AN IRON AGE LANDSCAPE IN THE EDOMITE LOWLANDS: ARCHAEOLOGICAL SURVEYS ALONG WĀDĪ AL-GHUWAYB AND WĀDĪ AL-JĀRIYA, JABAL ḤAMRAT FĪDĀN, JORDAN, 2002

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Introduction

As part of a 'deep-time' study of the role of early ore procurement and metallurgy on social evolution from the Neolithic period to the Iron Age, Archaeological surveys were carried out on two seasonal drainages in southern Jordan from 27 September to 5 October, 2002. The drainages that were investigated include portions of Wādī al-Jāriya (وادي الجارية) and Wādī al-Ghuwayb (وادي الغويب) that flows westward from the mountains of the Faynān (فينان) region in Jordan to Wādī 'Arabah (وادي عربة) valley that borders Israel. There are three major natural copper ore resource zones in the southern Levant that include the southern Sinai peninsula (Rothenberg 1970), the Timna region that borders Wādī 'Arabah in Israel (Rothenberg 1990), and ca. 120km north of Timna, Faynān – the largest ore resource zone in the region (Hauptmann 1987a; 2000). The surveys were part of the Jabal Ḥamrat Fīdān (جبل حمرة فيدان)project (Levy and Adams in press; Levy *et al.* 1999) and aimed primarily at examining the local regional setting of the site of Khirbat an-Naḥās (خربة النحّاس), a magnificent Iron Age metal production center, made most famous by the American archaeologist Nelson Glueck during the 1930's (Glueck 1940). While sites from all periods ranging from prehistoric through the Islamic periods were recorded, the primary goal of the 2002 surveys was aimed at identifying the archaeological landscape and settlement system connected to Iron Age (ca. 1200 - 586BC) metal production at this major Iron Age industrial center. The JHF project was initiated in 1997 to explore the role of technological change, early ore procurement and copper metallurgy on social evolution during a broad swath of time spanning the major formative periods in south Levantine archaeology and history. The project is carried out under the auspices of the University of California, San Diego and the Department of Antiquities of Jordan. Excavations have been carried out by the JHF team at sites spanning the origins of agricultural and sedentism during the Pre-Pottery Neolithic period (Moreno *et al.* in press); the emergence of chiefdom level societies in the Chalcolithic period (Levy 1998); the Early Bronze I when the Levant saw the establishment of one of the earliest pan-regional economic systems that linked Egypt and the southern Levant (Adams 2000; Levy *et al.* 1999; van den Brink and Levy 2002); the Early Bronze III – IV periods (ca. 2800 - 2000BC) when the first phase of early Levantine urbanism reached its zenith and then collapsed (Adams 2000; Levy *et al.* 2002) and finally, the Iron Age when the first state level societies evolved in the Levant (Levy *et al.* 1999). The excavations carried out in the JHF have been conducted at sites rich in architecture and cultural materials that provide abundant assemblages for testing models related to shifts in the organization and scale of ore procurement and metal production from the Neolithic through the Iron Age periods. However, to fully understand the nature of these production systems through time, it is necessary to understand the local environmental setting and settlement patterns that were articulated by these important sites when they were occupied. It is in this spirit that the 2002 archaeological surveys were carried out in the JHF. The following is a brief summary and presentation of the settlement pattern data recorded during the recent surveys in the Jabal Ḥamrat Fīdān region.

2002 Research Agenda

At certain points in time, settlement in the Faynān district formed an integral part of local complex social systems, such as the Iron Age Edomite kingdom (Hauptmann 1986; Hauptmann *et al.* 1985; Hauptmann 1987b; Keesmann *et al.* 1984). However, the degree that core civilization (i.e. Egyptian, Assyrian, Babylonian) hegemony played in the region during the IA is open to debate. To date, the role of metallurgy in the formation, maintenance and collapse of the Edomite kingdom has not been systematically investigated

(Bartlett 1989; 1992; Bienkowski and van der Steen 2001; LaBianca 1999; LaBianca and Younker 1998). A preliminary geophysical survey at Khirbat an-Naḥās with carried out by the JHF team with A. Witten (Levy *et al.* 1999; Levy 2001). Over the past five years, the Faynān district has been the focus of renewed interest for paleo-environmental, economic and culture historical research by several British teams (Barker *et al.* 1997; Barker *et al.* 2000; Barker *et al.* 1998). However, these projects and pioneering Faynān research by A. Hauptmann did not incorporate large-scale excavation of key archaeological sites in the area to provide the much-needed chronological anchors or social context for early metallurgy in the area. In this sense, the JHF project is a social archaeological investigation of the role of early metallurgy on social evolution in the southern Levant. To achieve a 'social archaeology' of this part of Jordan, a framework for studying the social dimensions of ancient metal production based on the application of on-site GIS was established by the UCSD team (Levy *et al.* 2002; 2001b). The rich potential of Wādī al Ghuwayb – Wādī al-Jāriya can be seen in the survey results presented below. As our team recently completed the first season of excavations at Khirbat an-Naḥās, it is still too early to incorporate the results of those large-scale excavations for answering many of the broader questions related to the JHF project goals.

The Jabal Ḥamrat Fīdān Region (Area = ca. 240 km^2) – Gateway to the Faynān Copper Ore District

Historical and Environmental Setting

The study area (**Fig. 1**) is located roughly 50km southeast of the Dead Sea and forms part of the region known since the Late Bronze and Iron Ages in Egyptian, Assyrian and Biblical texts as 'Edom' and 'Seir'. The name 'Edom' is derived from a Semitic root word meaning 'red' after the local red sandstone (Bartlett 1992). As Bartlett (1992) points out, the name 'Seir' first appears in Egyptian archives found at 'Amarna from King Abdi-hiba of Jerusalem (first half of the 14th century BC) who wrote to Pharaoh Amenhotep II "The land of the king is lost there is a war against us, as far as the lands of Seir ([matat] Se-.ki) (and) as far as Gath-Carmel". It is also mentioned in the Papyrus Harris where Rameses III (1193 - 1162BC) claims "I have destroyed the people of Seir among the Shosu tribes. I have laid waste their tents, with their people, their belongings, and likewise their cattle without number" (Papyrus Harris I: 76: 9-11). As shown by these two historical sources dating from as early as the Late Bronze and Iron Ages, Edom (Seir) was know as territory linked with pastoral nomadic groups such as Shasu. Biblical references also indicate that nomadic pastoral societies continued to be an important component of the human landscape from the time of the Exodus (Numbers 20: 19) through the 10th to seventh century BC (cf. Psalm 83: 6). However, during the eighth-sixth century BC, fortified towns emerged in the Edomite highlands as localities such as Bozra [modern Buṣayra (بُصـــيـــرة); cf. (Bennett 1977)], Ṭawīlān (طويلان) and Umm al-Biyāra (أم البيارة) on the as well as large sites in the lowland region bordering Wādī 'Arabah such as the fortress at Tall al-Khalīfah (تل الخليـفـة) (Glueck 1940) near 'Aqaba, the fortress at Hatzeva, the fortified metal production center of Khirbat an-Naḥās and the nearby metal production site of Khirbat al-Jāriya (Glueck 1940). The relationship between the nomadic communities who lived in Edom during this time and the major Iron Age metal production sites is an important area of Iron Age research that the JHF project is focusing on (Levy *et al.* 1999). Following the Iron Age when nomadic societies played a central role in the early history of Edom, pastoralists continued to oscillate in importance throughout the history of the region from the formation of the Nabataean state (ca. fourth century BC - 106AD) (Bartlett 1999) that evolved out of the local nomadic Arab population, all the way up to the present when high ranking/ prestige endowed Bedouin tribesmen from the Arabian peninsula (Pasha 1958) established the Hashemite Kingdom of Jordan during the past century. Thus, the importance of assessing the role of nomadic communities in the evolution of the Iron Age states of Transjordan (i.e. Ammon, Moab and Edom) is a growing scholarly research direction (Bienkowski and van der Steen 2001; LaBianca 1999; LaBianca and Younker 1998). We believe isolating the nature of Iron Age pastoral nomadism in the Faynān region will be a key for clarifying the social evolutionary trajectories that led to the emergence of the Edomite kingdom.

The Jabal Ḥamrat Fīdān research area encompasses an area of ca. 240km^2 located to the west of the main Faynān valley where mostly British teams have carried out archaeological survey work over the past decade (Barker *et al.* 1997; 1999; Barker 2000, Barker and Thomas 1998; Findlater *et al.* 1998; Finlayson *et al.* 2000; Wright *et al.* 1998). The JHF research area is defined by the Jabal Ḥamrat Fīdān (JHF) mountain system that extends for ca. 8km in a north-south direction along the edge of Wādī 'Arabah where its northern aspect

is cut by Wādī Fīdān; on the north bank of this drainage, Jabal al Minshār (جبل المنشار) extends for ca. 4km north/south. Together, this mountain chain dominates the 'gateway' to the main Faynān valley. The main drainage system that cuts though the Faynān district has three names. It has its origin high up on the Edomite plateau near the village of Ḍānā (ضانا) and is called Wādī Ḍānā (وادي ضانا). From there it flows westward and becomes Wādī Faynān and then Wādī Fīdān. Geologically the region is dominated by a variety of granite, limestone, shale and sandstone formations (Rabb'a 1994). Copper ore occurs in two main deposits in the Faynān district – the Dolomite Limestone Shale (DLS or Burj) unit and the Massive Brown Sandstone (MBS) unit (Hauptmann 2000). These ore deposits, especially the DLS, were intensively exploited in the post-Early Bronze IA periods.

Water is the key to survival in the desert and this precious resource, even when compared to other drainages in the Faynān district, is particularly scarce in the wadis that were surveyed in 2002. In Wādī al-Ghuwayb and Wādī al-Jāriya survey area, there is an absence of freshwater springs. The nearest source is 'Ayn al-Ghuwayb (عين الغويب) approximately 3km up-stream from Khirbat an-Naḥās (**Fig. 1**). The average annual rainfall in the area is ca. 90mm. Unlike the nearby Wādī Fīdān, ca. 5km to the southwest (Levy *et al.* 2001a), the valley bottoms along Wādī al-Ghuwayb and Wādī al-Jāriya lack evidence of Holocene terraces that would have been conducive to agriculture. Only around the spring at 'Ayn al-Ghuwayb is it possible to practice agriculture. As this locality is outside the immediate catchment area of the main Iron Age (IA) sites in the survey area, it seems local agriculture at the main IA metal production sites did not take place and alternative models of subsistence provision must be considered. The following presents a brief overview of the 2002 survey results.

The Wādī al-Ghuwayb and Wādī al-Jāriya Survey 2002

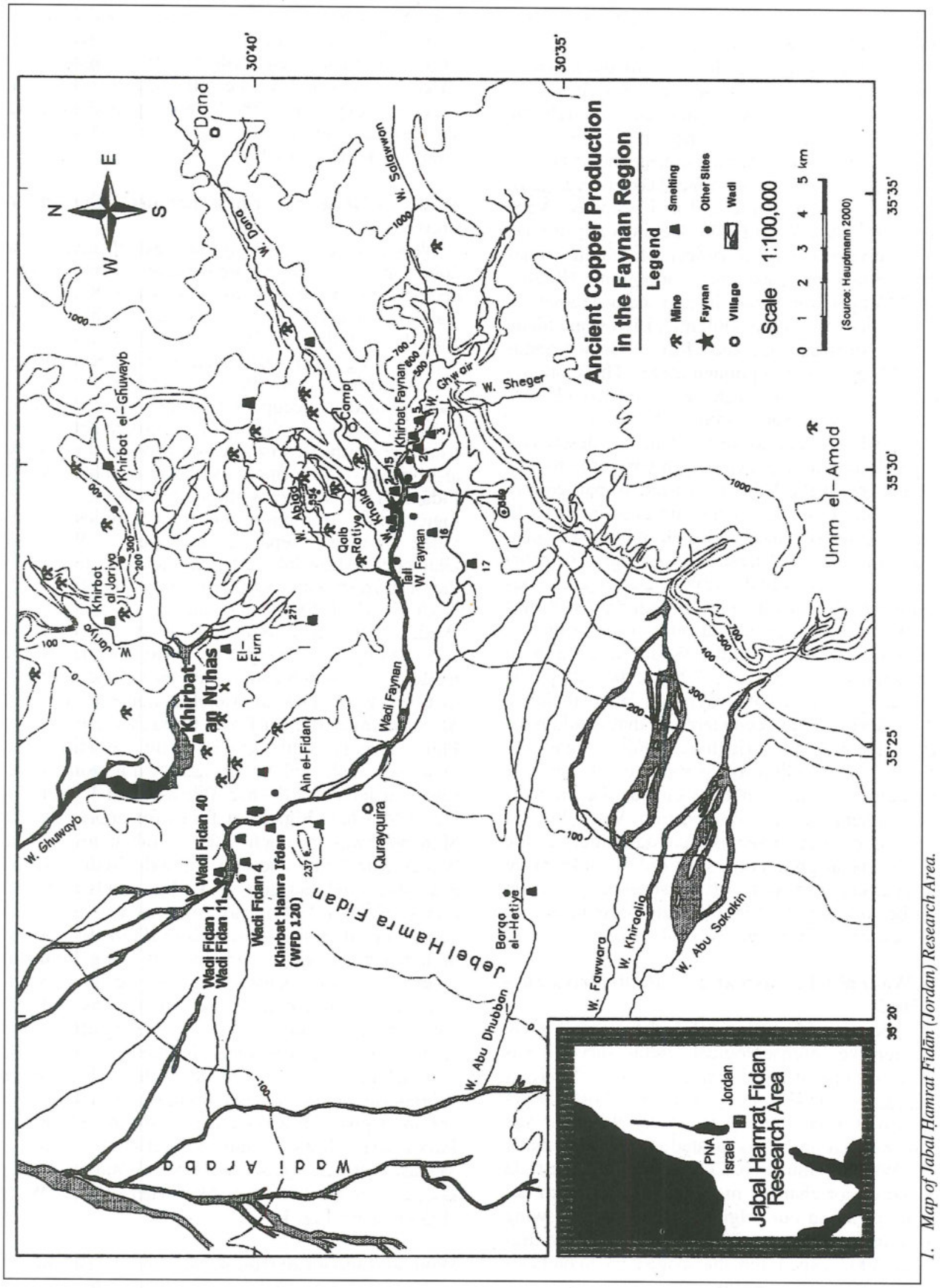
To examine IA settlement in the research area, an intensive archaeological field survey was planned for one seasonal drainage system (Wādī *al-Ghuwayb*) in the JHF study area. In addition, large-scale excavations were planned for the Iron Age site of Khirbat an-Naḥās located on the south bank of the Wādī al-Ghuwayb. Contingencies in the field dictated minor changes in the general research design proposed in our original plans. The following is a summary of the results of the work carried during the 2002 expedition that began on September 12 and finished on December 6, 2002. To insure that all data was digitally recorded and linked to a Geographic Information System (ArcMap), the same protocols established for 'Digital Archaeology' research in the JHF project in previous seasons (Levy *et al.* 2001b) was applied in 2002. The primary survey data recorded in 2002 is presented in **Tables 1 to 4**.

Wādī al-Ghuwayb Environmental Considerations

When the research design was established for the 2002 survey, it was proposed that an intensive 100% pedestrian survey (both east and west of Khirbat an-Naḥās) be carried out along Wādī al-Ghuwayb. It was thought that an intensive archaeological site survey along the wadi associated with Khirbat an-Naḥās (KEN) would 'flesh out' patterns of settlement related to occupation at KEN (see **Fig. 14**). Wādī al-Ghuwayb flows for approximately 14km from the northeast to the west where it skirts Jabal al-Minshār – the northern extension of Jabal Ḥamrat Fīdān. This wadi cuts through a number of geological units. In its eastern most extremities, it is divided into two separate drainages – Wādī al-Ghuwayb ar-Rawānī (وادي الغويب الروّاني) leading to the only fresh water spring in the region and Wādī al-Ghuwayb al -'Aṭshāna (وادي الغويب العطيشاني) or dry Wādī al-Ghuwayb. As it flows westward, the wadi cuts through a variegated geological landscape made up of Kurnub and Umm Ishrin Sandstone formations as well as an isolated range of Hunayk Monzogranite. It then flows through a complex of Pleistocene fluviatile gravels, Finan granite, Burj Dolomite Shale and Nā'ūr (ناعور) limestone represented at Jabal al-Minshār. When the wadi skirts Jabal al-Minshār (**Fig. 2**), it flows for approximately 8km northwest through Wādī 'Arabah toward the border with Israel and cuts through Wādī 'Arabah Fluviatile sand and gravel, Aeolian sands and sand dunes (Rabb'a 1994). However, as no significant copper ore deposits – the *raison d'etre* for the establishment of KEN – are located along Wādī al-Ghuwayb, it was decided to change the survey strategy and concentrate in the region to the east of Khirbat an-Naḥās. While not ignoring the significance of settlement to the west of KEN, those areas will be systematically surveyed in the future. To explore neighboring areas to Wādī al-Ghuwayb rich in copper ore deposits, it was decided to examine Wādī al-Jāriya that flows southwest between Jabal al-Maḥāsh (جبل المحاش) and Jabal al-Marzūka (جبل المرزوقة) for approximately 6km where it joins Wādī al-Ghuwayb (**Fig. 1**).

Wādī al-Jāriya Environmental Considerations

Unlike Wādī al-Ghuwayb, Wādī al-Jāriya is a



1. *Map of Jabal Ḥamrat Fidān (Jordan) Research Area.*

Table 1a: Jabal Hamrat Fidan Survey 2002: Wadi al-Ghuwayb Survey Data

Site	Wadi	Easting	Northing	Elevation	Size (m2)	Ceramic Date	Lithic Date	Relative Date	Site Type
1	WAG	729644.681	3396947.339	41.677	1123	Roman	Unknown	Bedouin	Cemetery
2	WAG	729701.751	3396977.962	42.644	301	N/A	Upper Paleolithic	Late Prehistoric	Tumuli field
3	WAG	729570.378	3397227.509	21.058	18221	Roman	EBI	EBI	Arch_Complex
4	WAG	729854.582	3397121.364	21.954	262	N/A	Upper Paleolithic	Upper Paleolithic	Arch_Fragment
5	WAG	729943.234	3396879.939	119.191	141507	N/A	Upper Paleolithic	Upper Paleolithic	Tumuli_Field
6	WAG	733730.070	3397453.242	75.630	1242	N/A	N/A	Bedouin	Camp_Site
7	WAG	733606.066	3397429.037	73.004	2829	N/A	N/A	Bedouin	Camp_Site
8	WAG	733491.283	3397469.956	72.602	726	Roman/BYZ	Unknown	Possibly Late Prehistoric	Cairn Field
9	WAG	733474.957	3397563.836	90.864	182	N/A	N/A	Bedouin and Prehistoric	Arch_Fragment
10	WAG	733532.797	3397541.761	87.842	8	N/A	Upper Paleolithic	Upper Paleolithic	Arch_Fragment
11	WAG	733590.442	3397557.832	85.837	17	N/A	Unknown	Unknown	Arch_Fragment
12	WAG	733573.667	3397522.180	82.807	50	N/A	N/A	Bedouin	Camp_Site
13	WAG	733621.790	3397574.894	86.787	111	N/A	Unknown	Possibly Ancient	Cairn Field
14	WAG	733622.740	3397513.023	83.948	31	N/A	N/A	Unknown	Tumuli/Stone circle
15	WAG	733644.874	3397529.601	80.530	642	N/A	Unknown	Possibly EBA	Stone Circle/Wall_Line
16	WAG	733648.458	3397575.996	81.420	90	N/A	Unknown	Bedouin	Camp_Site
17	WAG	733709.869	3397505.782	82.460	244	N/A	Unknown	Possibly Prehistoric	Cairn Field
18	WAG	733787.579	3397488.130	80.295	339	Roman	EBI	EBI	Arch_Fragment
19	WAG	733893.009	3397449.167	79.414	2216	Chalco/EBI	Late Prehistoric	Bedouin and Late Prehistoric	Camp_Site/Cairn_Field
20	WAG	733908.648	3397570.839	92.324	104	N/A	Upper Paleolithic	Upper Paleolithic	Stone Circle
21	WAG	733955.996	3397421.923	78.921	346	N/A	N/A	Bedouin	Camp_Site
22	WAG	733825.430	3397461.219	79.671	682	Roman/BYZ	Upper Paleolithic	Bedouin and Upper Paleolithic	Camp_Site/Cairn
23	WAG	733990.143	3397488.966	84.147	355	EBII-III	Unknown	EBII-III	Circ_Struc/Wall_Line
24	WAG	734173.265	3397582.210	94.384	4538	IAIIA (Pre-Edomite)	EBI?	IAIIA (Pre-Edomite)	Cemetery
25	WAG	734085.336	3397509.167	86.091	543	N/A	Unknown	Bedouin	Cemetery
26	WAG	734095.688	3397582.863	86.761	369	IAIIB (Edomite)	EBI?	IAIIB (Edomite)	Find_Spot
27	WAG	734068.631	3397465.279	81.883	2550	IAIIA (Pre-Edomite)	Unknown	Bedouin	Camp_Site
28	WAG	734265.009	3397560.523	93.389	281	N/A	Upper Paleolithic	Upper Paleolithic	Stone Concentrations
29	WAG	734806.746	3397301.657	145.514	3	N/A	N/A	Unknown	Burial
30	WAG	734368.047	3397603.972	95.950	193	Unknown	Unknown	Possibly Prehistoric	Unknown
31	WAG	734336.505	3397569.935	92.640	113	N/A	N/A	Possibly Prehistoric	Cairn Field
32	WAG	734393.291	3397566.477	86.382	289	N/A	N/A	Unknown	Square Structure
33	WAG	734418.278	3397662.226	93.531	15	N/A	Unknown	Possibly Prehistoric	Stone Circle
34	WAG	734552.712	3397198.781	91.592	1668	Roman/BYZ	N/A	Bedouin	Camp_Site
35	WAG	734498.753	3397290.196	90.618	1019	IAII/Roman/BYZ	Unknown	Early Bedouin?	Cemetery
36	WAG	734503.938	3396989.885	98.943	546	N/A	Unknown	Bedouin	Camp_Site
37	WAG	734535.978	3396842.367	102.995	13	N/A	N/A	Unknown	Stone Circle
38	WAG	734581.679	3396942.227	99.026	112	N/A	N/A	Unknown	Unknown
39	WAG	734586.616	3396892.765	98.060	6	N/A	N/A	Unknown	Arch_Fragment
40	WAG	734557.246	3396941.655	95.313	4	N/A	N/A	Unknown	Arch_Fragment
41	WAG	734426.576	3397079.539	100.565	253	N/A	N/A	Unknown	Stone Circle
42	WAG	734413.883	3397474.324	90.102	1649	Gaza	Unknown	Ancient	Storage Facility?
43	WAG	734391.196	3397391.639	89.519	33	Islamic	N/A	Possibly Prehistoric	Arch_Fragment
46	WAG	734853.283	3397422.457	103.751	1080	N/A	N/A	Possibly Prehistoric	Possibly Cemetary
47	WAG	734744.216	3397426.297	98.452	758	N/A	N/A	Unknown	Arch_Fragment

Table 1b: Jabal Hamrat Fidan Survey 2002: Wadi al-Ghuwayb Survey Data

Site	Wadi	Easting	Northing	Elevation	Size (m2)	Ceramic Date	Lithic Date	Relative Date	Site Type
49	WAG	734214.471	3397358.318	83.968	198	N/A	N/A	Unknown	Arch_Fragment
50	WAG	734143.571	3397359.212	82.521	489	N/A	N/A	Uknown	Arch_Fragment
51	WAG	733554.594	3397317.924	72.209	4257	Roman/BYZ/Mod	N/A	Bedouin/Poss. Prehistoric	Camp_Site
52	WAG	733818.883	3397332.793	78.261	5627	N/A	N/A	Bedouin	Camp_Site
53	WAG	734473.999	3396419.594	119.402	82896	Islamic	Unknown	Islamic	Metallurgical
56	WAG	734655.391	3396299.608	115.378	777	Islamic	Unknown	Bedouin	Cemetery
57	WAG	734157.856	3396658.991	106.473	4521	Roman/BYZ	N/A	Islamic	Mine
58	WAG	734242.137	3396736.660	134.858	572	IAIIA (Pre-Edomite)	N/A	Islamic	Mine
59	WAG	733805.118	3397029.789	135.735	1306	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cairn Field
60	WAG	733578.973	3396984.104	86.380	137	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cemetery
61	WAG	733813.403	3396743.463	152.787	2749	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cemetery
62	WAG	733463.548	3396990.569	83.190	86342	IAII	N/A	IAII	Metallurgical Complex
101	WAG	733508.883	3397745.450	98.840	6087	N/A	N/A	Bedouin	Camp_Site
102	WAG	733609.276	3397694.088	87.283	338	N/A	N/A	Unknown	Tumul/Wall_Line
103	WAG	733688.347	3397713.982	94.826	4945	N/A	N/A	Unknown	Cemetery
104	WAG	733584.052	3397743.408	95.556	2122	N/A	Unknown	Unknown	Arch_Complex
501	WAG	733758.702	3397566.217	87.831	544	N/A	N/A	Bedouin	Camp_Site
44	WAG_DRY	734691.693	3397056.703	95.630	10545	N/A	N/A	Bedouin	Camp_Site
45	WAG_DRY	734367.058	3397253.730	87.679	15014	Gaza	N/A	Bedouin	Camp_Site
48	WAG_UP	734554.300	3397445.088	94.395	2683	Roman/BYZ	Unknown	Possibly Prehistoric	Storage_Facility

Table 2a: Jabal Hamrat Fidan Survey 2002: Wadi al-Ghuwayb Environmental Data

Site	Wadi	Ceramic Date	Lithic Date	Relative Date	Site Type	Geomorphology	Distance to Spring (m)
1	WAG	Roman	Unknown	Bedouin	Cemetery	Plateau, Colluvium	3233
2	WAG	N/A	Upper Paleolithic	Late Prehistoric	Tumuli field	Plateau, Colluvium	3254
3	WAG	Roman	EBI	EBI	Arch_Complex	Colluvium	3402
4	WAG	N/A	Upper Paleolithic	Upper Paleolithic	Arch_Fragment	Colluvium	3395
5	WAG	N/A	Upper Paleolithic	Upper Paleolithic	Tumuli_Field	Plateau, Colluvium	3032
6	WAG	N/A	N/A	Bedouin	Camp_Site	Terrace I, sandy, fluviatal	3710
7	WAG	N/A	N/A	Bedouin	Camp_Site	Terrace I, fluviatal	3817
8	WAG	Roman/BYZ	Unknown	Possibly Late Prehistoric	Cairn Field	Terrace I, fluviatal	3935
9	WAG	N/A	N/A	Bedouin and Prehistoric	Arch_Fragment	Terrace II, talus slope	3934
10	WAG	N/A	Upper Paleolithic	Upper Paleolithic	Arch_Fragment	Terrace II, talus slope	3885
11	WAG	N/A	Unknown	Unknown	Arch_Fragment	Terrace II, colluvial cobbles	3832
12	WAG	N/A	N/A	Bedouin	Camp_Site	Terrace II, talus slope	3860
13	WAG	N/A	Unknown	Possibly Ancient	Cairn Field	Terrace II, colluvial, shale	3796
14	WAG	N/A	N/A	Unknown	Tumuli/Stone circle	Terrace II, colluvial, shale	3811
15	WAG	N/A	Unknown	Possibly EBA	Stone Circle/Wall_Line	Terrace II, colluvial cobbles, shales	3777
16	WAG	N/A	Unknown	Bedouin	Camp_Site	Terrace II, talus bench	3776
17	WAG	N/A	Unknown	Possibly Prehistoric	Cairn Field	Terrace II, colluvial cobbles	3740
18	WAG	Roman	EBI	EBI	Arch_Fragment	Terrace II, talus slope	3651
19	WAG	Chalco/EBI	Late Prehistoric	Bedouin and Late Prehistoric	Camp_Site/Cairn_Field	Floodplain_terrace	3542
20	WAG	N/A	Upper Paleolithic	Upper Paleolithic	Stone Circle	Terrace II	3524
21	WAG	N/A	N/A	Bedouin	Camp_Site	Floodplain_terrace	3514
22	WAG	Roman/BYZ	Upper Paleolithic	Bedouin and Upper Paleolithic	Camp_Site/Cairn	Terrace I, fluvial	3646
23	WAG	EBII-III	Unknown	EBII-III	Circ_Struc/Wall_Line	Floodplain_terrace	3470
24	WAG	IAIIA (Pre-Edomite)	EBI?	IAIIA (Pre-Edomite)	Cemetery	Terrace, colluvial cobbles	3239
25	WAG	N/A	Unknown	Bedouin	Cemetery	Floodplain_terrace	3363
26	WAG	IAIIB (Edomite)	EBI?	IAIIB (Edomite)	Find_Spot	Floodplain_terrace	3333
27	WAG	IAIIA (Pre-Edomite)	Unknown	Bedouin	Camp_Site	Floodplain_terrace	3377
28	WAG	N/A	Upper Paleolithic	Upper Paleolithic	Stone Concentrations	High Terrace, colluvial	3183
29	WAG	N/A	N/A	Unknown	Burial	Mountain Plateau	2793
30	WAG	Unknown	Unknown	Possibly Prehistoric	Unknown	High Terrace, colluvial	3071
31	WAG	N/A	N/A	Possibly Prehistoric	Cairn Field	High Terrace, talus slope	3111
32	WAG	N/A	N/A	Unknown	Square Structure	Talus Slope	3047
33	WAG	N/A	Unknown	Possibly Prehistoric	Stone Circle	Low Terrace	3006
34	WAG	Roman/BYZ	N/A	Bedouin	Camp_Site	Terrace, fluvial	3048
35	WAG	IAII/Roman/BYZ	Unknown	Early Bedouin?	Cemetery	Terrace, fluvial	3065
36	WAG	N/A	Unknown	Bedouin	Camp_Site	Talus Slope	3183
37	WAG	N/A	N/A	Unknown	Stone Circle	Talus Slope, colluvial, shale	3250
38	WAG	N/A	N/A	Unknown	Unknown	Talus Slope	3164
39	WAG	N/A	N/A	Unknown	Arch_Fragment	Terrace	3186
40	WAG	N/A	N/A	Unknown	Arch_Fragment	Talus Slope	3187
41	WAG	N/A	N/A	Unknown	Stone Circle	Talus Slope	3234
42	WAG	Gaza	Unknown	Ancient	Storage Facility?	Terrace, fluvial	3061
43	WAG	Islamic	N/A	Possibly Prehistoric	Arch_Fragment	Talus Slope	3126

Table 2b: Jabal Hamrat Fidan Survey 2002: Wadi al-Ghuwayb Environmental Data

Site	Wadi	Ceramic Date	Lithic Date	Relative Date	Site Type	Geomorphology	Distance to Spring (m)
46	WAG	N/A	N/A	Possibly Prehistoric	Possibly Cemetary	Talus Slope	2690
47	WAG	N/A	N/A	Unknown	Arch_Fragment	Drainage	2770
49	WAG	N/A	N/A	Unknown	Arch_Fragment	Terrace, fluvial	3301
50	WAG	N/A	N/A	Uknown	Arch_Fragment	Terrace, fluvial	3380
51	WAG	Roman/BYZ/Mod	N/A	Bedouin/Poss. Prehistoric	Camp_Site	Terrace, fluvial	3889
52	WAG	N/A	N/A	Bedouin	Camp_Site	Terrace, colluvial and fluvial	3656
53	WAG	Islamic	Unknown	Islamic	Metallurgical	Shale Mountain Slopes with lime/sandst	3419
56	WAG	Islamic	Unknown	Bedouin	Cemetery	Hillock surrounded by drainages	3479
57	WAG	Roman/BYZ	N/A	Islamic	Mine	Mine Tailings on Shale Slopes	3643
58	WAG	IAIIA (Pre-Edomite)	N/A	Islamic	Mine	Shale mountain plateau	3552
59	WAG	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cairn Field	Shale mountain plateau	3800
60	WAG	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cemetery	Hillock	4032
61	WAG	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cemetery	Shale mountain plateau	3930
62	WAG	IAII	N/A	IAII	Metallurgical Complex	Holocene Terrace	4031
101	WAG	N/A	N/A	Bedouin	Camp_Site	Colluvium	3839
102	WAG	N/A	N/A	Unknown	Tumul/Wall_Line	Colluvium	3775
103	WAG	N/A	N/A	Unknown	Cemetery	Colluvium	3635
104	WAG	N/A	Unknown	Unknown	Arch_Complex	Colluvium	3764
501	WAG	N/A	N/A	Bedouin	Camp_Site	Colluvium	3665
44	WAG_DRY	N/A	N/A	Bedouin	Camp_Site	Terrace, fluvial	2963
45	WAG_DRY	Gaza	N/A	Bedouin	Camp_Site	Terrace, fluvial	3218
48	WAG_UP	Roman/BYZ	Unknown	Possibly Prehistoric	Storage_Facility	Drainage Mouth	2939

Table 3a: Jabal Hamrat Fidan Survey 2002: Wadi al-Jariya Survey Data

Site	Wadi	Easting	Northing	Elevation	Size (m2)	Ceramic Date	Lithic Date	Relative Date	Site Type
502	WAJ	734081.304	3397900.427	95.601	406	N/A	Unknown	Bedouin	Camp_Site
503	WAJ	734118.724	3397870.133	93.184	13	N/A	Unknown	Unknown	Find_Spot
504	WAJ	734159.786	3397940.782	101.157	10	N/A	N/A	Bedouin	Stone Circle
505	WAJ	734147.799	3397888.199	93.400	282	N/A	Chalco/EBI	Paleolithic	Lithic Scatter
506	WAJ	734290.165	3398345.237	137.432	1187	EBI	EBI?	EBI	Seasonal_Site
507	WAJ	734231.250	3398251.234	143.346	645	N/A	N/A	Bedouin	Other
508	WAJ	734118.974	3397742.646	85.103	527	N/A	EBI?	Bedouin	Camp_Site
509	WAJ	734300.275	3397881.236	94.514	518	N/A	Unknown	Bedouin	Camp_Site
510	WAJ	734309.193	3397988.405	99.017	22	N/A	Unknown	Bedouin	Stone Circle/Wall_Line
511	WAJ	734289.443	3398059.336	100.041	1120	Roman/BYZ	Unknown	EBA/IAII/BYZ	Arch_Complex
512	WAJ	734425.057	3398099.185	105.212	1272	Roman/BYZ	EBI?	Bedouin	Other
513	WAJ	734585.441	3398495.216	132.337	9270	EBI	EBI	Bedouin	Seasonal_Site
514	WAJ	734531.745	3398640.355	135.761	1218	IAII	EBI?	Bedouin	Stone Circle
515	WAJ	734427.308	3398919.048	125.050	5888	IAIIA (Pre-Edomite)	EBI	IAIIA (Pre-Edomite)	Cemetery
516	WAJ	734240.052	3398806.846	131.741	3088	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Building
517	WAJ	734442.075	3398634.123	120.166	69	N/A	N/A	Bedouin	Cemetery
518	WAJ	734328.398	3398982.357	133.882	4363	IAIIA (Pre-Edomite)	EBI	IAIIA (Pre-Edomite)	Arch_Complex
519	WAJ	734263.725	3398936.294	153.860	21	N/A	N/A	Unknown	cairn
520	WAJ	734435.776	3398626.876	120.207	33639	IAII	EBI?	IAII	Cemetery
521	WAJ	734416.626	3398783.434	125.423	3208	IAIIA (Pre-Edomite)	Late Prehistoric	IAIIA (Pre-Edomite)	Cemetery
522	WAJ	734335.471	3399040.440	138.416	272	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cairn Field
523	WAJ	734344.686	3399125.594	136.856	1456	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Cairn Field
524	WAJ	734418.261	3399065.805	129.895	388	IAIIA (Pre-Edomite)	Unknown	Bedouin	Cemetery
525	WAJ	734397.692	3399149.429	127.251	1472	GAZA	EBI?	Bedouin	Camp_Site
526	WAJ	734520.198	3399114.592	125.879	1675	Roman	Late Prehistoric	Bedouin	Camp_Site
527	WAJ	734625.251	3398889.952	127.259	5466	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Cairn Field
528	WAJ	734561.456	3398844.293	120.730	2314	Modern	IAII	Bedouin	Camp_Site
529	WAJ	734517.889	3399250.370	131.115	351	N/A	N/A	Unknown	Stone Circle
530	WAJ	734393.624	3399326.274	130.975	13986	IAIIA (Pre-Edomite)	EBI	Bedouin	Seasonal_Site
531	WAJ	734112.902	3399621.857	150.748	3656	Roman	Upper_Paleolithic?	IAIIA	Cairn Field
532	WAJ	734383.203	3399644.178	137.920	6831	Roman	Unknown	Roman	Seasonal_Site
533	WAJ	734595.577	3399659.824	141.553	4764	Roman/BYZ	EBI?	Roman/BYZ	Seasonal_Site
534	WAJ	734462.892	3399592.203	137.168	2579	N/A	EBI	EBI	Seasonal_Site
535	WAJ	734667.896	3399605.697	142.672	8	IAIIA (Pre-Edomite)	Unknown	EB I?	Stone Circle/Wall_Line
536	WAJ	734492.310	3399740.030	150.736	23	N/A	N/A	Unknown	Cairn Field
537	WAJ	734389.977	3399541.968	133.071	4277	EBA/IAII	EBI?	EBA/IAII	Seasonal_Site
538	WAJ	734569.610	3399487.130	159.813	961	N/A	Unknown	Unknown	Camp_Site

Table 3b: Jabal Hamrat Fidan Survey 2002: Wadi al-Jariya Survey Data

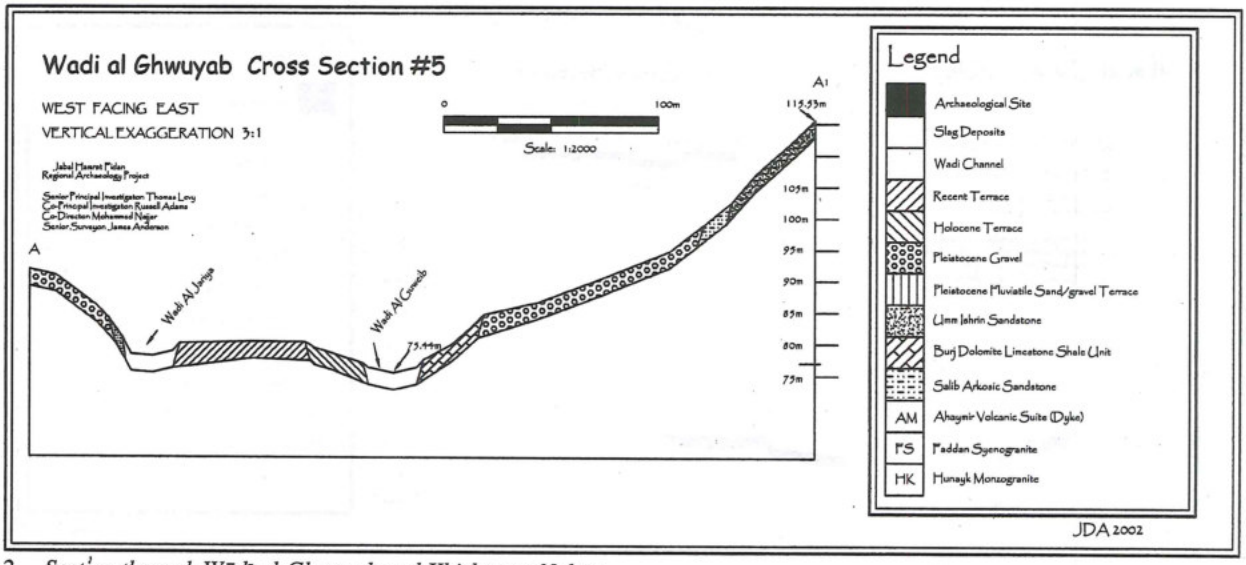
Site	Wadi	Easting	Northing	Elevation	Size (m2)	Ceramic Date	Lithic Date	Relative Date	Site Type
539	WAJ	734443.730	3399518.928	143.909	725	N/A	Unknown	Prehistoric	Cairn Field
540	WAJ	734879.802	3399884.595	153.755	33335	IAII	IAII	IAII	Metallurgical Complex
542	WAJ	735126.249	3399554.998	162.706	670	N/A	N/A	Unknown	Mine & Tailings
543	WAJ	735335.730	3399427.765	194.374	49	N/A	N/A	Unknown	Mine & Tailings
544	WAJ	735350.655	3399418.697	195.783	2195	N/A	N/A	Unknown	Mine & Tailings
545	WAJ	735396.425	3399402.055	205.601	915	N/A	N/A	Unknown	Mine & Tailings
546	WAJ	735527.344	3399403.228	224.168	531	N/A	N/A	Unknown	Mine & Tailings
547	WAJ	735580.778	3399397.272	222.951	909	N/A	N/A	Unknown	Mine & Tailings
548	WAJ	735616.297	3399264.202	236.485	649	IAII/EBAII-III/BYZ	N/A	IAII/EBAII-III/BYZ	Mine & Tailings
549	WAJ	735666.035	3399223.366	238.376	869	N/A	N/A	Unknown	Mine & Tailings
550	WAJ	735757.729	3399193.691	247.170	530	N/A	N/A	Unknown	Mine & Tailings
551	WAJ	735897.862	3399120.869	262.931	1400	Rom/BYZ	N/A	Rom/BYZ	Mine & Tailings
552	WAJ	735921.220	3399190.542	270.811	1	N/A	N/A	Unknown	Mine & Tailings
553	WAJ	736035.975	3399217.052	289.450	259	N/A	N/A	Unknown	Mine & Tailings
554	WAJ	736050.727	3399227.828	292.897	74	N/A	N/A	Unknown	Mine & Tailings
555	WAJ	735381.743	3399287.474	186.900	657	N/A	N/A	IAII	Ore Processing Site

Table 4a: Jabal Hamrat Fidan Survey 2002: Wadi al-Jariya Environmental Data

Site	Wadi	Ceramic Date	Lithic Date	Relative Date	Site Type	Geomorphology	Distance to Spring (m)
502	WAJ	N/A	Unknown	Bedouin	Camp_Site	Colluvium	3277
503	WAJ	N/A	Unknown	Unknown	Find_Spot	Colluvium	3241
504	WAJ	N/A	N/A	Bedouin	Stone Circle	Colluvium	3187
505	WAJ	N/A	Chalco/EBI	Paleolithic	Lithic Scatter	Pleisto. Terrace	3171
506	WAJ	EBI	EBI?	EBI	Seasonal_Site	Holocene Terrace	2998
507	WAJ	N/A	N/A	Bedouin	Other	Colluvium	3022
508	WAJ	N/A	EBI?	Bedouin	Camp_Site	Sand Field	3266
509	WAJ	N/A	Unknown	Bedouin	Camp_Site	Alluvial_Fan	3067
510	WAJ	N/A	Unknown	Bedouin	Stone Circle/Wall_Line	Colluvium	3035
511	WAJ	Roman/BYZ	Unknown	EBA/IAII/BYZ	Arch_Complex	Colluvium	3036
512	WAJ	Roman/BYZ	EBI?	Bedouin	Other	Colluvium	2897
513	WAJ	EBI	EBI	Bedouin	Seasonal_Site	Alluvial_Fan	2671
514	WAJ	IAII	EBI?	Bedouin	Stone Circle	Alluvial_Fan	2733
515	WAJ	IAIIA (Pre-Edomite)	EBI	IAIIA (Pre-Edomite)	Cemetery	Colluvium	2826
516	WAJ	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Building	Colluvium	3001
517	WAJ	N/A	N/A	Bedouin	Cemetery	Alluvial_Fan	2840
518	WAJ	IAIIA (Pre-Edomite)	EBI	IAIIA (Pre-Edomite)	Arch_Complex	Colluvium	2977
519	WAJ	N/A	N/A	Unknown	cairn	Bedrock	3026
520	WAJ	IAII	EBI?	IAII	Cemetery	Colluvium	2745
521	WAJ	IAIIA (Pre-Edomite)	Late Prehistoric	IAIIA (Pre-Edomite)	Cemetery	Colluvium	2842
522	WAJ	IAIIA (Pre-Edomite)	N/A	IAIIA (Pre-Edomite)	Cairn Field	Colluvium	2967
523	WAJ	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Cairn Field	Colluvium	2966
524	WAJ	IAIIA (Pre-Edomite)	Unknown	Bedouin	Cemetery	Colluvium	2901
525	WAJ	GAZA	EBI?	Bedouin	Camp_Site	Colluvium	2911
526	WAJ	Roman	Late Prehistoric	Bedouin	Camp_Site	Alluvial_Fan	2789
527	WAJ	IAIIA (Pre-Edomite)	Unknown	IAIIA (Pre-Edomite)	Cairn Field	Colluvium	2662
528	WAJ	Modern	IAII	Bedouin	Camp_Site	Alluvial_Fan	2722
529	WAJ	N/A	N/A	Unknown	Stone Circle	Colluvium	2833
530	WAJ	IAIIA (Pre-Edomite)	EBI	Bedouin	Seasonal_Site	Colluvium	2929
531	WAJ	Roman	Upper_Paleolithic?	IAIIA	Cairn Field	Bedrock	3271
532	WAJ	Roman	Unknown	Roman	Seasonal_Site	Alluvial_Fan	3015
533	WAJ	Roman/BYZ	EBI?	Roman/BYZ	Seasonal_Site	Alluvial_Fan	2826
534	WAJ	N/A	EBI	EBI	Seasonal_Site	Alluvial_Fan	2956
535	WAJ	IAIIA (Pre-Edomite)	Unknown	EB I?	Stone Circle/Wall_Line	Alluvial_Fan	2791
536	WAJ	N/A	N/A	Unknown	Cairn Field	Bedrock	3010
537	WAJ	EBA/IAII	EBI?	EBA/IAII	Seasonal_Site	Alluvial_Fan	3023
538	WAJ	N/A	Unknown	Unknown	Camp_Site	Colluvium	2847
539	WAJ	N/A	Unknown	Prehistoric	Cairn Field	Colluvium	2978
540	WAJ	IAII	IAII	IAII	Metallurgical Complex	Holocene Terrace	2620
542	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	2338
543	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	2103

Table 4b: Jabal Hamrat Fidan Survey 2002: Wadi al-Jariya Environmental Data

Site	Wadi	Ceramic Date	Lithic Date	Relative Date	Site Type	Geomorphology	Distance to Spring (m)
544	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	2102
545	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	2039
546	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1911
547	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1879
548	WAJ	IAII/EBAII-III/BYZ	N/A	IAII/EBAII-III/BYZ	Mine & Tailings	DLS	1775
549	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1720
550	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1629
551	WAJ	Rom/BYZ	N/A	Rom/BYZ	Mine & Tailings	DLS	1444
552	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1474
553	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1386
554	WAJ	N/A	N/A	Unknown	Mine & Tailings	DLS	1388
555	WAJ	N/A	N/A	IAII	Ore Processing Site	Alluvial Terrace	1986

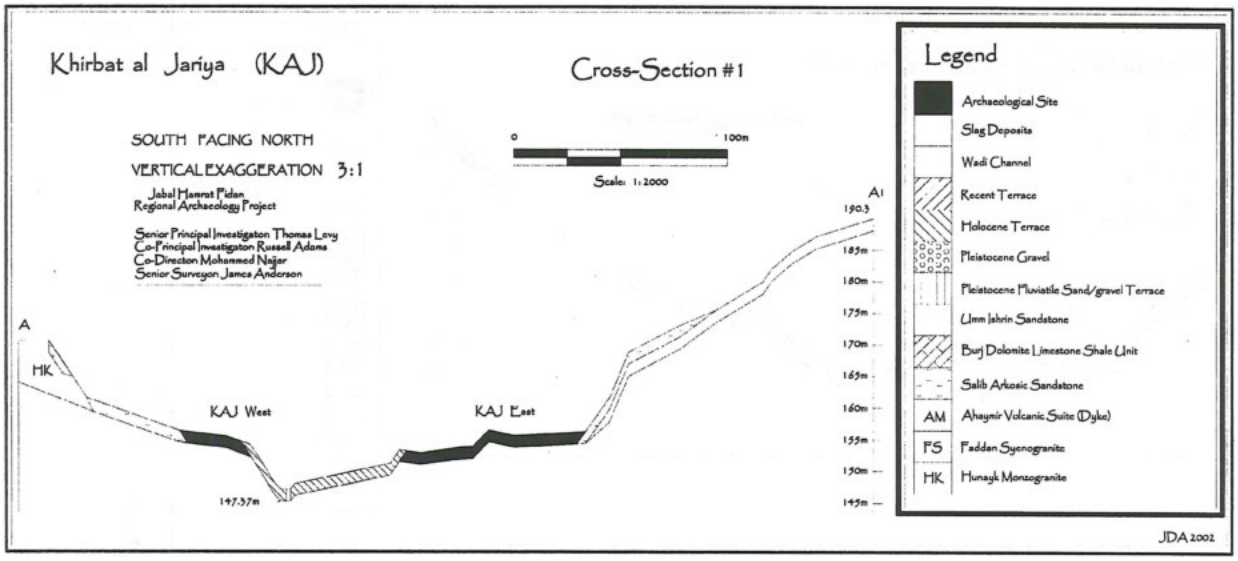


2. *Section through Wādī al-Ghuwayb and Khirbat an-Naḥās.*

much narrower drainage and cuts through large deposits of copper ore bearing deposits in its upper reaches where it is associated with the Dolomite Limestone Shale (Burj) unit that ancient miners actively sought from the Early Bronze II, through the Iron Age and into the Islamic periods (Hauptmann 2000). A secondary drainage flowing from the east into Wādī al-Jāriya follows an elongated seam of the Dolomite Limestone Shale (Burj) unit for approximately 2km. As this smaller wadi debouches on the east side of Khirbat al-Jāriya Iron Age metal production site, this area was also included in our survey. Wādī al-Jāriya is approximately 5km in length, has relatively steep valley walls, and in its upper reaches (for ca. 2km) cuts through Umm Ishrin Sandstone formations that sit atop the ore-rich Dolomite Limestone Shale unit. The valley bottom here is filled with Holocene fluviatile gravel. Behind a narrowing of the channel, roughly 2.25km downstream from it's beginning, Wādī al-Jāriya cuts through the same Hunayk Monzogranite formation that borders Wādī al-Ghuwayb. The site of Khirbat al-Jāriya (**Fig. 3**), first discovered and reported on by Glueck (1935) lies behind a 'choke point' where Wādī al Jāriya cuts through a narrow gorge that flows through small granite mountains (**Fig. 3**). This wadi continues to flow for approximately 3km until it joins Wādī al-Ghuwayb. A relatively large exposure of Salib Arkosic Sandstone is situated on the west bank of this drainage at this point. Thus, with DLS deposits in its' upper reaches and in some of the secondary drainages that flow from the east into the drainage, Wādī al-Jāriya area contains large deposits of copper ore that were especially attractive to miners and metal workers during the Iron Age.

Survey Methodology

Portions of Wādī al-Ghuwayb and Wādī al-Jāriya were explored in a cursory manor by early explorers such as Musil (1907/8); Blake; Kirkbride; Head and Horsfield, who first identified the importance of copper ore deposits for the ancient inhabitants in this part of Edom (Glueck 1940). However, it was Nelson Glueck, under the auspices of ASOR, the Hebrew Union College (Cincinnati) and the then Transjordan Department of Antiquities who recorded three of most important Iron Age sites in the region: Khirbat an-Naḥās, Khirbat al-Jāriya and Khirbat al-Ghuwayb. More recent archaeologists, such as MacDonald (1992) and Weisgerber under the auspices of the German Mining Museum (Hauptmann 2000) also visited most of these sites and published cursory maps of Khirbat an-Naḥās (KEN). While Glueck seems to be the first investigator to record the sites of Khirbat al-Jāriya and Khirbat al-Ghuwayb, he never found the mines that provided the ore for these sites (Glueck 1935) – something our survey managed to achieve. The lack of systematic 100% survey coverage of these drainages and the relatively short periods of time previous researchers spent in this region (due to the great logistic difficulties in getting to the area and working there in the summer months), made it difficult for earlier researchers to identify the nature of the ore procurement system used in this area during the Iron Age. Until our survey in 2002, no systematic survey had been made of Wādī al-Ghuwayb and Wādī al-Jāriya and no detailed topographic and surface architectural maps had been made of the two main Iron Age copper production centers of Khirbat an-Naḥās and Khirbat al-Jāriya. Thus, while segments of both Wādī al-



3. Section through the Wādī al-Jāriya *and Khirbat al-Jāriya.*

Ghuwayb (WAG) and Wādī al-Jāriya (WAJ) need to be systematically surveyed, it is now possible to postulate on firmer ground how ores were extracted, transported and processed during the Iron Age in this part of southern Edom. That said, it should be emphasized that this report was written only three weeks since the end of the 2002 fieldwork and that we are still only at the beginning of the analysis phase of our research.

In terms of survey methodology, all areas within 250m on each side of the respective wadi systems were examined. A wide range of cultural and environmental variables was recorded for each site. Digital photographs were also made of each site and any important architectural features visible on the site surface. Finally, a topographic and architectural feature map was made of each site using a total station. All these data were then linked in the ArcMap GIS program. The spatial data for all the sites found along Wādī al-Jāriya and Wādī al-Ghuwayb are presented in **Tables 1 and 3**; conversely some of the key environmental variables are presented in **Tables 2 and 4**. These data form the basis for the GIS analyses used in the JHF project. A plot of all 118 archaeological sites recorded in the 2002 survey is presented in **Fig. 4**.

Overview of Wādī al-Ghuwayb (WAG) Survey Results

The 'jewel in the crown' of Iron Age settlement along Wādī al-Ghuwayb is the site of Khirbat an-Naḥās that is approximately 8.6 hectares in area. Before addressing the nature of the Iron Age settlement along this drainage, a brief overview of the entire site survey assemblage is presented below. A total of 54 sites were recorded along the ca. 1.5km length of Wādī al-Ghuwayb. This may seem like a relatively short segment of the drainage to survey, however, the richness of sites in the area demanded that they be fully mapped, photographed and recorded with the same level of precision that was carried out in our 1998 survey of Wādī Fīdān (Levy *et al.* 2001a). In addition, due to contingencies in the field the WAG survey was extended to a smaller secondary drainage, Wādī Nuqayb al-'Usaymir (نقيب الأسيمر), that flows from the southeast into the WAG. This was done so that a small series of mines connected to KEN could be included in the survey. Along Wādī Nuqayb al-'Usaymir, Glueck (1940) found a spectacular Mediaeval Islamic site devoted to metal production that he called Khirbat Nuqayb al-'Usaymir. As the mines that are associated with Nuqayb al-'Usaymir (located ca. 1km east of KEN; WAG 58; **Table 1**) were probably also exploited during the Iron Age, it was important to include this area in the 2002 survey. The contingencies alluded to above refer to our decision to try and obtain a detailed survey of a ca. 1km catchment area around KEN – something that was only partially accomplished this year due to time constraints. As the ceramics provide most of the evidence for dating the sites recorded in the survey, an overview of the pottery assemblage, methods of analysis and implications are outlined below.

The Survey Ceramics

Introduction and Methodology

The ceramic collections from the site survey along Wādī al-Ghuwayb/Wādī al-Jāriya were

counted and weighed by site, and then sorted into diagnostic and non-diagnostic portions for further analysis. Only the diagnostic fraction was analyzed in detail in the field, with the non-diagnostic fraction being retained for further study at a later date. The goal of the ceramic analysis from the survey was primarily to try to ascertain the relative dating of the various sites found, in order to build up an understanding of the landscape use through time. The classification of the ceramics was done broadly into primary periods as recognized: Early Bronze Age, Iron Age, Nabataean, Roman, Byzantine and Islamic. Where possible these periods were further subdivided into sub-periods (i.e. EBA I or IBA II-III), although this was easier for periods like the Early Bronze Age where the ceramic typology and technologies are well understood from several years of prior analysis of the key phases in the region. A second aim of the ceramic analysis was to build upon the knowledge of the regional ceramics and to extend our understanding of the lesser-known periods such as the Iron Age. The Iron Age ceramics from the lowland region of Edom are still not well understood either in terms of chronology or indeed of the full range of types for the various sub-phases of the Iron Age, despite some progress in this regard in recent years (Adams in Barker *et al.* 1999; 2000). This is of course a problem that extends beyond the local and regional spheres of analyses in Jordan, as the chronological and typological phases of the Iron Age in the southern Levant as a whole are currently a topic of considerable debate (Ben-Tor 2000; 2001; Finkelstein 1996; 1999; 2000b; 2002), with various suggestions for a refinement of the traditional chronology having been recently suggested. It is anticipated that the work of the JHF survey and the KEN excavations will add to this debate and hopefully also resolve some of the regional issues with a more robust understanding the archaeology of Edom during the Iron Age.

The study of the diagnostic portion of the ceramics included both a typological as well as a technical analysis, with considerable effort going into building up, where possible, a detailed description of the range of fabrics, tempers and manufacturing techniques. In the typological analysis of the Iron Age ceramics a largely descriptive approach was taken, as we intentionally avoided mapping our material onto specific regional typologies, preferring instead to build up an independent typology that could at a later date be compared with some of the better-known typologies for Edom (Bennett and Bienkowski 1995b; Oakshott 1978). This was done to avoid the pitfalls of relying on the Edomite highland sites to determine the settlement dynamics in the lowlands of Edom.

As the diagnostic ceramics were analyzed and relative dates were assigned, we attempted to assign primary periods of use to the survey sites. In general, whenever the ceramics allowed, we determined what we believed to be the 'dominant' period of use of the sites. If lithics were also available from a surveyed site, these data were used to strengthen the ascription of a date for the site. This was especially true for EBA I sites. **Tables 1 and 3** present both the ceramic date and the lithic date for the sites with a relative date category that was used in the field by the survey teams. Finally, it should be highlighted that the survey ceramic assemblage was the source of data most relied on for dating the sites for GIS and related analyses. As with much of the Faynān region, the landscape is a virtual palimpsest of sites from a variety of periods, and it is not uncommon to have ceramics from more than one period found in association with a site. Whenever it was not possible to discern a 'dominant' period of use, the periods present were all listed. The Classical and later ceramics were not investigated in detail at this stage, with only a preliminary description of sherds being made. It is anticipated that this material will be studied in more detail at a later date.

Site Dating

Of the total number of sites discovered in the survey, useful collections of ceramics were made at only 51. The total number and weights of the diagnostic and non-diagnostic portions are listed below:

Total no. of sherds	4014
Total weight (kgs)	58.765
Total no. of diagnostic sherds	722
Weight of Diagnostic sherds (kgs)	15.246

The survey is dominated to a very large degree by the presence of Iron Age ceramics, which were widespread throughout the survey area, but concentrated to a large degree in the middle of Wādī al-Jāriya and also in the immediate vicinity of Khirbat an-Naḥās. In total, 22 of the 51 sites with ceramics had Iron Age ceramics as either the dominant or as a component part of the ceramic collections (20 dominant (including WAJ 540, Khirbat al-Jāriya], 2 co-dominant). It should be emphasized that while 22 sites were identified with Iron Age ceramics, a total of 36 Iron Age sites were identified based on non-ceramic criteria. This is especially true with regard to the mines where variables such as mining tools, tailings, ventilation

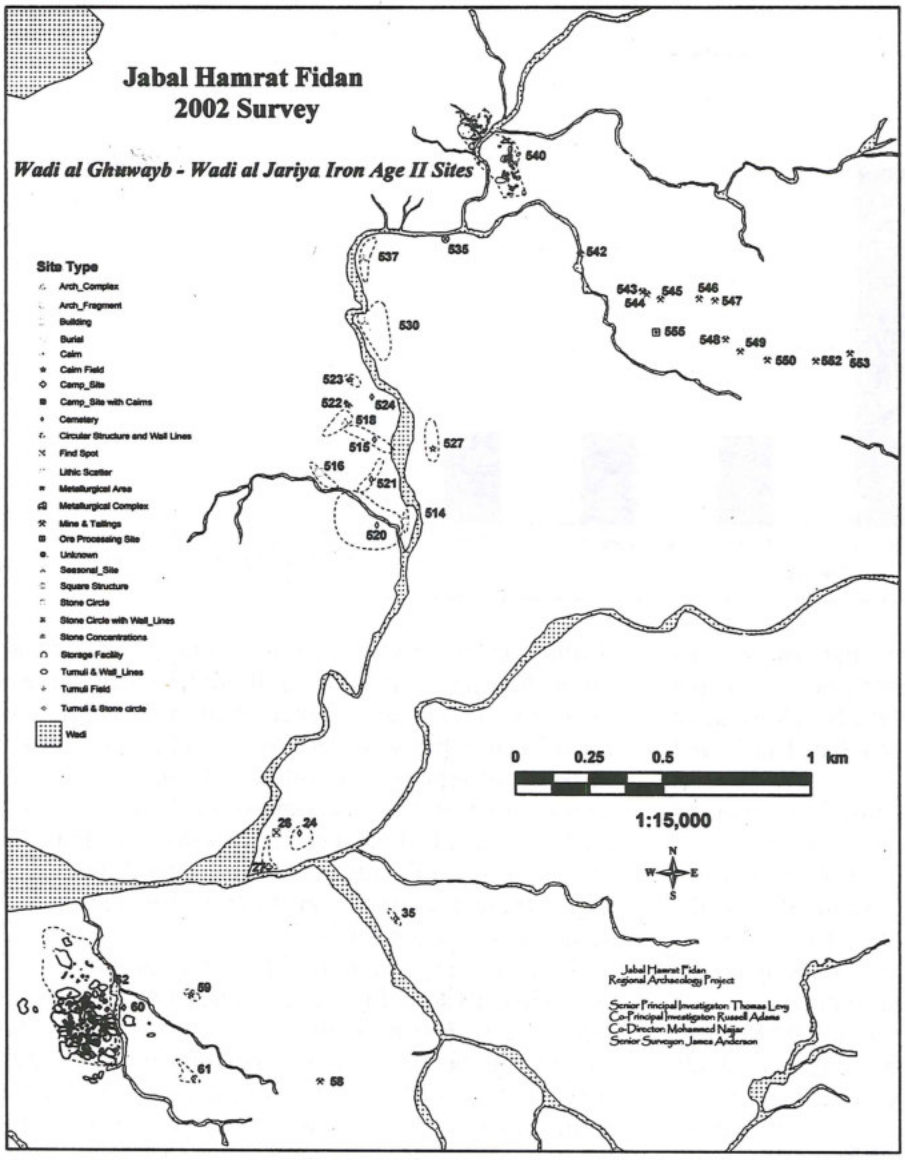
shafts and other features could be used to tentatively date these sites (see **Figs. 6 and 9**). The quantities of Iron Age ceramics was very significant in terms of both the total numbers of sherds and overall weights, but the small number of typologically diagnostic sherds was relatively small by comparison. The largest concentrations of Iron Age ceramics were in the upper portions of Wādī al-Jāriya, and specifically at Khirbat al-Jāriya (**Figs. 4 and 5**).

The presence of Roman ceramics in some of the sites surveyed was also quite high with 19 sites in total (9 dominant, 10 co-dominant). Early Bronze Age ceramics were dominant at only 4 sites and co-dominant at 2 others. Byzantine ceramics were co-dominant at 5 sites; Islamic period ceramics were dominant at 6 sites. It is worth noting that the Byzantine assignments were made on a limited assessment of the material and the exact determinations of Roman and Byzantine ceramics will require further detailed investigation. The Islamic period material was equally problematic, with the majority of this material (outside of WAG 53), being composed of hand-made wares that are notoriously difficult to date precisely. The only obviously determinable wares were of the painted Mamluk and Fatimid/Ayyubid ceramics such as was found at WAG 53, often with a variety of glazed and painted fine wares, or the Gaza wares from post-medieval campsites. This material will be dealt with in more detail in a forthcoming article on Khirbat Nuqayb al-'Usaymir. As is well known by now, there is a distinct lack of Middle Bronze Age sites and perhaps Late Bronze Age sites in this region. In the 2002 survey areas, the presence of aceramic Neolithic or Chalcolithic sites was not detected. In general, the survey area was largely devoid of prehistoric sites of the Middle Paleolithic and Neolithic periods and only a handful of Early Bronze Age sites were found. Compared with Wādī Fīdān (Levy *et al.* 2001a), Wādī Faynān (Barker 2000; Najjar *et al.* 1990), Wādī al-Ghuwayr and other drainages to the south of Wādī al-Ghuwayb and Wādī al-Jāriya, Neolithic and Early Bronze Age occupation is small by comparison to other known sites from adjacent wadi systems. It might be assumed that Wādī al-Ghuwayb in its upper portions and Wādī al-Jāriya may have been unattractive locations due to environmental factors (i.e. the lack of permanent springs). Regardless of the reasons, the dearth of sites of these periods should be marked as significant, given the large number of sites of these periods in the region. When looking at the distribution of sites from the different periods, it seems safe to conclude that human occupation in the survey area was at its zenith during the Iron Age — a conclusion reached by Glueck (1940) back in the 1930s.

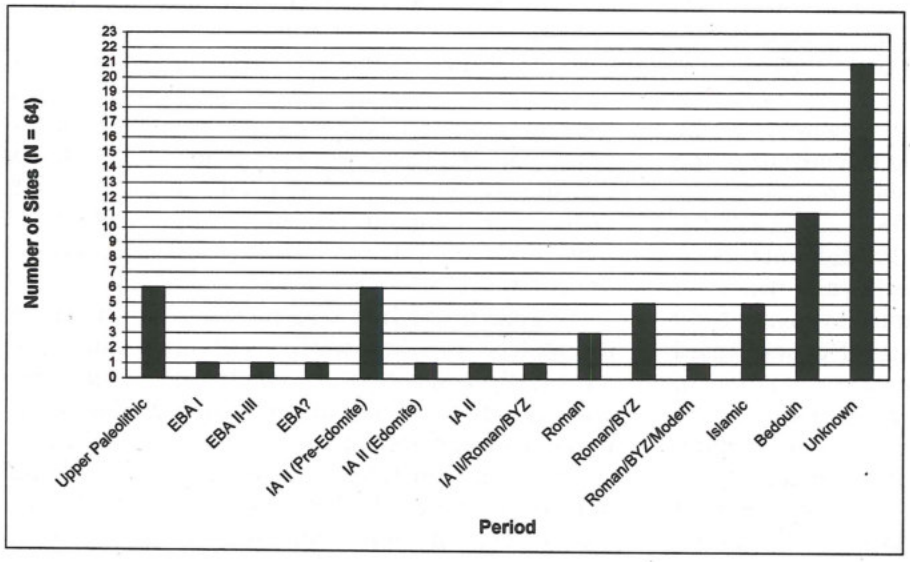
The Iron Age Ceramics

Our understanding of the chronology and material culture of the Iron Age in southern Jordan is relatively weak. Despite excavations at several key sites (such as Buṣayra and Ṭawīlān by Bennett), and despite extensive surveys in this and adjoining regions, we have a limited understanding of the Iron Age ceramics in the region. The dominant ceramics from the survey are those that relate to the Iron Age. The work of Oakshott (1978; 1983) and Hart (1989) in building up the preliminary typologies of highland Edomite ceramics, and the more recent work of Bienkowski (Bennett and Bienkowski 1995a; Bienkowski and Bennett in press) to a large extent frame the basis of our current understanding of the Iron Age ceramics of the region. However, the vast majority of the material from these sites investigated, which are all on the Jordanian plateau, have always been assumed to be quite late in date (primarily seventh century), and our understanding of the full range of Iron Age ceramics seems biased by these sites. Unfortunately little attempt has been made to corroborate the presumed dating of these sites, and we have been left with relative dating based upon direct comparisons to other sites within and outside the region. This sort of analysis however, can result in a degree of circularity of reasoning, and it is anticipated that work by the JHF project will provide some firm temporal (i.e. radiometric and stratigraphic) anchors on which to base our typological study of the ceramics.

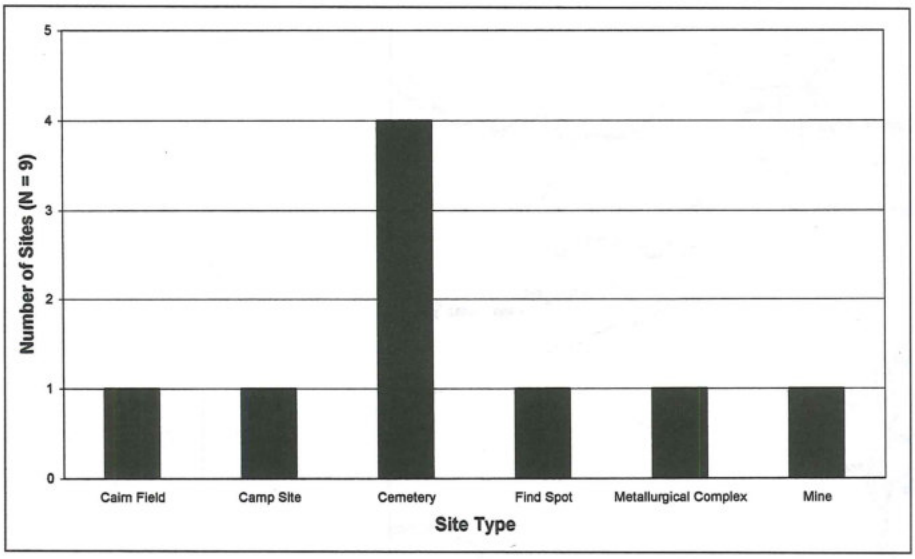
Equally, over two decades of relatively intensive survey in southern Jordan have added little to the overall understanding of the Iron Age sequences of Jordan south of Wādī al-Mūjib. Hart's (1987b; 1988) survey of the region around Ghrarah was of a fairly limited nature, and like the excavations, provides only a partial view of the regional ceramics. The surveys of MacDonald in Wādī al-Ḥasā, Southern Ghawrs and Northeast 'Arabah, and the more recent in the Buṣayra region have provided a number of candidate sites for excavation but afford little in the way of useful information for understanding the temporal distinctions within the excavated assemblages. The survey work of Miller (1991) (Karak Plateau survey) has proved less than reliable with regard to the Iron Age pottery (Bienkowski 2001b). Overall, the reliability of the survey analysis from both the MacDonald (MacDonald *et al.* 1983) and Miller



4. Distribution map of archaeological sites recorded in survey along Wādī al-Jāriya and Wādī al-Ghuwayb.



5. Histogram of Wādī al-Ghuwayb archaeological sites by period.



6. Histogram of Wādī al-Ghuwayb Iron Age II archaeological sites by type (function).

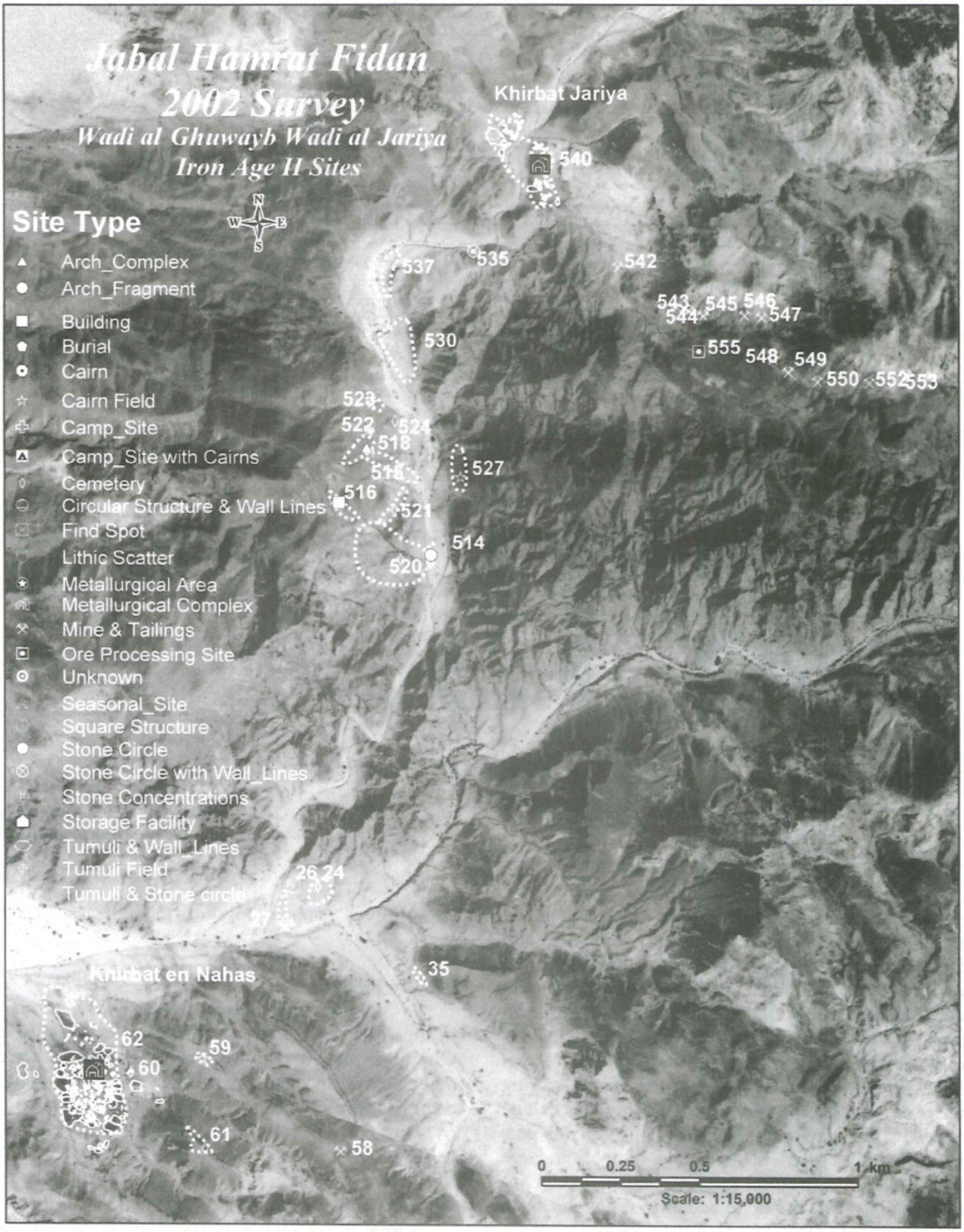
(1991) surveys has proved less than reliable as shown by work undertaken by Bienkowski and Adams (Bienkowski and Adams 1999; Bienkowski *et al.* 1997) at two key sites in Wādī al-Ḥasā and Wādī al-Mūjib respectively.

More recently a clearer picture has emerged from surveys and excavations in the Faynān region, by Levy and Adams, and Barker. The clearest indication for significant Iron Age occupation of the Faynān region has come from the Iron Age cemetery at Wādī Fīdān 40, which is likely a cemetery associated with pastoralist populations such as the Shasu, in the region (Levy *et al.* 1999; Levy and Adams in press). The 1998 survey of Wādī Fīdān also provided as clear indication of the extent of the Iron Age occupation (n = 24) of the region, with a number of sites attributed to Iron Age smelting. Last of all the survey of the eastern Faynān basin by Barker has recovered a sizable ceramic assemblage from the survey, with large portions of it attributable to the Iron Age.

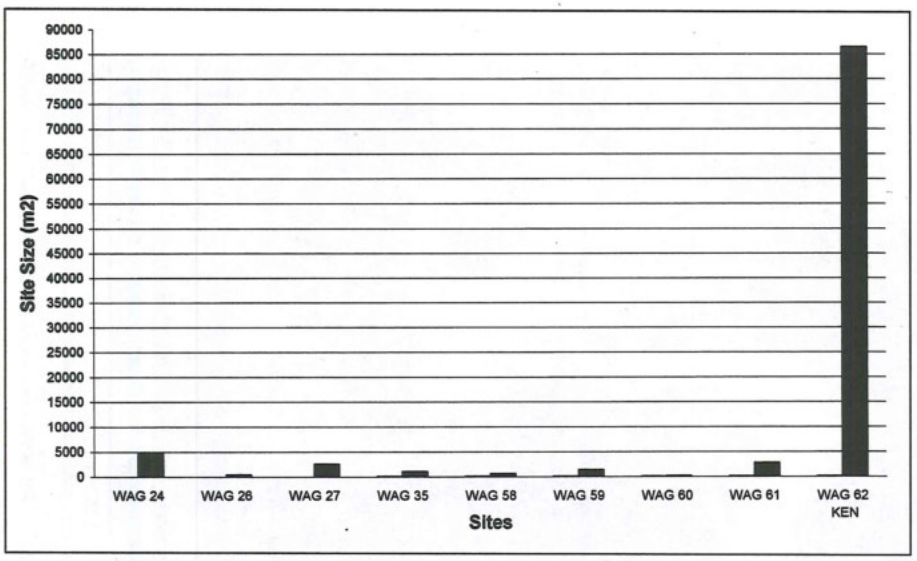
By far, the most significant issue with all of the data collected to date is in trying to understand the temporal distinctions within the Iron Age assemblages. Hart and Knauf (1986) suggested the possibility of an 'Edomite' and 'Pre-Edomite' component to the assemblages in the Faynān region on the basis of fairly limited ceramic evidence from the plateau. This observation was of course based upon understanding the excavated material at Ṭawīlān and Buṣayra as 'normative' Edomite ceramics largely attributable to the seventh century BC, and, the supposition that other ceramic types and coarser fabrics found in the region suggested at least a temporal (earlier) and possibly a cultural distinction in the Iron Age assemblages. In general, all of the surveys from the JHF and Faynān surveys also show this clear variance in the assemblages so far collected, but whether this should be understood in terms of temporal or cultural distinctions has up to now remained an open question. It is against the background of this state of knowledge that the present study will attempt to understand the meaning of these distinctions in the Iron Age ceramic assemblages of southern Jordan.

The Iron Age pottery illustrated in this report (see **Figs. 10 and 11**) can be generally dated to the Iron Age II, and most likely to the last half of this period on the basis of parallels from other sites. There is little in the survey assemblage that could be termed as Iron Age I or assigned to the ever-elusive tenth century. As stated above, this is not an unexpected situation, given the poor state of our understanding of the earliest phases of the Iron Age in southern Jordan. Although the pieces illustrated are a representative sample of the survey assemblage, there are comparatively few fine wares or smaller vessels in the assemblage (by comparison to the excavation typology at Khirbat an-Naḥās to be published shortly) and tends toward larger and heavier fabrics, possibly due to post-depositional processes or survey bias.

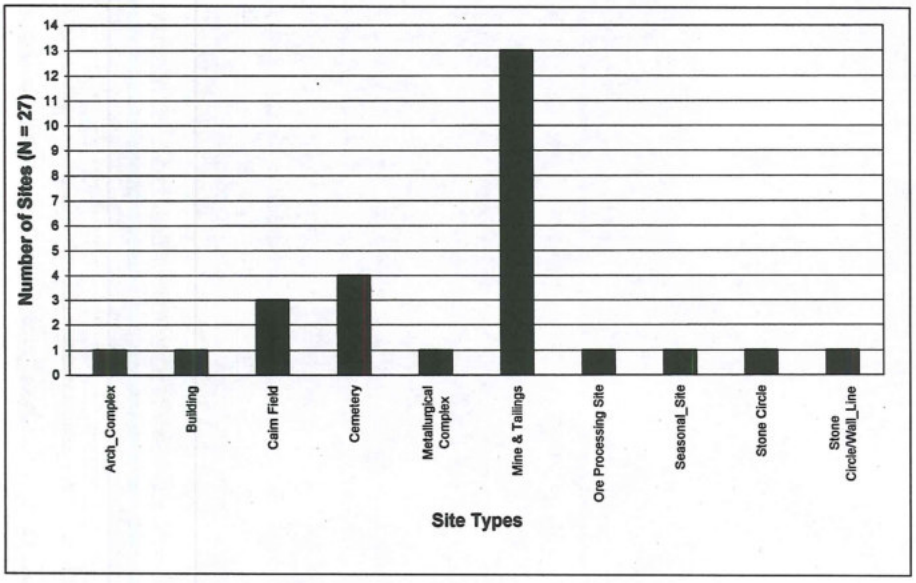
In general the Iron Age pottery from the survey assemblage is wheel-made, well fired and highly technically competent in manufacture. There are a wide variety of fabrics, and inclusions within the ceramic that suggests that there is at least some variety in place and materials of manufacture, although none of the pottery by fabric is necessarily of a non-local origin. The most common inclusions in the ce-



7. Iron Age II sites plotted on aerial photography of Wādī al-Jāriya and Wādī al-Ghuwayb research area.



8. Histogram of Wādī al-Ghuwayb Iron Age II archaeological sites by size.



9. Histogram of Wādī al-Jāriya Iron Age II archaeological sites by type (function).

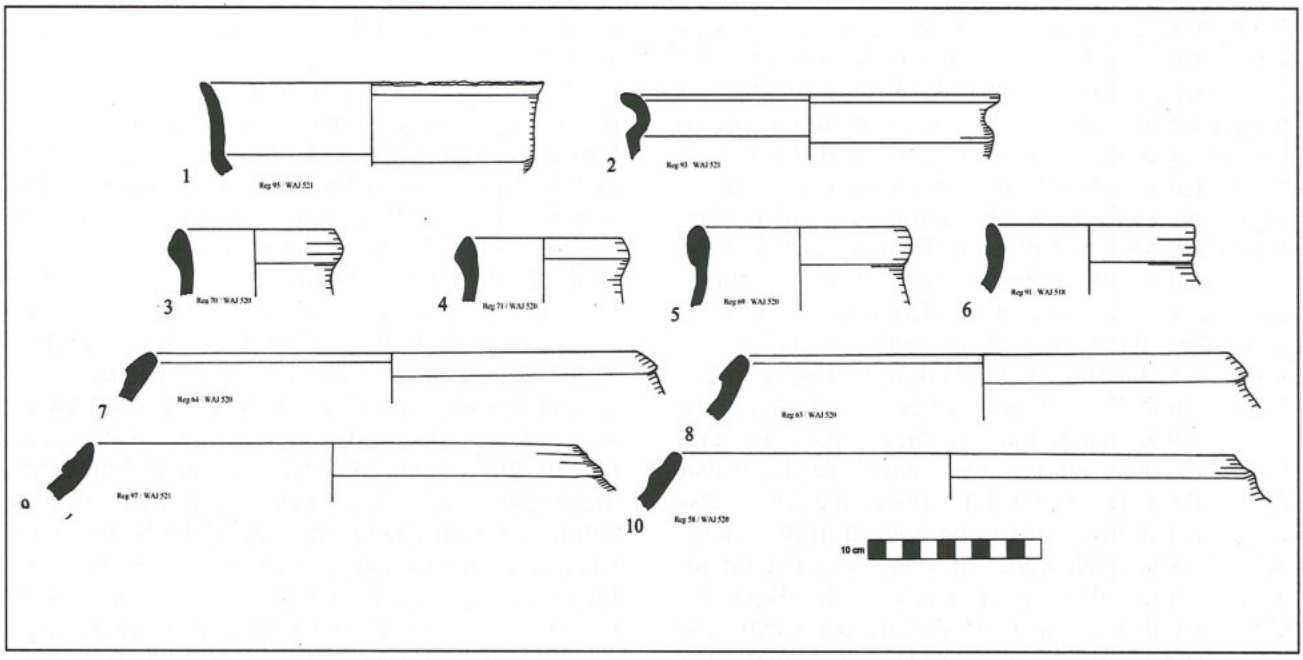
ramics is a mixed wadi sand fraction, quite varied in mineralogy, but which in general coincides with the regional geology. A good portion of the ceramics has shale and mica, which are also found in abundance locally due to the basement rock complexes of the Jabal Ḥamrat Fīdān. These inclusions display variable sorting, suggesting that there was some selection – taking place in the manufacturing process, and this is most noticeable in the calcite added to the cooking pots. Although not all pots identified by 'type' have calcite temper, a large proportion have quite angular, most likely intentionally crushed calcite added to a general wadi sand coarse fraction. Much of the preliminary analysis, undertaken with a 10x and 30x binocular microscope will require further detailed analysis and petrographic analysis to confirm these initial findings.

Survey Results

To highlight the regional nuances of settlement in the study area, the survey results from Wādī al-Ghuwayb and Wādī al-Jāriya are described separately below. In harmony with the project research design, more attention is paid in this report to an overview of the Iron Age settlement pattern for the region.

Wādī al-Ghuwayb Survey

A total of 64 sites were recorded along Wādī al-Ghuwayb over a distance of ca. 1.5km. In addition a small tertiary drainage flowing eastward from Wādī



10. Pottery from sites surveyed in Wādī al-Jāriya.

Description of Ceramics from Wādī al-Jāriya Survey

1 Reg No: 95. WAJ 521. Carinated Bowl, flaring, tapered rim. Rim Diameter: 20cm. Exterior: light reddish-brown. Interior: pink. Core: dark gray. Inclusions: shales, angular, low sphericity; wadi sand, angular, low sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

2 Reg No: 93. WAJ 521. Carinated Bowl, everted, rounded rim. Rim Diameter: 22cm. Exterior: light reddish-brown. Interior: pink. Core: dark gray. Inclusions: shales, angular, Low sphericity; fine wadi sand, rounded, low sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: fine. Hardness: hard. Feel: rough.

3 Reg No: 70. WAJ 520. Jug: upright, tapered rim, with triangular section. Rim Diameter: 9cm. Exterior: light reddish-brown. Interior: reddish-yellow. Core: dark gray. Inclusions: wadi sand, sub-angular, low sphericity. Fabric: coarse ware. Sorting: good. Texture: fine. Hardness: hard. Feel: rough.

4 Reg No: 71. WAJ 520. Jug: upright, tapered rim, with triangular section. Rim Diameter: 9cm. Exterior: white Slip. Interior: reddish-yellow. Core: dark gray. Inclusions: wadi sand, sub-angular, low phericity. Fabric: Coarse ware. Sorting: good. Texture: irregular. Hardness: hard. Feel: rough.

5 Reg No: 69. WAJ 520. Jar: upright folded rim, thickened exterior. Rim Diameter: 12cm. Exterior: white slip. Interior: pink. Core: light reddish-brown. Inclusions: wadi sand, rounded, high sphericity. Fabric: medium-fine ware. Sorting: good. Texture: fine. Hardness: very hard. Feel: smooth.

6 Reg No: 91. WAJ 518. Jar: upright rounded and folded rim. Rim Diameter: 12cm. Exterior: very pale brown slip. Interior: pink. Core: reddish-brown. Inclusions: fine wadi sand, rounded, low sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

7 Reg No: 64. WAJ 520. Cooking Pot: sloping, rounded and folded rim. Rim Diameter: 28cm. Exterior: reddish-brown. Interior: light reddish-brown. Core: dark gray. Inclusions: wadi sand, sub-rounded, low sphericity; calcite, angular, low sphericity. Fabric: coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

8 Reg No: 63. WAJ 520. Cooking Pot: sloping, rounded and folded rim. Rim Diameter: 28cm. Exterior: reddish-brown. Interior: reddish-brown. Core: light reddish-brown. Inclusions: wadi sand, rounded, low sphericity; calcite, angular, low sphericity. Fabric: coarse ware. Sorting: fair. Texture: irregular. Hardness: hard. Feel: rough.

9 Reg No: 97. WAJ 521. Cooking Pot: sloping, tapered and folded rim. Rim Diameter: 28cm. Exterior: light red. Interior: light red. Core: dark gray. Inclusions: wadi sand, sub-rounded, low sphericity; calcite, angular, low sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

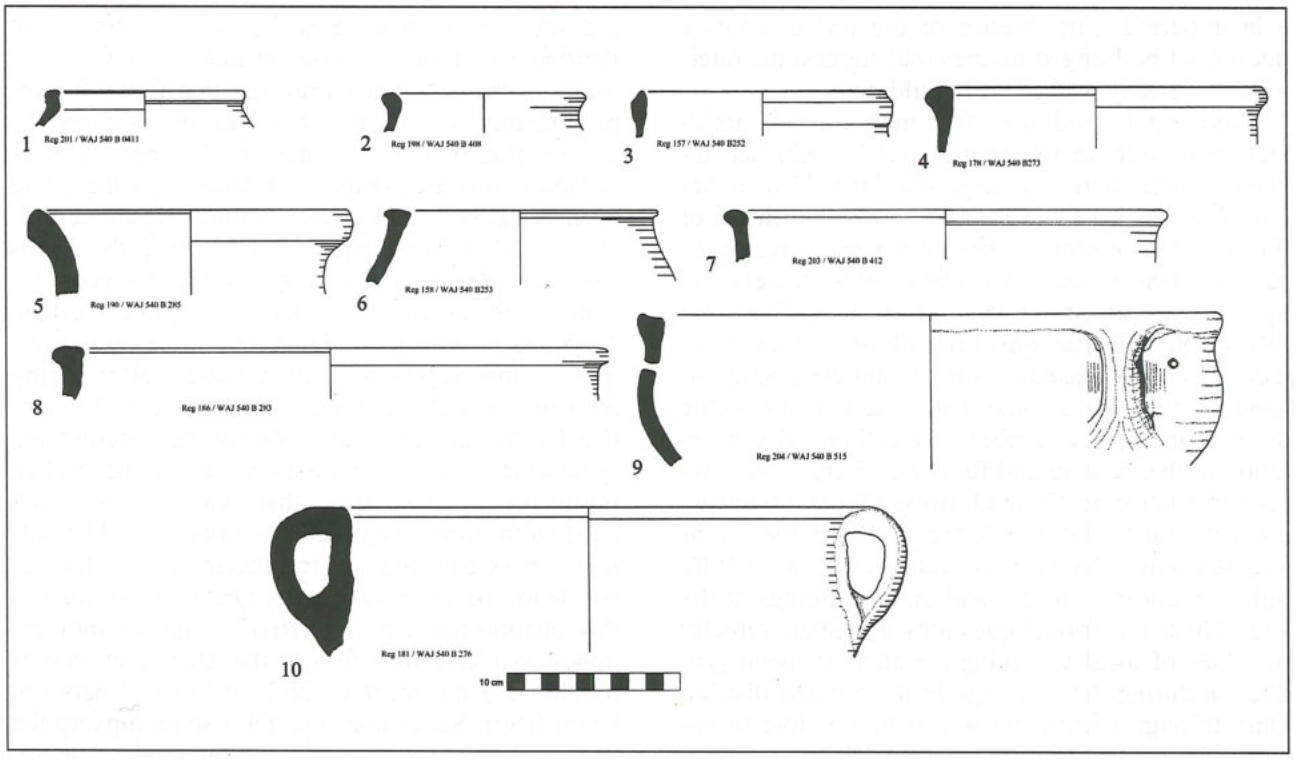
10 Reg No: 58. WAJ 520. Cooking Pot: sloping, rounded and folded rim with exterior ridge. Rim Diameter: 32cm. Exterior: pink. Interior: light reddish-brown. Core: dark gray. Inclusions: calcite, angular, low sphericity; wadi sand, sub-rounded, low sphericity. Fabric: coarse ware. Sorting: fair. Texture: irregular. Hardness: hard. Feel: rough.

Nuqayb al-'Usaymir to Khirbat an-Naḥās was surveyed bringing the total distance examined for the WAG survey to ca. 2.5km. With the exception of the Paleolithic and modern Bedouin sites found in the survey area, it can be assumed that the driving force of occupation in this area was interest in the exploitation of copper ore. Settlement pattern data for all periods is presented in **Tables 1 and 2**, however, as the JHF project focuses on the Neolithic through the Iron Age, more detailed discussion is given for only those periods here. A total of six sites were identified and linked to the Upper Paleolithic period. The dating was based on the presence of elongated blades that are highly patinated and brown in color. While there seems little doubt that these lithics date to the Paleolithic, the Upper Paleolithic date may have to be revised in the future. All of these prehistoric sites are situated on an upper terrace along both banks of the Wādī al-Ghuwayb that consists of Pleistocene sands and clays. The terrace is approximately 6m above the modern wadi channel, (**Fig. 2**) and may represent part of the Pleistocene valley bottom. The paucity of material suggests that these sites had an ephemeral occupation and were not campsites. Only three sites were identified that date to the EB I – III periods (**Tables 1 and 2**; **Fig. 5**). The surface architecture is limited mostly to stone circles, campsites and small wall lines. Most of these sites are probably linked to the exploitation of the DLS ore unit located upstream in Wādī al-Jāriya and neighboring drainages. They represent some of the earliest evidence for the exploitation of these ores in the Faynān district. While EB I corral sites have been recorded near the mouth of Wādī al-Ghuwayb by Macdonald (1992), the presence of an EB I site in survey area represents more direct evidence for the exploitation of copper ore closer to the ore sources.

Iron Age: The 9 Iron Age sites identified in the WAG survey are dwarfed by Khirbat an-Naḥās (ca. 8.6 hectares in area) (**Figs. 7, 8**). The site has one small cluster of mines to the southwest that was mapped by the German Mining Museum team (Weisgerber n.d) but not included in our survey. The other Iron Age sites in the WAG system include a cairn field, campsite, 4 cemetery sites, and a mine, ca. 1km to the east of KEN. As discussed above with regard to the internal chronological significance of the Iron Age ceramics, it is difficult at this time to go beyond ascribing the sites to the Iron Age II period. With the exception of KEN, all of these sites are ephemeral in nature. Even the cemetery sites lack well defined surface burial monuments like those observed on the surface at Wādī Fīdān 30 to the southwest of KEN (Levy *et al.* 1999).

As Khirbat an-Naḥās is the largest site in both the survey area and the western portion of the Faynān district (see **Fig. 1**), this year careful attention was given to mapping all the visible surface features. The resulting map (see **Fig. 12**) provides the first detailed map of Khirbat an-Naḥās and its plethora of architectural features on the site. The site sits on the same Pleistocene sand and silt sediments on which the Paleolithic sites described above are located. Located in a small *cul-de-sac* surrounded by formations of Salib Arkosic Sandstone, it is surprisingly far from formations containing the copper ore rich Dolomite Limestone Shale (Burj) unit. While there are pockets of DLS within the 1km catchment area of KEN, the main DLS units are located up-stream around Wādī al-Jāriya. Perhaps due to lack of time spent at the site, earlier researchers did not fully appreciate the high degree of spatial organization of Khirbat an-Naḥās. As seen in the photograph of the site (see **Fig. 14**) there are 10s of clusters of rock debris that reflect the presence of collapse architectural features surrounded, or embedded, in huge deposits of slag often rising to heights of over 4 meters. There are at least 5 "bands" of building complexes stretching across the site oriented in a northwest/southeast direction. In total, over 100 building complexes (**Fig. 12**) were mapped at the site and over 34 massive slag mounds – some measuring over 50 x 70m in area and +4m in height. The German Mining Museum team sampled one of the buildings on the east side of the site (Fritz 1996) and made a rough section through one of the nearby slag mounds (Engel 1993). Following the 2002 survey, our team excavated the gate system at KEN, a building devoted to slag processing and a slag mound (to be described in a forthcoming article).

In terms of monumental architecture, a large fortress dominates KEN with a gate located on its western side. While some researchers have suggested that the fortress belongs to the Roman period, the lack of Roman ceramics in any meaningful sense at KEN, the presence of only one gate, and elements of casemate construction indicate that the fortress belongs to the genera of late Iron Age gates from the desert regions of the southern Levant (Meshel 1992). The KEN fortress is square in shape and ca. 73 x 73m in size making it one of the largest Iron II desert fortresses in the southern Levant. Our excavations in the fortress this season confirm its Iron Age date, however, lack of space precludes going into more detail here. The fortress is bounded on the west side by a series of 8 large corrals from



11. Pottery from Khirbat al-Jariya.

Description of Ceramics from Khirbat al-Jāriya

1 Reg No: 201. WAJ 540. Jar: upright, flattened rim. Rim Diameter: 10cm. Exterior: pink. Interior: pink. Core: pinkish-gray. Inclusions: wadi sand, Sub-Angular, Low Sphericity; shales, angular, low sphericity. Fabric: medium-fine ware. Sorting: poor. Texture: fine. Hardness: hard. Feel: smooth.

2 Reg No: 198. WAJ 540. Jug: curved-out and rounded rim. Rim Diameter: 11cm. Exterior: light red. Interior: pale red. Core: gray. Inclusions: wadi sand, sub-rounded, high sphericity. Fabric: medium-fine ware. Sorting: good. Texture: fine. Hardness: hard. Feel: smooth.

3 Reg No: 157. WAJ 540. Jug: curved-in, tapered rim, exterior ridge. Rim Diameter: 10cm. Exterior: light red. Interior: light red. Core: gray. Inclusions: wadi sand, sub-rounded, low sphericity. Fabric: medium-coarse ware. Sorting: Ppor. Texture: irregular. Hardness: hard. Feel: smooth.

4 Reg No: 178. WAJ 540. Jar: upright rim with thickened exterior, and exterior ridge. Rim Diameter: 20cm. Exterior: reddish-yellow. Interior: reddish-yellow. Core: reddish-yellow. Inclusions: fine wadi sand, sub-rounded, high sphericity. Fabric: medium-coarse ware. Sorting: Fair. Texture: fine. Hardness: hard. Feel: rough

5 Reg No: 190. WAJ 540. Jar: upright, rounded rim with exterior ridge. Rim Diameter: 18cm. Exterior: pink. Interior: light reddish-brown. Core: light gray. Inclusions: wadi sand, rounded, high sphericity; shales, Angular, low sphericity; limestone, Angular, low sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

6 Reg No: 158. WAJ 540. Jar: sloping, T-shaped and flattened rim. Rim Diameter: 15cm. Exterior: pinkish-white. Interior: pink. Core: pink. Inclusions: wadi sand, angular, high sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

7 Reg No: 203. WAJ 540. Krater: upright rim, thickened exterior. Rim Diameter: 27cm. Exterior: pinkish-white. Interior: pink. Core: pink. Inclusions: wadi sand, sub-angular, low sphericity. Fabric: medium-fine ware. Sorting: Poor. Texture: fine. Hardness: hard. Feel: smooth.

8 Reg No: 186. WAJ 540. Krater: upright rim, thickened exterior. Rim Diameter: 32cm. Exterior: yellowish-red slip. Interior: very pale brown. Core: light gray. Inclusions: wadi sand, rounded, high sphericity. Fabric: medium-coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

9 Reg No: 204. WAJ 540. Krater Bowl: sloping rim, thickened exterior. Rim Diameter: 33cm. Exterior: pink. Interior: pink. Core: pink. Inclusions: wadi sand, sub-rounded, high sphericity. Fabric: medium-fine ware. Sorting: fair. Texture: fine. Hardness: hard. Feel: smooth.

10 Reg No: 181. WAJ 540. Krater: everted rim, thickened exterior. Rim Diameter: 32cm. Exterior: pinkish-gray. Interior: light reddish-brown. Core: light reddish-brown. Inclusions: wadi sand, sub-rounded, low sphericity; shales, Angular, low sphericity. Fabric: Medium-Coarse ware. Sorting: poor. Texture: irregular. Hardness: hard. Feel: rough.

a later period. The interior of the fort contains a number of building structures that suggest the interior was densely packed with buildings.

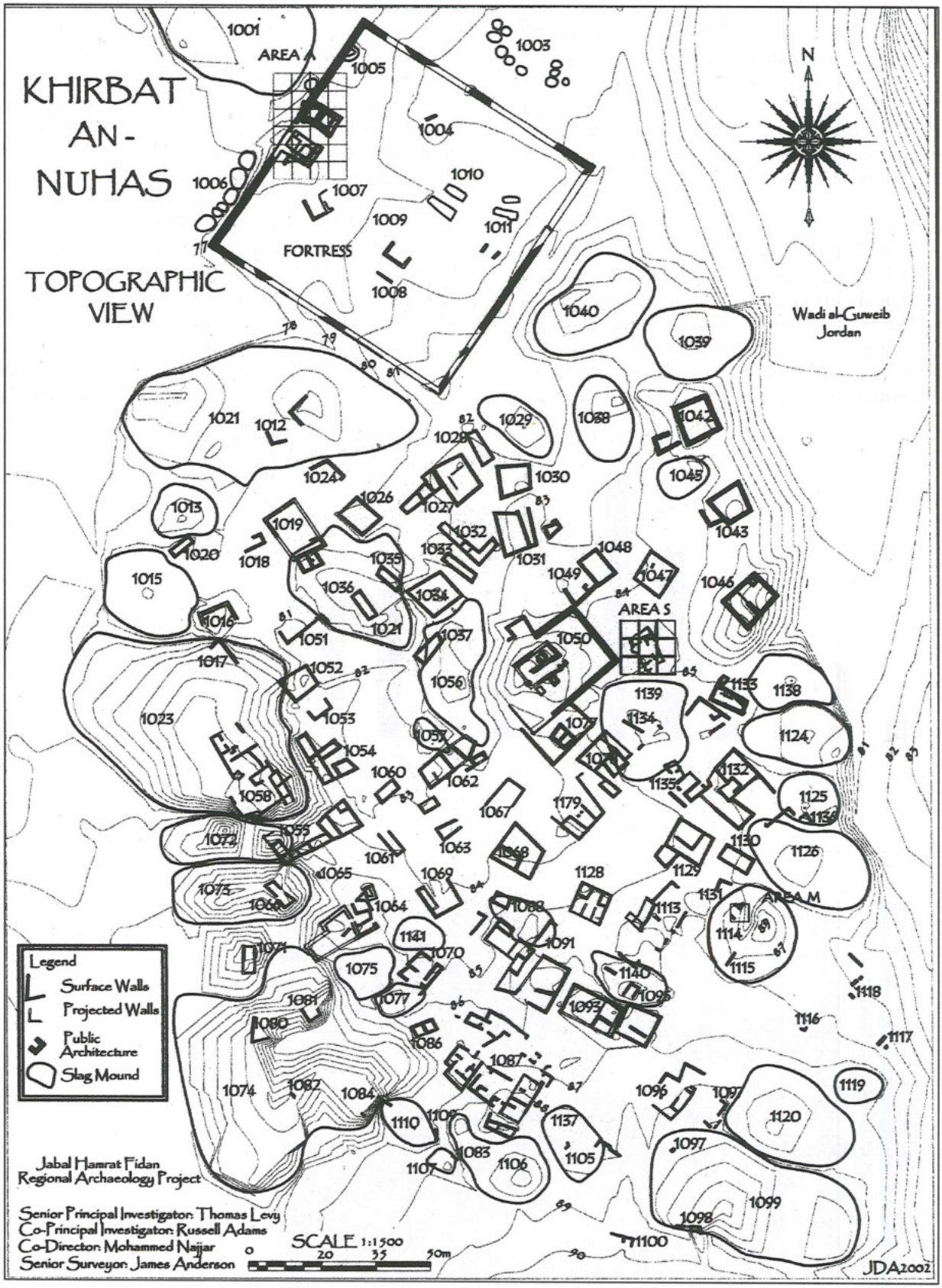
Additional evidence for monumental architecture is seen in the central part of Khirbat an-Naḥās where there is a large (ca. 20 x 30m) tower complex (Figure 12, No. 1050). To the northeast of this structure are three other large towers averaging ca. 10 x 10m in area. All four of these towers rise up over ca. 6m above the site surface. These are formidable constructions. Like all the surface architecture at KEN, based on surface pottery and architectural style, we assume that these structures date to the Iron Age. A number of questions arise in relation to their dating and function: Were these towers constructed before the fortress? Were the towers contemporary with the fortress? Were they constructed when the fortress went out of use? Who built the towers, fortress and other buildings at the site? These are critical questions that relate directly to issues of local vs. foreign control of metal production during the Iron Age in the Faynān district. Only through excavation will it be possible to answer these questions. In short, KEN is a monumental metal production site that will require a number of years of careful excavation before its socio-economic and political role in Iron Age Edom can be understood.

Wādī al-Jāriya Survey

A total of 54 sites were recorded during the survey along Wādī al-Jāriya (WAJ; **Tables 3 and 4**). As seen in (**Fig. 6**), with 27 sites, the Iron Age occupation is the most intense period of occupation in the study area. The WAJ site distribution pattern for Roman, Byzantine, and modern Bedouin sites is quite similar to Wādī al-Ghuwayb (**Figs. 13 and 5**) with small, ephemeral sites. These include stone circles, lithic scatters, campsites, and cairn fields.

Iron Age: The distribution of Iron Age sites (**Figs. 4 and 7**) along Wādī al-Jāriya represents an archetypal industrial settlement pattern. Two sites dominate the settlement pattern: WAJ 520 – a mortuary site – and WAJ 540, or Khirbat al-Jariya initially studied by Glueck (1940). Cemetery 520 is situated ca. 1km downstream from KAJ (**Fig. 7**) so it is not clear exactly how this site relates to the KAJ metal production site. Both of these sites measure ca. 3.4 hectares in area and dominate the WAJ landscape (**Fig. 15**). There is a range of different site types that surround WAJ 520 and KAJ that include (**Fig. 9**): isolated buildings, cairn fields, metallurgical sites, ore processing sites, seasonal camps, stone circles, etc. By far, the largest group of sites in the WAJ survey area is the mine and tailing sites. As seen in (**Fig. 7**), to the southeast of Khirbat al-Jāriya, a dense cluster of mines were found in the secondary drainage that flows for approximately 1km and debouches directly on the eastern side of KAJ. A total of 12 mines were recorded in this area (**Fig. 7**). A number of these had been re-opened by Jordan's Natural Resource Authority (NRA) who explored the area in the 1970s and early 1980s in the hope of finding economically viable copper ore deposits. While Faynān copper is no longer of significant value on today's market, this area was actively sought after during the Iron Age. The mines are relatively easy to identify by the presence of mine tailings around the mine entrances. The tailings represent the broken fragments of host rock that was smashed and crushed in order to extract the copper ore. The tailings can extend from several meters to over 80 meters from the mine entrances. Once accustomed to this phenomenon, it is relatively easy to spot the mines that carefully follow the DLS unit that is roughly 2-3 meters thick and sandwiched between Umm Ishrin Sandstone. The DLS seam dips up the small valley at roughly a 30-degree grade. The ancient workings in the mine tunnels could be followed sometimes for more than 60 meters into the mountainside. In some mines, ventilation shafts were found penetrating from the surface down more than 10 meters into the horizontal tunnels. Occasionally, these shafts were in-filled with sediment but it was still possible to recognize them on the surface. It is possible that the Iron Age occupants of KAJ were the people responsible for working these mines during the Iron Age.

The most important site in Wādī al-Jariya is Khirbat al-Jāriya (**Figs. 16 and 17**). The site was first identified by Nelson Glueck (1935) whose map outlines the main architectural features of the site, but introduces more order to the settlement plan than may be warranted. KAJ is situated on both banks of the wadi (**Fig. 3**) in a narrow valley bounded by Salib Arkosic Sandstone. This is a low spot for the occurrence of the DSL copper ore bearing unit which is located about 200 meters to the east of the site in the secondary wadi mentioned above. As KAJ is bifurcated by the wadi, it is difficult to say which side of the site was more important to the settlement organization. Rectilinear buildings occur on both sides of the wadi. However, the eastern portion of KAJ contains more evidence of slag mounds than does the western side (**Fig. 16**), which may indicate that more industrial activities were carried out here than on the western side of site. Like Khirbat an-Naḥās, there may be a square-shaped fortified tower on the eastern side of

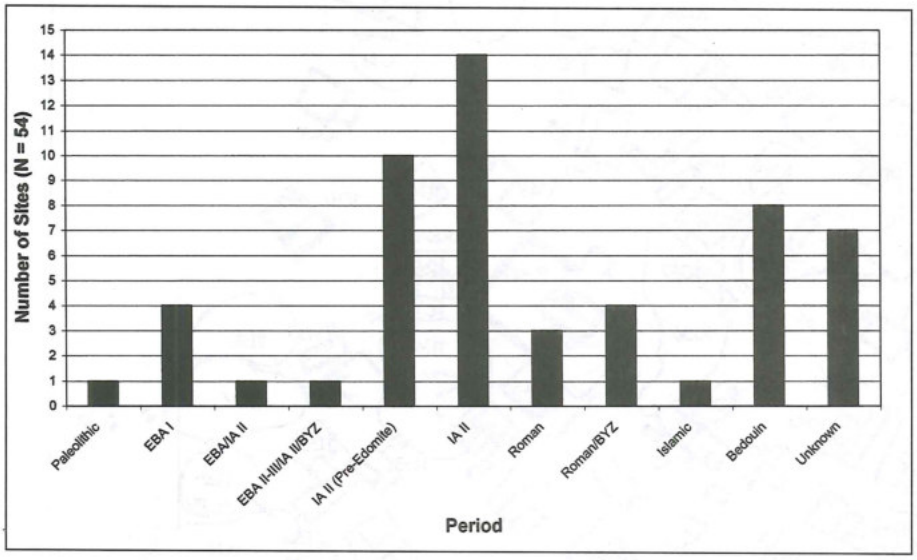


12. Topographic map of Khirbat an-Naḥās.

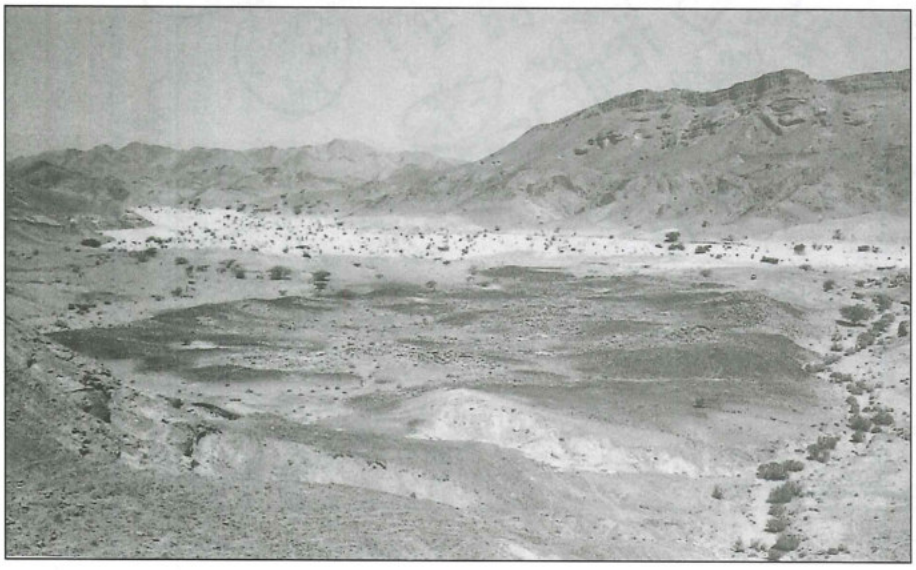
the site (**Fig. 16**). One of the central questions regarding the towers at both KEN and KAJ is whether they were constructed to keep people out or keep people in. Glueck (1940: 60) assumed that any work force compelled to labor in the Faynān region would have been slaves. Perhaps the excavation of these large-scale architectural features will help answer this question.

Conclusion

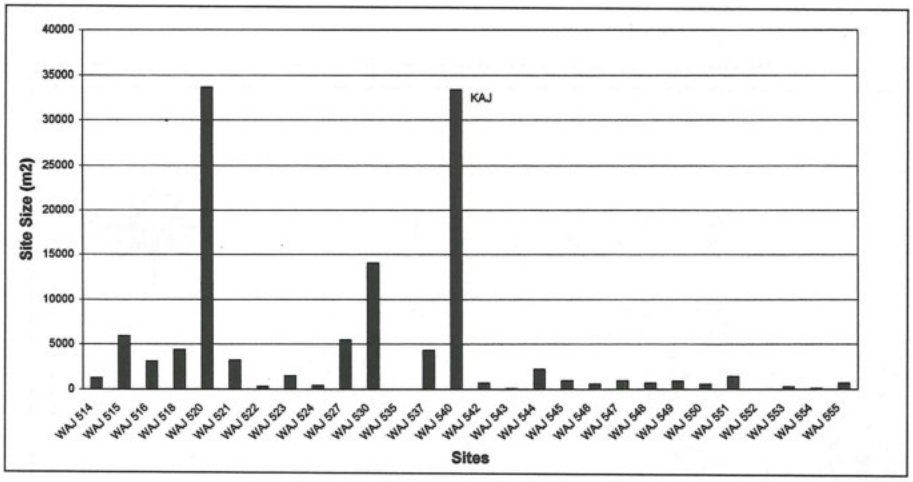
The 2002 survey along Wādī al-Ghuwayb and Wādī al-Jāriya represents the first systematic archaeological survey in this part of the Faynān district. The overwhelming message revealed by the survey data is that ancient settlement in this area can best be described as an Iron Age settlement system devoted to the extraction, processing and distribution of copper ore and copper metal. The lack of agricultural sites and tools related to farming points to the highly specialized nature of why human beings wanted to settle in this difficult environment. The discovery of the mining complex to the east of Khirbat al-Jāriya add an important new dimension to our understanding of how the Iron Age surface remains in this part of Edom articulate. It is now clear that Khirbat an-Naḥās is roughly 2/3 larger than Khirbat al-Jāriya. The higher density of slag and buildings at KEN (Fig. 12) compared with KAJ (Fig. 16) show that KEN was the nexus of metal production during the Iron Age. Exactly when and how KEN emerged as the center of copper metal production during the Iron Age can only be answered through careful excavation of the site. The location of KAJ in close proximity to the



13. Histogram of Wādī al-Jāriya archaeological sites by period.



14. Photograph of Khirbat an-*Naḥās, northwest.*



15. Histogram of Wādī al-Jāriya *Iron Age II archaeological sites by size.*

mines suggests that it may have been the home to the miners who worked the DSL deposits in the vicinity. It is possible that ore processing and partial metal processing may have been carried out at KAJ and transported ca. 3.5km downstream to KEN. But this assumes that both sites were contemporaneous – an assumption that cannot be made yet. An incredible amount of work remains before we can clarify the developmental history of the Iron Age settlement pattern in the survey area. For example, it is important to clarify whether KAJ pre-dates or post-dates the emergence of Khirbat an-Naḥās as the southern Levant's main copper producer during the Iron Age. Once large-scale excavations take place at Iron Age sites in the Edomite lowlands, scholars will be in a better position to identify the processes that led to the rise, consolidation and collapse of Jordan's southernmost Iron Age kingdom.

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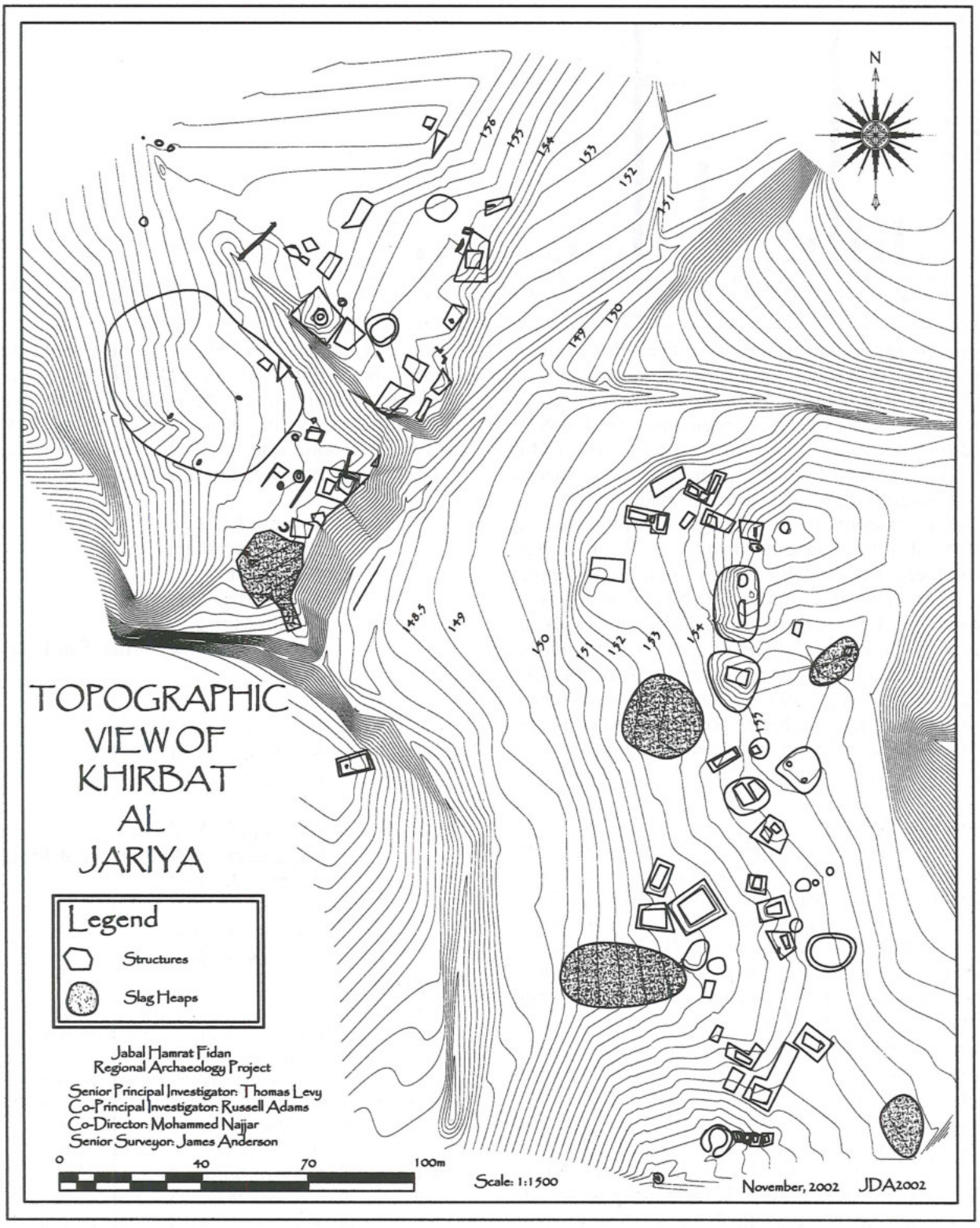

16. Topographic map of Khirbat al-Jāriya.

17. Photograph of Khirbat al-Jāriya, southwest.

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