تحفة العالم ۶۰

و قلعهٔ شـوشـتر ازقلاع مشـهورهٔ گردون ... و مسـمی به قلعهٔ سـلاسل است. و آن بر یک قطعهٔ کوه است بر ضلع جنوبی شـهر، و در اطراف آن صـحرای خالی بسـیاری گذاشـته‌اند که در وقت محاصـره مردمان دیهات قریبه با

مواشـی و حیوانات خود توانند ماند. و در سه ضلع قلعه رود مافاریان بمنزلهٔ خندق است. و در ضلع دیگر خندقی بسـیار عریض و عمیق دارد که عندالاحتیاج آب رودخانه را به خندق جاری می‌داشـتند...چاه و قنات بسیاری در آن هست که در وقت محاصره از آنها آب برمی‌دارند...

.... (شرح افسانهٔ نام سلاسل، از روی غلامی به همین نام که بر یکی از والیان فارس یاغی شد و در شوشتر مستقر، و در نهایت مورد بخشش واقع شد)

تحفة العالم ۶۱

... تا عهد سـلطنت ... نادرشـاه... حکام را بودباش قلعه بود. به این سـبب عملهٔ دیوانی مانند وزرا و مسـتوفیان عطاردشـأن، هریک عمارتی مخصو در قلعه داشتند... بعد از نادرشاه آن اساس هم برچیده شد و کنون رسم است که حاکم در خانهٔ خود که به شهر دارد می‌ماند و آن عماراتعالی همه شکسته ... گشته‌اند.

... (شرح عسکر مکرم و داستان نام آن، عسکر یکی از امرای عرب به نام مکرم....)

تحفة العالم ۶۲

و از آثار قدیمه که در اطراف شـوشـتر به نظر می‌آید معلوم می‌گردد که سـلاطین سـلف را به عمارت و آبادی شـوشـتر اهتمامی عظیم بوده اسـت...چنانکه سـوای بند میزان و شـادروان قیصـر، در اصـل رودخانه بندها و آبگردان‌های بسـیار و انهار بی‌شـمار که از رودخانه جدا کرده‌اند از ملوک و سلاطین سلف بسیار است، و آنچه از آثار آنها باقی بود که حقیر اغلب آنها را دیده‌ام....:

... بالاتر از بند میزان، به دو فرسـنگی شـهر، بندی اسـت از سنگ و ساروج، مشهور به بند دختر که دو نهر از دو طرف رودخانه به سبب آن بند جاری

تحفة العالم ۶۳

بوده است: یکی به طرف مغرب که آر با چم محمدعلی بیک که یکی از اعزّه بوده می‌برد، و دیگر به طرف مشرق به ریگستان عقیلی که از املاک سادات مرعشی است... جاری بود.

دیگر پایین بند میزان، آخر شـهر، محاذی محله میدان شیخ و دکان شمس، بند برج عیار است که به طرف شهر آسـیاها و چرخاب‌های بسـیار بر آن دایر بود. و اکثر باغاتی که در آن محله بودند، مثل سـالم آباد و گلابی و بلاگردان و برج عیـار، همـه بـه آن چرخاب‌ها معلمو بودند و در اغلب خانه‌های آن محله آب روان بود. و از طرف صـحرا باغات بسـیاری بود که از آب این بند مشجّر و خرم بودند، مثل باغ بلبل و طاش علیا و طاش سفلی و باغ خواجه فیض الله لشکرنویس. و لفظ برج عیّار نام خشلی است که از طلا و جواهر سازند و زنان در پیش سربندند. گویند زنی از اهل خیر، برج عیّار خود را فروخت و مردوانه‌وار شروع به ساختن این بند نمود....(شرح عمارت‌های نزدیک).

و در این محله جماعتی از کفره سـاکنند که آنها را صـابئه گویند. و بعض از علما مذهب آنها را مابین یهودیت و نصرانیت گفته‌اند....

تحفة العالم ۶۴

... عبادت آنها منحصـر است به اینکه صبحی در آب رودخانه تا کمر می‌روند و در برابر آفتاب چیزی به زبانی که دارند می‌خوانند و آب بر بردن و اطراف می‌پاشند و برمی‌گردند. بیشتر آنها به شغل زرگری مشغولند و ادانی آنها در باغات و زراعات خدمت می‌کنند....

تحفة العالم ۶۵

دیگر پایین‌تر در یک فرسـخی شهر، بندی است از سنگ خارا، خدا آفرین، مشهور به بند ماهی‌بازان که صیادان در آنجا شـکار ماهی می‌کنند. و در اطراف آن آثار چرخاب‌ها نمایانند و آسیاها تا حال هستند که در طغیانی آب سـیل که آسـیاهای شـهر زیر آب می‌مانند، مردم به آسـیاهای ماهی بازان آرد کنند. و به سبب ارتفاع آن بند و آسیاها آب سیل به آنها نمی‌رسد.

دیگر در هفت فرسخی بندی است مشهور به بند دارا و در اطراف آن هم آثار چرخاب‌ها و آبگردان‌ها باقی است. و کشـتی‌هایی که از بصـره خرما و اجناس دیگر می‌آورند تا بند دارا می‌آیند و از آنجا بر اسـتر و گاو به شـوشـتر می‌رسانند. و قریه‌ای را که در قرب واقع است حسام آباد گویند.

دیگر پایین‌تر بند قیر است که به جهت استحکام به جای ساروج و گچ، قیر آب کرده کار کرده‌اند. و در آن حوالی دهی است عرب‌نشین و قلعه‌ای است که به همین اسم مسمی شده است و آن را قلعهٔ بند قیر گویند.

دیگر بند اهواز است که از بندهای عظیمه و برالسنه و افواه دایر است....

تحفة العالم ۶۶

و شـهر اهواز از بلاد عظیمهٔ عالم... تمام بیشـه و جنگل و اراضـی آن شـکرسـتان بوده اسـت. و اماکنی که برای سـاختن شـکر سـاخته‌اند مثل حوض‌های بزرگ و سنگ آسیاها و غیره، آنقدر در آن سرزمین به نظر می‌آید که عدد آنها را خدای داند و بس....

تحفة العالم ۶۹

و در این جزء زمان در خوزسـتان شهری از دزفول آبادتر نیست. اگرچه کوچک است اما معمور... و سابقا از توابع شـوشـتر بوده اسـت که حاکم و ارباب مناصـب شرعی و عرفی از شوشتر معین می‌شدند، و حالیا شهری است به اسـتقلال... کشـت و زرع و وسمه در آن بلد بسیار است که از آن نیل به عمل آورند و به بلاد بعیده برند، و اغلب غلّه شوشتر از آنحاست...

... آب چاه‌های دزفول همه شـیرین و کم عمق، و کم خانه‌ای که در آن باغچهٔ مشـج نباشـد، بخلاف شـوشتر که چاه‌ها بغایت

تحفة العالم ۷۰

عمیق و آب‌های آنها در نهایت شوری است که از آن سبزه نروید...

BIBLIOGRAPHY

PRIMARY SOURCES

Abd Allāh ibn Nūr al-Dīn Shūshtarī. *Tazkirah-i Šūštar*. Bibliotheca Indica 206, 1924.

Abū Dulaf. *Abu Dulaf Travels in Iran (ar-Risāla)*. Edited by Vladimir Minorsky. Cairo: Cairo University Press, 1955.

Abū l-Fidā'. *Géographie d'Aboulféda*. Edited by Joseph T. Reinaud and William Mc.C. Slane. Paris: Imprimerie royale, 1840.

ANON. *Ḥudūd Al-'Ālam Min al-Mašriq Ila al-Maġrib*. Edited by Manuchihr Sutudeh. Tehran: Dānishgāh-i Tihrān, 1961.

al-Balāḏurī. *Kitāb Futūḥ al-Buldān (Liber Expugnationis Regionum)*. Edited by Michael J. de Goeje. Leiden: Brill, 1968.

Ad-Dimašqī. *Cosmographie de Chems-Ed-Din Abou Abdallah Mohammed Ed-Dimichqui (Nuḫbat Ad-Dahr)*. Edited by A. F. Mehren. St.-Petersburg: Académie impériale des sciences, 1866.

ad-Dīnwarī. *Aḫbār aṭ-Ṭiwāl*. Edited by 'Abdulmun'im 'Amer and Jamal ad-Din Shiyal. Cairo: Dār al-'Iḥyā, 1960.

Ḥāfiẓ Abrū. *Juġrāfiyā-yi Ḥāfiẓ Abrū*. Edited by Sadiq Sajjadi. 2 vols. Tehran: Bunyān, Daftar-i Našr-i Mīrāṣ-i Maktūb, 1997.

Ḫalīfa b. Ḫayyāt. *Tārīḫ Ḫalīfa B. Ḫayyāt*. Edited by Hikmat Guli Fawwaz and Mustafa Najib Fawwaz. Beirut: Dār al-Kutub al-'Ilmīyah, 1995.

Ḥamd Allāh Mustawfī. *Nuzhat-al-Qulub*. Edited by Muhammad Dabir Siyaqi. Qazwin: Hadith-i Emruz, 2002.

———. *The Geographical Part of the Nuzhat-Al-Qulub*. Edited by LeStrange. Gibb Memorial Series 23. London: Brill, 1919.

Ḥamzah al-Iṣfahānī. *Hamzae Ispahanensis Annalium Libri X (Tarīḫ-i Sinī Mulūk al-Arḍ Wa-l-Anbiyā')*. Edited by I. M. E. Gottwaldt. Vol. 2. 2 vols. St.-Petersburg: In commissis apud Leopold um Voss, 1844.

Ibn al-Faqīh. *Compendium Libri Kitāb Al-Buldān (Abridgment)*. Edited by Michael J. de Goeje. Leiden: Lugduni Batavorum, 1885.

———. *Het Boek van de Geschiedenis Der Landen*. Edited by Zacharias Van Laer. Bruxellis: s.n., 1985.

Ibn Balḫī. *Farsnāmā*. Shiraz: Bunyād-i Fārsšenāsī, 1995.

Ibn Baṭṭūṭa. *Tuḥfat an-Nuẓẓār fī Ġarā'ib al-Amṣār Wa 'Ajā'ib al-Asfār=Riḥla*. Edited by C. Defremery and B. R. Sanguinetti. Paris: Anthropos, 1969.

Ibn Ḥawqal. *Kitāb Ṣūrat al-Arḍ*. Edited by Johannes Hendrik Kramers. Vol. 2. 2 vols. Beirut: Dār Ṣādir, 1938.

Ibn Ḫurradaḏbih. *Kitāb al-Masālik Wa al-Mamālik*. Edited by Michael J. de Goeje. Beirut: Dār Ṣādir, 1889.

Ibn Rusta. *Kitāb al-A'lāk an-Nafīsa VII, Auctore Abū Alī Ahmed Ibn Omar Ibn Rosteh et Kitāb al-Boldan, Auctore Ahmed Ibn Abī Jakūb Ibn Wādhih al-Kātib al-Jakūbī*. Edited by Michael J. de Geoje. Bibliotheca Geographorum Arabicorum, VII. Leiden: Lugduni Batavorum Brill, 1892.

Ibn Sarābiyūn. *Das Kitāb 'Aǧā'ib al-Aḳālīm as-Sab'a Des Suhrāb*. Edited by Hans von Mžik. Leipzig: Harrassowitz, 1929.

al-Idrīsī. *Opus Geographicum Sive Liber Ad Eorum Delectationem Qui Terras Peragrare Studeant (Nuzhat al-Muštāq Fi-ḫtirāq al-āfāq)*. Edited by A. Bombaci, U. Rizzitano, L. Rubinacci, and L. Veccia Vaglieri. Napoli-Roma: Istituto universitario orientale di Napoli-Istituto italiano per il Medio ed Estremo oriente, 1970.

al-Iṣṭaḫrī. *Viae Regnorum: Descriptio Ditionis Moslemicae (Kitāb al-Masālik Wa al-Mamālik)*. Edited by Michael J. de Goeje. Bibliotheca Geographorum Arabicorum 1. Leiden: Lugduni-Batavorum Brill, 1927.

al-Mas'ūdi. *Les Prairie D'or (Murūj aḏ-Ḏahab)*. Edited by Charles A. C. Barbier de Meynard and Abel J. B. Pavet de Courteille. Paris: Imprimerie impériale, 1861.

al-Muqaddasi. *Ahsan al-Taqāsim fi Ma'rifat al-Aqālim*. Edited by Michael J. de Geoje. Cairo: Maktab al-Madbuli, 1991.

Mīr 'Abd al-Laṭīf Ḫān Šūštarī. *Tuḥfat al-'Ālam*. Tehran: Kitābḫāneh-yi Ṭahūrī, 1984.

Miskawaih. *The Concluding Portion of the Experiences of the Nations by Miskawaihi: The Eclipse of the 'Abbasid Caliphate (Tajārib al-Umam)*. Edited by H. F. Amedroz and D. S. Margoliouth. Oxford: Blackwell, 1920.

Najm al-Mulk, 'Abd al-Ġaffar. *Safarnāmeh-yi Khuzistan*. Edited by Muhammad Dabir Siyaqi. Tehran: 'Elmi, 1963.

as-Sam'ānī. *al-Ansāb li-l-Imām Abī Sa'd Abd al-Karīm b. Muḥammad b. Manṣur at-Tamīmī s-Sam'ānī (Kitāb al-Ansāb)*. Edited by 'Abdullāh 'Umar Barudi. Beirut: Dār al-Ǧinān, 1988.

Šaraf al-Dīn 'Alī Yazdī. *Ẓafarnāmah*. Edited by Muhammad 'Abbasi. Tehran: Amirkabir Press, 1957.

aṭ-Ṭabarī. *Annales Quos Scripsit Abu Djafar Mohammed Ibn Djarir Al-Tabari*. Edited by Michael J. de Geoje. 11 vols. Leiden: Lugduni Batavorum Brill, 1964.

al-Ya'qūbī. *Kitāb al-A'lāk an-Nafīsa VII, Auctore Abū Alī Ahmed Ibn Omar Ibn Rosteh et Kitāb Al-Boldan, Auctore Ahmed Ibn Abī Jakūb Ibn Wādhih al-Kātib al-Jakūbī*. Edited by Michael J. de Goeje. Leiden: Lugduni Batavorum Brill, 1892.

———. *Tārīḫ al-Ya'qūbī*. Edited by ANON. Beirut: Dār Ṣādir, 1960.

Yāqūt al-Ḥamawī. *Mu'jam al-Buldān*. Edited by ANON. 7 vols. Beirut: Dār Ṣādir, 1955.

Adams, Robert McCormick. “Agriculture and Urban Life in Early Southwestern Iran.” *Science* 136, no. 3511 (1962): 109–22.

———. *Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates*. Chicago: University of Chicago Press, 1981.

———. “Historic Patterns of Mesopotamian Irrigation Agriculture.” In *Irrigation’s Impact on Society*, edited by Theodore E. Downing and McGuire Gibson, 1–6. Tucson: University of Arizona Press, 1974.

———. “Intensified Large-Scale Irrigation as an Aspect of Imperial Policy. Strategies of State Craft on the Late Sasanian Mesopotamian Plain.” In *Agricultural Strategies*, edited by Joyce Marcus and Charles Stanish, 17–37. Cotsen Advanced Seminar Series 2. Los Angeles: Cotsen Institute of Archaeology at UCLA, 2006.

———. *Land behind Baghdad a History of Settlement on the Diyala Plains*. Chicago: University of Chicago Press, 1965.

Adams, Robert McCormick, and Hans J. Nissen. *The Uruk Countryside : The Natural Setting of Urban Societies*. Chicago: University of Chicago Press, 1972.

Alizadeh, Abbas. “Elymaean Occupation of Lower Khuzestan during the Seleucid and Parthian Periods: A Proposal.” *Iranica Antiqua*, no. 20 (1985): 175–95.

Alizadeh, Abbas, Nick Kouchoukos, Tony J. Wilkinson, Marjan Mashkour, and A. M. Bauer. “Human-Environment Interactions on the Upper Khuzestan Plains, Southwest Iran. Recent Investigations.” *Paléorient* 30, no. 1 (2004): 69–88.

Alizadeh, Karim, and Jason A. Ur. “Formation and Destruction of Pastoral and Irrigation Landscapes on the Mughan Steppe, North-Western Iran.” *Antiquity* 81, no. 311 (2007): 148–60.

Bagg, Ariel M. “Assyrian Hydraulic Engineering. Tunneling in Assyria and Technological Transfer.” In *Men of Dikes and Canals : The Archaeology of Water in the Middle East; International Symposium Held at Petra, Wadi Musa (H.K. of Jordan) 15-20 June, 1999*, edited by Hans-Dieter Bienert and Jutta Häser. Rahden/Westf.: VML, Verlag Marie Leidorf, 2004.

———. *Assyrische Wasserbauten : Landwirtschaftliche Wasserbauten im Kernland Assyriens zwischen der 2. Hälfte des 2. Und der 1. Hälfte des 1. Jahrtausends v. Chr.* Mainz am Rhein: P. von Zabern, 2000.

———. “Irrigation in Northern Mesopotamia: Water for the Assyrian Capitals (12th-7th Centuries BC).” *Irrigation and Drainage Systems* 14, no. 4 (2000): 301–324.

Bakker, A. J. “Iran - the Development of Land and Water Resources in Khuzistan - Report to the Government.” Rome, Italy: FAO, 1956.

Banaji, Jairus. “Late Antique Legacies and Muslim Economic Expansion.” In *Money, Exchange and the Economy in the First Century of Islam*, edited by John Halden. Ashgate: Aldershot,

2010.

Bartl, Karin. “Balih Valley Survey. Settlements of the Late Roman/early Byzantine and Islamic Period.” In *Continuity and Change in Northern Mesopotamia from the Hellenistic to the Early Islamic Period : Proceedings of a Colloquium Held at the Seminar Für Vorderasiatische Altertumskunde, Freie Universität Berlin, 6th-9th April, 1994*, edited by Stefan R Hauser and Karin Bartl, 333–48. Berlin: D. Reimer, 1996.

Bell, Mark Sever. “A Visit to the Kárún River and Kúm.” *Blackwood’s Edinburgh Magazine*, 1889.

Bonacossi, Daniele Morandi, and Marco Iamoni. “Landscape and Settlement in the Eastern Upper Iraqi Tigris and Navkur Plains: The Land Of Nineveh Archaeological Project, Seasons 2012–2013.” *Iraq* 77, no. 01 (2015): 9–39.

Bosworth, Clifford Edmond, X. De Planhol, and Judith A Lerner. “AHVĀZ.” *Encyclopædia Iranica*. I/7. Accessed March 28, 2014. http://www.iranicaonline.org/articles/ahvaz-a-town-of-southwestern-iran#pt1.

Boucharlat, Rémy, and E Haerinck. *Tombes d’époque parthe : Chantiers de la Ville des Artisans*. Leiden; Boston: Brill, 2011.

Boucharlat, Rémy, and Audran Labrousse. “Le palais d’Artaxerxes II sure la rive droite du Chaour à Suse.” *CDAFI* 10 (1979): 19–136.

Boucharlat, Rémy, Jean Perrot, and Daniel Ladiray. “Les niveaux post-achéménides à Suse, secteur nord.” *CDAFI* 15 (1987): 145–311.

Bulliet, Richard W. *Cotton, Climate, and Camels in Early Islamic Iran: A Moment in World History*. New York: Columbia University Press, 2009.

Carter, Elizabeth, and Matthew W. Stolper. *Elam: Surveys of Political History and Archaeology*. University of California Press, 1984.

Casana, Jesse. “Radial Route Systems and Agro-Pastoral Strategies in the Fertile Crescent: New Discoveries from Western Syria and Southwestern Iran.” *Journal of Anthropological Archaeology* 32, no. 2 (2013): 257–73.

Casana, Jesse, and Jackson Cothren. “Stereo Analysis, DEM Extraction and Orthorectification of CORONA Satellite Imagery: Archaeological Applications from the Near East.” *Antiquity* 82, no. 317 (2008): 732–49.

Casana, Jesse, Jackson Cothren, and Tuna Kalayci. “Swords into Ploughshares Archaeological Applications of CORONA Satellite Imagery in the Near East.” *Internet Archaeology* 32 (2012). doi: http://dx.doi.org/10.11141/ia.32.2.

Christensen, Peter. *The Decline of Iranshahr: Irrigation and Environments in the History of the Middle East, 500 B.C. to A.D. 1500*. Copenhagen: Museum Tusculanum Press, 1993.

Curzon, George Nathaniel Curzon. *Persia and the Persian Question.* Vol. 2. 2 vol. vols. London: Longmans, Green, 1892.

Debevoise, Neilson Carel. *Parthian Pottery from Seleucia on the Tigris*. Ann Arbor: University of Michigan Press, 1934.

Delougaz, Pinhas, and Helen J. Kantor. *Chogha Mish: Final Report on the Last Six Seasons of*

Excavations, 1972-1978. Edited by Abbas Alizadeh. Vol. 2. 2 vols. The University of Chicago Oriental Institute Publications 101. Chicago: Oriental Institute of the University of Chicago, 1996.

———. *Chogha Mish: The First Five Seasons of Excavations, 1961-1971*. Edited by Abbas Alizadeh. Vol. 1. 2 vols. The University of Chicago Oriental Institute Publications 101. Chicago: Oriental Institute of the University of Chicago, 1996.

de Miroschedji, Pierre. "Fouilles du chantier Ville Royal II à Suse (1975-1977) II. Niveaux d'époques achemenide, parthe et islamique." *CDAFI* 15 (1987): 11–143.

———. "Fouilles Du Chantier Ville Royalle II à Suse (1975-1977). I. Les niveaux elamite." *CDAFI* 12 (1981): 9–136.

———. "Observations dans les couches neo-elamites au nord-ouest du tell de la Ville Royale à Suse." *CDAFI* 12 (1981): 143–67.

———. "Prospections archaologiques au Khuzistan en 1977." *CDAFI* 12 (1981): 169–93.

Douglas C. Comer, and Michael J Harrower, eds. *Mapping Archaeological Landscapes from Space*. New York: Springer, 2013.

Edgeworth, Matt. *Fluid Pasts: Archaeology of Flow*. Bristol: Bristol Classical, 2011.

"Environmental Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System." Lar Eng. Co, 2005.

Ertsen, Maurits W., and Joanne van der Spek. "Modeling an Irrigation Ditch Opens up the World. Hydrology and Hydraulics of an Ancient Irrigation System in Peru." *Physics & Chemistry of the Earth* 34, no. 3 (2009): 176–91.

Eva Kaptijn. *Life on the Watershed Reconstructing Subsistence in a Steppe Region Using Archaeological Survey : A Diachronic Perspective on Habitation in the Jordan Valley*. Leiden: Sidestone Press, 2009.

Gasche, Hermann. "La poterie elamite du deuxieme millennaire avant J.-C." *MDAI* 47 (1973).

———. , ed. "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers: A Geo-Archaeological Approach: A Joint Belgo-Iranian Project: First Progress Report - Part 1." *Akkadica* 125, no. 2 (2004): 147–54.

———. , ed. "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 2." *Akkadica* 126, no. 1 (2005): 1–43.

———. , ed. "The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers : A Geo-Archaeological Approach : A Joint Belgo-Iranian Project : First Progress Report - Part 3." *Akkadica* 128, no. 1 (2007): 1–72.

Gasche, Hermann, and Steven W. Cole. "Second-and First-Millennium BC Rivers in Northern Babylonia." In *Changing Watercourses in Babylonia : Towards a Reconstruction of the Ancient Environment in Lower Mesopotamia*. Edited by Hermann Gasche and Michael Tanret, 1–64. Ghent: University of Ghent, 1998.

Gasche, Hermann, and A. R. Paymani. "Repères archéologiques dans le bas Khuzestan: The Persian Gulf Shorelines and the Karkheh, Karun, and Jarrahi Rivers: A Geo-

Archaeological Approach: A Joint Belgo-Iranian Project: First Progress Report - Part 2." *AKKADICA* 126 (2005): 13–43.

Gasche, Hermann, and Michael Tanret, eds. *Changing Watercourses in Babylonia : Towards a Reconstruction of the Ancient Environment in Lower Mesopotamia*. Ghent: Univ. of Ghent, 1998.

Graadt Van Roggen, D. L. "Notice sur les anciens travaux hydrauliques Susiane." In *Mémoires de la délégation en Perse*, VII: 167–207. Paris: E. Leroux, 1906.

Haerinck, Ernie. *La céramique en Iran pendant la période parthe (ca. 250 Av. J.C. à Ca. 225 après J.C.) : Typologie, Chronologie et Distribution*. Gent: Iranica Antiqua, 1983.

Hannestad, Lise. "Pottery from Failaka." In *Arabie orientale, Mésopotamie et Iran méridional: De L'âge du fer au début de la période islamique: Réunion de travail, Lyon, 1982, Maison de l'Orient*. Edited by Jean-François Salles and Rémy Boucharlat, 67–83. Histoire Du Golfe 37. Paris: Editions Recherche sur les civilisations, 1984.

Hansman, John. "Urban Settlement and Water Utilization in South-Western Khuzistan and South-Eastern Iraq from Alexander the Great to the Mongol Conquest of 1256." University of London, 1970.

Hardy-Guilbert, Claire. "Les niveaux islamiques du secteur Apadana-Ville Royale." *CDAFI* 14 (1984): 121–209.

Harrison, David. *The Bridges of Medieval England Transport and Society, 400-1800*. Oxford: Oxford University Press, 2007.

Heyvaert, Vanessa, Peter Verkinderen, Jan Walstra, C. Baeteman, and Michael Tanret. "Geoarchaeological Research in Lower Khuzestan: State of the Art." In *Susa and Elam : Archaeological, Philological, Historical and Geographical Perspectives : Proceedings of the International Congress Held at Ghent University, December 14-17, 2009*. Edited by Katrien de Graef and J Tavernier, 2012.

Hill, David V. *The Materials and Technology of Glazed Ceramics from the Deh Luran Plain: A Study in Innovation*. Oxford: British Archaeological Reports, 2006.

Hole, Frank, ed. *The Archaeology of Western Iran : Settlement and Society from Prehistory to the Islamic Conquest*. Washington D.C.: Smithsonian Institution Press, 1987.

Hole, Frank, and Kent V. Flannery. "The Prehistory of Southwestern Iran: A Preliminary Report." *Proceedings of the Prehistoric Society* 33 (1968): 147–206.

Hritz, Carrie, and Tony J. Wilkinson. "Using Shuttle Radar Topography to Map Ancient Water Channels in Mesopotamia." *Antiquity* 80, no. 308 (2006): 415–24.

Hunt, Robert C. "Size and the Structure of Authority in Canal Irrigation Systems." *Journal of Anthropological Research* 44, no. 4 (1988): 335–55.

"Hydraulic Report-The Renovation and Restoration Plan of Shushtar Historic Hydraulic System." Lar Eng. Co, n.d.

"Inventory of Shared Water Resources in Western Asia." Beirut: UN-ESCWA and BGR, 2013. http://waterinventory.org/surface_water/shatt-al-arab-karkheh-and-karun-rivers.

Iqtidari, Ahmad. *Āṯār Wa Banā'hā-yi Tārīḫī-Yi Khūzistān*. 2 vols. Tehran: Nashr-i Ishārah, 1996.

Jacobsen, Thorkild. “The Waters of Ur.” *Iraq* 22 (1960): 174–85.

Jacobsen, Thorkild, and Seton Lloyd. *Sennacherib’s Aqueduct at Jerwan*. Chicago, Ill.: University of Chicago Press, 1935.

Kaptijn, Eva. “Communality and Power: Irrigation in the Zerqa Triangle, Jordan.” *Water History* 2, no. 2 (2010): 145–63.

Kasrawi, Ahmad. *Tārīẖ-i Pānṣad Sāli-yi Ḫuzistān*. Tehran: Gutenberg, 1951.

Kelly, William W. “Concepts in the Anthropological Study of Irrigation.” *American Anthropologist* 85, no. 4 (1983): 880–86.

Kennedy, Hugh. “Military Pay and the Economy of the Early Islamic State.” *Historical Research* 75, no. 188 (2002): 155–69.

Kennet, Derek. *Sasanian and Islamic Pottery from Ras Al-Khaimah : Classification, Chronology and Analysis of Trade in the Western Indian Ocean*. Oxford, England: Archaeopress, 2004.

Kervran, Monique. “Les niveaux islamiques du secteur oriental du tépé de l’Apadana.” *CDAFI* 7 (1977): 75–161.

———. “Recherches sur les niveaux islamiques de la Ville des Artisans.” *CDAFI* 14 (1984): 7–120.

———. “Une sucrerie d’époque islamique sur la rive droite du Chaour à Suse II. Le matériel archéologique.” *CDAFI* 10 (1979): 177–90.

khazraee, Emad. “Shadorvan, and the Difficulties of Shushtar Historical Studies.” *Golestān-E-Honar: Quarterly on the History of Iranian Art and Architecture* 4, no. 3 (2008): 113–22.

Kinneir, John McC. *A Geographical Memoir of the Persian Empire*. Middle East Collection. New York, Arno Press, 1973.

Kirkby, Michael J. “Land and Water Resources of the Deh Luran and Khuzistan Plains.” In *Studies in the Archeological History of the Deh Luran Plain : The Excavation of Chagha Sefid*, 251–88. Ann Arbor: Museum of Anthropology, University of Michigan, 1977.

Kouchoukos, Nicholas. “Landscape and Social Change in Late Prehistoric Mesopotamia.” Yale University, 1998.

Labrousse, Audran, and Rémy Boucharlat. “La Fouille Du Palais Du Chaour à Suse En 1970 et 1971.” *CDAFI* 2 (1972): 61–167.

Lambton, Ann K. S. “The Evolution of the Iqṭā’ in Medieval Iran.” *Iran* 5 (1967): 41–50.

Layard, Austen Henry. “A Description of the Province of Khuzistan.” *Journal of the Royal Geographical Society of London* 16 (1846): 1–105.

Leach, Edmund R. “Hydraulic Society in Ceylon.” *Past and Present* 15, no. 1 (1959): 2–26.

Lees, G. M, and N. L Falcon. “The Geographical History of the Mesopotamian Plains.” *Geographical Journal* 118, no. 1 (1952): 24–39.

Le Strange, Guy. *The Lands of the Eastern Caliphate: Mesopotamia, Persia and Central Asia from the Moslem Conquest to the Time of Timur*. Cambridge: Cambridge University Press, 1930.

Malatesta, Luca Claude, Sébastien Castelltort, Simone Mantellini, Vincenzo Picotti, Irka Hajdas, Guy Simpson, Amriddin Ergashevich Berdimuradov, Maurizio Tosi, and Sean Douglas

Willett. “Dating the Irrigation System of the Samarkand Oasis: A Geoarchaeological Study.” *Radiocarbon* 54, no. 1 (2012): 91–105.

Mason, Robert B. *Shine like the Sun : Lustre-Painted and Associated Pottery from the Medieval Middle East*. Costa Mesa, Calif. : Toronto, Ont., Canada: Mazda Publishers ; Royal Ontario Museum, 2004.

Mason, Robert B, and Edward J Keall. “The ’Abbāsid Glazed Wares of Sīrāf and the Baṣra Connection: Petrographic Analysis.” *Iran* 29 (1991): 51–66.

Millon, Rene F. “Irrigation at Teotihuacan.” *American Antiquity* 20, no. 2 (1954): 177–80.

Mitchell, William P. “The Hydraulic Hypothesis: A Reappraisal.” *Current Anthropology* 14 (1973): 532–34.

Moghaddam, Abbas. “A Note on the Gargar Irrigation System.” *Iranian Journal of Archaeological Studies* 2, no. 2 (2014): 37–49.

———. , ed. *Barrasī'hā-Yi Bāstān'shinākhtī-i Miyānāb, Shūshtar*. Silsilah-i Guzārishhā-Yi Bāstān′shināsī (Archaeological Reports) 8. Tehran: Pizhūhishkadah-i Bāstān′shināsī (Iranian Center for Archaeological Research), 2005.

———. *Later Village Period Settlement Development in the Karun River Basin, Upper Khuzestan Plain, Greater Susiana, Iran*. Oxford: Archaeopress, 2012.

———. “Report of Educational Excavation at Tappeh Meshval 3.” Report presented to ICHHTO, 2009.

Moghaddam, Abbas, and Negin Miri. “Archaeological Research in the Mianab Plain of Lowland Susiana, South-Western Iran.” *Iran* 41 (2003): 99–137.

———. “Archaeological Surveys in the ‘Eastern Corridor’, South-Western Iran.” *Iran* 45 (2007): 23–55.

Morgan, Jacques de. *Recherches Archéologiques*. MDP 1. Paris, 1900.

Morgan, Peter, and Janet Leatherby. “Excavated Ceramics from Sirjan.” In *Syria and Iran. Three Studies in Medieval Ceramics*, edited by James W. Allan and Caroline Roberts, 23–173. Oxford Studies in Islamic Art 4, 1987.

Neely, James. “Sasanian and Early Islamic Water-Control and Irrigation Systems on the Deh Luran Plain, Iran.” In *Irrigation’s Impact on Society*, edited by Theodore E Downing and McGuire Gibson, 21–42. Tucson, Arizona: The University of Arizona Press, 1974.

———. “Sasanian Period Drop-Tower Gristmills on the Deh Luran Plain, Southwestern Iran.” *Journal of Field Archaeology* 36, no. 3 (2011): 232–54.

Netting, Robert McC. “The System Nobody Knows: Village Irrigation in the Swiss Alps.” In *Irrigation’s Impact on Society*. Edited by Theodore E Downing and McGuire Gibson, 67–76. Tucson, Arizona: The University of Arizona Press, 1974.

Nissen, Hans J. *The Early History of the Ancient Near East, 9000-2000 B.C.* Chicago: University of Chicago Press, 1988.

Paul, Jürgen. *Herrscher, Gemeinwesen, Vermittler : Ostiran und Transoxanien in vormongolischer Zeit*. Beirut: In Kommission bei Franz Steiner, Stuttgart, 1996.

Potts, Daniel T. “Gundešapur and the Gondeisos.” *Iranica Antiqua* 24 (1989): 323–35.

———. “Northeastern Arabia in the Later Pre-Islamic Era.” In *Arabie orientale, Mésopotamie et Iran méridional: De l’âge du fer Au début de la période islamique: Réunion de travail, Lyon, 1982, Maison de l’Orient*. Edited by Jean-François Salles and Rémy Boucharlat, 85–144. Histoire Du Golfe 37. Paris: Editions Recherche sur les civilisations, 1984.

———. *The Archaeology of Elam: Formation and Transformation of an Ancient Iranian State*. Cambridge University Press, 1999.

Pournelle, Jennifer R. “KLM to CORONA: A Bird’s Eye View of Culutral Ecology and Early Mesopotamian Urbanization.” In *Settlement and Society : Essays Dedicated to Robert McCormick Adams*, edited by Elizabeth Stone, 29–62. Los Angeles; Chicago: Cotsen Institute of Archaeology University of California; Oriental Institute of the University of Chicago, 2007.

———. “Marshland of Cities: Deltaic Landscapes and the Evolution of Early Mesopotamian Civilization,” 2003.

Price, David H. “Wittfogel’s Neglected Hydraulic/Hydroagricultural Distinction.” *Journal of Anthropological Research* 50, no. 2 (1994): 187–204.

Pyne, Nanette Marie. “The Impact of the Seljuq Invasion on Khuzestan: An Inquiry into the Historical, Geographical, Numismatic, and Archaeological Evidence (Iran).” Ph.D. Diss., University of Washington, 1982.

Rackham, Harris, ed. *Pliny Natural History*. The Loeb Classical Library 352. Cambridge (Mass.); London: Harvard university press, 1989.

Rahbar, Mehdi. “Kāwuš-i Bāstānšināsī Dar Gilālak-i Šūštar,” n.d.

Rawlinson, Henry. “Notes on a March from Zoháb, at the Foot of Zagros, along the Mountains to Khúzistán (Susiana), and from Thence through the Province of Luristan to Kirmánsháh, in the Year 1836.” *Journal of the Royal Geographical Society of London* 9 (1839): 26–116.

Rayne, Louise. “Imperial Irrigated Landscapes in the Balikh Valley.” *Water History* 7, no. 4 (2015): 419–40.

Reade, Julian E. “Studies in Assyrian Geography, Part I: Sennacherib and the Waters of Nineveh.” *Revue d’Assyriologie et D’archeologie Orientale* 72 (1978).

Robinson, Chase F. “The Conquest of Khuzistan: A Historiographical Reassessment.” *Bulletin of the School of Oriental and African Studies* 67, no. 1 (2004): 14–39.

Rosen, Arlene. *Civilizing Climate : Social Responses to Climate Change in the Ancient near East*. Lanham: Altamira Press, 2007.

Rosen-Ayalon, Myriam. “Niveaux islamiques de la Ville Royale.” *CDAFI* 2 (1972): 169–202.

Rost, Stephanie. “Watercourse Management and Political Centralization in Third-Millennium B.C. Southern Mesopotamia: A Case Study of the Umma Province of the Ur III Period (2112–2004 B.C.).” Stony Brook University, 2015.

Ruffner, Kevin Conley. *Corona America’s First Satellite Program*. Washington, D.C.: History Staff, Center for the Study of Intelligence, Central Intelligence Agency, 1995.

Sarre, Friedrich Paul Theodor. *Die Keramik von Samarra : Unter Mitwirkung von Ernst Herzfeld, Mit Beiträgen vom Materialprüfungsamt Der Technischen Hochschule, Berlin, und von*

Dr. Berlin: D. Reimer, 1925.

Schindler, A. Houtum. “Reisen im Südwestlichen Persien.” *Zeitschrift dDer Gesellschaft für Erdkunde zu Berlin* 14 (1879): 38–124.

Selby, William B. “Account of the Ascent of the Karun and Dizful Rivers and the Ab-I-Gargar Canal, to Shuster.” *Journal of the Royal Geographical Society of London* 14 (1844): 219–46.

Simonet, Geneviève. “Irrigation de piémont et économie agricole à Assur.” *Revue d’Assyriologie* 71 (1977): 157–68.

Simpson, St John. “Partho-Sasanian Ceramic Industries in Mesopotamia.” In *Pottery in the Making: Ceramic Traditions*, 74–79. Washington, D.C.: Smithsonian Institution Press, 1997.

Soroush, Mehrnoush. “Irrigation in Khuzistan after the Sasanians: Continuity, Decline, or Transformation?” In *The Long Seventh Century: Continuity and Discontinuity in an Age of Transition*. Edited by Alessandro Gnasso, Emanuele E. Intagliata, and Thomas J. Macmaster, 269–89. Oxford: Peter Lang Pub Inc, 2014.

———. “The Miṣr of ‘Askar Mokram: Preliminary Report and Framework for Future Research.” *AMIT* 46 (In press).

Steinkeller, Piotr. “City and Countryside in Third-Millennium Southern Babylonia.” In *Settlement and Society: Essays Dedicated to Robert McCormick Adams*. Edited by Elizabeth Stone, 185–212. Los Angeles; Chicago: Cotsen Institute of Archaeology University of California; Oriental Institute of the University of Chicago, 2007.

Steward, Julian H. “Cultural Causality and Law: A Trial Formulation of the Development of Early Civilizations.” *American Anthropologist* 51, no. 1 (January 3, 1949): 1–27.

———. “Some Implications of the Symposium.” In *Irrigation Civilizations : A Comparative Study : A Symposium on Method and Result in Cross-Cultural Regularities*. 58–78. Pan American Union Social Sciences Monographs 1. Washington: Social Science Section, Deptof Cultural Affairs, Pan American Union, 1955.

Stride, Sebastian, Bernardo Rondelli, and Simone Mantellini. “Canals versus Horses: Political Power in the Oasis of Samarkand.” *World Archaeology* 41, no. 1 (2009): 73–87.

“The Renovation and Restoration Plan of Shushtar Historic Hydraulic System-Vol 7: Study and Preservation of Architectural Heritage.” Lar Eng. Co, 2005.

Ur, Jason A. “CORONA Satellite Photography and Ancient Road Networks: A Northern Mesopotamian Case Study.” *Antiquity* 77, no. 295 (2003): 102–15.

———. “Sennacherib’s Northern Assyrian Canals: New Insights from Satellite Imagery and Aerial Photography.” *Iraq* 67, no. 1 (2005): 317–45.

Ur, Jason A., Lidewijde De Jong, Jessica Giraud, James F. Osborne, and John MacGinnis. “Ancient Cities and Landscapes in the Kurdistan Region of Iraq: The Erbil Plain Archaeological Survey 2012 Season,” 2013.

Verkinderen, Peter. *The Waterways of Iraq and Iran in the Early Islamic Period: Changing Rivers and Landscapes of the Middle East*. London; Palgrave: I.B. Tauris, 2015.

———. “Tigris, Euphrates, Kārūn, Karkheh, Jarrahi, Tracking the Traces of Five Rivers in Lower Iraq and Khūzistān in the Early Islamic Period.” Ph.D. Diss., Universiteit Gent, 2009.

Walmsley, Alan. *Early Islamic Syria: An Archaeological Assessment*. London: Duckworth, 2007.

Walstra, Jan, Vanessa Heyvaert, and Peter Verkinderen. “Assessing Human Impact on Alluvial Fan Development: A Multidisciplinary Case-Study from Lower Khuzestan (SW Iran).” *Geodinamica Acta* 23, no. 5/6 (2010): 267–85.

———. “Remote Sensing for the Study of Fluvial Landscapes in Lower Khuzestan, SW Iran.” In *Proceedings RSPSoc 2009 Annual Conference*, 370–78. Nottingham, UK, 2009.

Walstra, Jan, Peter Verkinderen, and Vanessa Heyvaert. “Reconstructing Landscape Evolution in the Lower Khuzestan Plain (SW Iran): Integrating Imagery, Historical and Sedimentary Archives.” In *Landscapes through the Lens : Aerial Photographs and Historic Environment*. Edited by David Cowley, Robin A Standring, and Matthew J Abicht, 111–28. Oxford, UK; Oakville, CT: Oxbow Books ; [Distributed in the US by] David Brown Book Co., 2010.

Watson, Andrew. *Agricultural Innovation in the Early Islamic World : The Diffusion of Crops and Farming Techniques, 700-1100*. Cambridge [Cambridgeshire]; New York: Cambridge University Press, 1983.

Watson, Oliver. *Ceramics from Islamic Lands*. London: Thames & Hudson, 2004.

Weiss, Harvey. “Ceramics for Chronology Discriminant and Cluster Analyses of Fifth Millennium Ceramic Assemblages from QABR Sheykheyn, Khuzistan.” 1976.

Wenke, Robert. “Imperial Investments and Agricultural Developments in Parthian and Sassanian Khuzestan: 150 B.C. to A.D. 640,” Mesopotamia, no. 10–11 (1976 1975): 99–137.

Wheatley, Paul. *The Places Where Men Pray Together: Cities in Islamic Lands, Seventh Through the Tenth Centuries*. Chicago: University of Chicago Press, 2001.

Wilkinson, Tony J. *Archaeological Landscapes of the Near East*. Tucson: University of Arizona Press, 2003.

———. “Empire and Environment in the Northern Fertile Crescent.” In *Landscapes and Societies Selected Cases*. Edited by I. Peter Martini and Ward Chesworth, 135–51. Dordrecht ; New York: Springer, 2010.

———. “Geoarchaeology, Landscape and the Region.” In *Excavations at Tell Brak.*, edited by David Oates. London; Cambridge: British School of Archaeology in Iraq ; McDonald Institute for Archaeological Research, 2001.

———. “Introduction.” *Water History* 2, no. 2 (2010): 85–90.

———. “Linear Hollows in the Jazira, Upper Mesopotamia.” *Antiquity* 67, no. 256 (1993): 548–62.

———. *On the Margin of the Euphrates : Settlement and Land Use at Tell Es-Sweyhat and in the Upper Lake Assad Area, Syria*. Excavations at Tell Es-Sweyhat, Syria. Vol. 1. Chicago: Oriental Institute of the University of Chicago, 2004.

———. “Regional Approaches in Mesopotamian Archaeology.” *Journal of Archaeological Research* 8 (2000): 219–67.

———. “The Disjunction between Mediterranean and Near Eastern Survey: Is It Real?” In *Mediterranean Archaeological Landscapes: Current Issues*. Edited by Effie-Fotini Athanassopoulos and LuAnn Wandsnider, 55–68. Philadelphia: University of Pennsylvania Museum of Archaeology and Anthropology, 2004.

———. *Town and Country in Southeastern Anatolia. Volume I: Settlement and Land Use at Kürban Höyük and Other Sites in the Lower Karababa Basin*. Oriental Institute Papers 109. Chicago, 1990.

Wilkinson, Tony J., Rémy Boucharlat, Maurits W. Ertsen, Gavin Gillmore, Derek Kennet, Peter Magee, Khodadad Rezakhani, and Tijs De Schacht. “From Human Niche Construction to Imperial Power: Long-Term Trends in Ancient Iranian Water Systems.” *Water History* 4, no. 2 (2012): 155–76.

Wilkinson, Tony J., and Louise Rayne. “Hydraulic Landscapes and Imperial Power in the Near East.” *Water History* 2, no. 2 (2010): 115–44.

Wilkinson, Tony J., and T.J. Tucker. *Settlement Development in the North Jazira, Iraq : A Study of the Archeological Landscape*. Baghdad: British School of Archeology in Iraq, 1995.

Wilkinson, Tony J., Jason Ur, Eleanor Barbanes Wilkinson, and Mark Altaweel. “Landscape and Settlement in the Neo-Assyrian Empire.” *Bulletin of the American Schools of Oriental Research*, no. 340 (2005): 23–56.

Williamson, Andrew. “Regional Distribution of Medieval Persian Pottery in the Light of Recent Investigations.” In *Syria and Iran. Three Studies in Medieval Ceramics*, edited by James W. Allan and Caroline Roberts, 11–22. Oxford Studies in Islamic Art 4, 1987.

Wittfogel, Karl A. “Geopolitics, Geographical Materialism and Marxism.” Translated by G. L. Ulmen. *Antipode* 17, no. 1 (1985): 21–71.

Wittfogel, Karl August. *Oriental Despotism; a Comparative Study of Total Power*. New Haven: Yale University Press, 1957.

Woodbridge, Kevin. “Responses of River Karun and the River Dez to Human Activities,” Unpublished Diss. Chapter, n.d.

Woodbridge, Kevin P. “The Influence of Earth Surface Movements and Human Activities on the River Karun in Lowland South-West Iran.” Ph.D. Diss., University of Hull, 2013.