

PETRA DECUMANUS MAXIMUS SURVEY 2008

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Introduction

In late June - July 2008 a three-person team under the aegis of the University of Delaware (USA) conducted a three-week, site-intensive survey at Petra of the paved and partially colonnaded street / *decumanus maximus* (hereafter referred to as the *decumanus maximus*) and some of the adjacent features. The team included Steven E. Sidebotham (USA), Ross I. Thomas (UK) and Mary A. Sidebotham (USA). Jean-Louis Rivard (Canada) augmented the plans and drawings somewhat based on additional survey work he and Sidebotham undertook at Petra in May - June 2013¹.

The objective of the Delaware survey was to draw a detailed plan of *decumanus maximus* (**Fig. 1**), the city's primary east - west artery, in order to understand better its dimensions, orientation, date(s) of construction, areas of repair, periods of use and relationship to adjacent buildings. Earlier excavators and scholars presented three major chronological / use phases of this thoroughfare and some of its immediate environs (Parr 1970; Fiema 1998; Kanellopoulos 2001: 11-22). These are: (1) period of unpaved street or streets and environs prior to the extant paved one; (2) paved street and environs of the early Roman period; (3) late Roman modifications and uses of the paved street and environs. Excavations by D. Graf in the

area (Graf *et al.* 2005, 2007, forthcoming; Graf 2013a, 2013b) since Z. Fiema's project in 1997 (Fiema 1998) taken together with the results of our survey necessitate some modification / clarification of the chronologies proposed by earlier scholars. In general, however, our survey confirmed the relative chronology of the street vis-à-vis adjacent structures proposed by earlier investigators. This data, when used in conjunction with information provided by the excavations of Graf (and others in the future) should allow scholars to establish a more secure phasing for the structures adjacent to the street, any earlier manifestations of the street and the extant street itself.

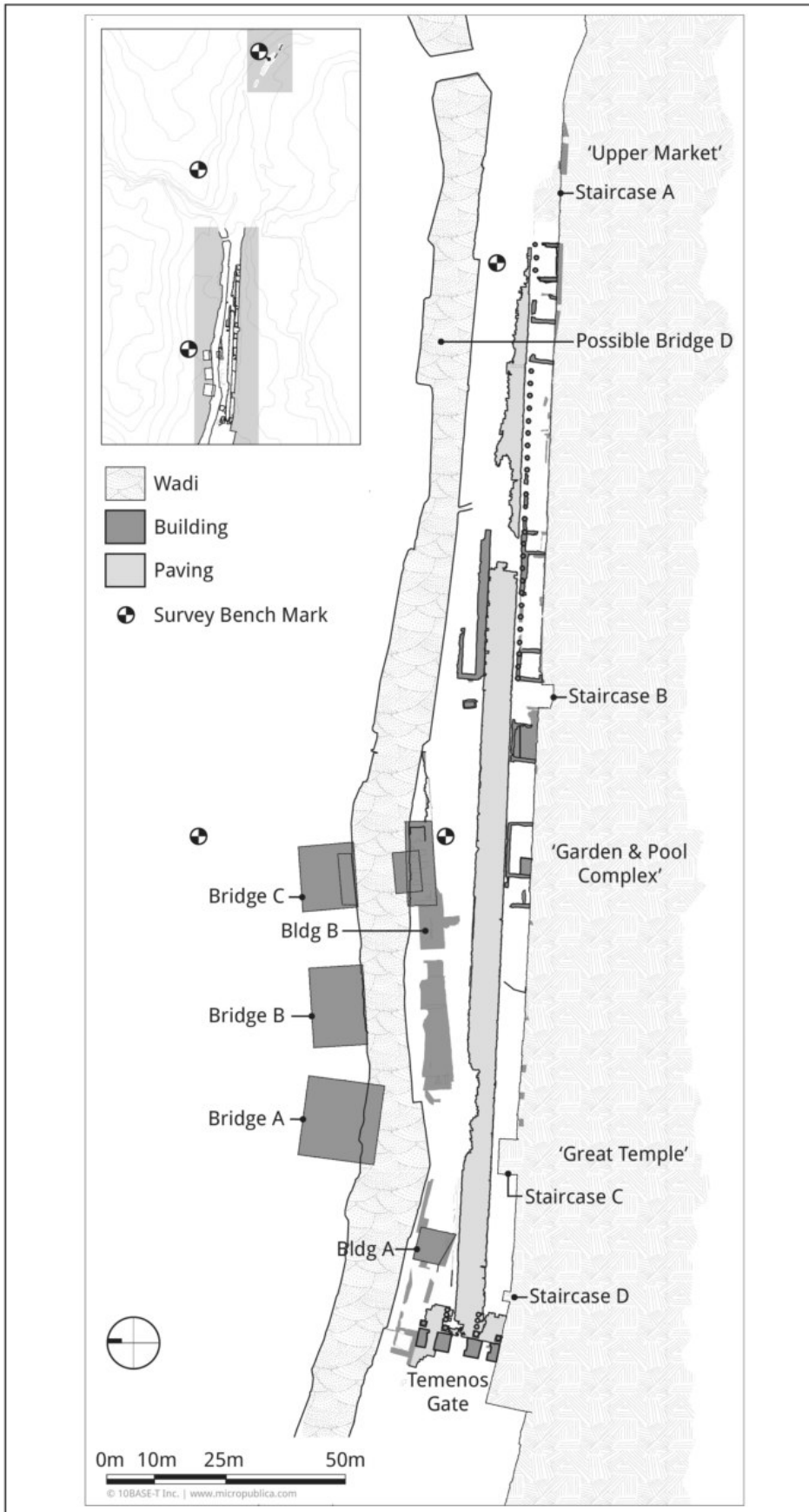
The Survey

The survey used a Leica TC-300 total station² to produce a detailed and accurate local map of the *decumanus maximus* and its immediate environs. In order to place the Delaware survey within the context of ongoing and previous work conducted in the area, the project located and tied in the main survey point created by our team with those of Peter Parr (in his trench 3 on the southern side of the *decumanus maximus*), David Graf (in his trench HPP2007-9 on the southern side of the *decumanus maximus*), three ACOR survey points used by Kanellopoulos and Akasheh to prepare their 2001 map of the

1. Dr. and Mrs. J. A. Seeger, Mr. W. Whelan, Prof. S. E. Sidebotham, Ms. M. A. Sidebotham and the Department of History, University of Delaware provided funding for the project in 2008. The return visit in 2013 was courtesy of Prof. D. F. Graf, University of Miami, Coral Gables, Florida (USA) as part of his survey of the adjacent area.

2. Loaned by the University of Southampton (UK), as were

survey and graphics software LISCAD, CAD, Corel Draw and Leica Survey Office that were used to generate the survey maps, plans and drawings produced by R. I. Thomas. Subsequently, Jean-Louis Rivard added some additional survey details from the 2013 season and modified the style of the drawings. The Brown University (USA) team loaned a tripod for use with the total station.



1. Plan of decumanus maximus and environs produced by University of Delaware Petra Street Survey project (2008). Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard (2013).

street (**Fig. 2**) and a survey point generated by Brown University above and behind (south of) the ‘Great Temple’. The Delaware team also measured these with a hand-held GPS receiver to place the local survey grid in real-world coordinates³.

To conduct the survey the Delaware project employed local labor and tools to remove concretions and wind-blown sand obscuring the street⁴. The sandy layer was especially dense towards the eastern end of the *decumanus maximus*, but clearing and cleaning took place along the entire length of the thoroughfare and in some of the adjacent structures. A heavy layer of dense concretion covered portions of the street towards its eastern end and no amount of cleaning could remove this deposit. There is additional discussion of this concretion presented below.

While ACOR / Kanellopoulos / Akasheh (Kanellopoulos and Akasheh 2001: 6; cf. Murray and Ellis 1940) published an excellent initial / overall plan of the *decumanus maximus* and its environs (**Fig. 2**), it does not provide, nor was that its intention, the great detail produced by the Delaware survey which is needed for more detailed analysis and interpretation. It does not depict some of the structures adjacent to the street with as much precision as our plan, nor could it given that Graf’s excavations took place only after the ACOR survey. The Delaware survey drew a definitive map of the street pavers, stone by stone, and recorded in plan, in as much detail as time allowed, the structures adjacent to the street. The street pavers are made of a local mulluscan limestone (J. A. Harrell pers. comm.)

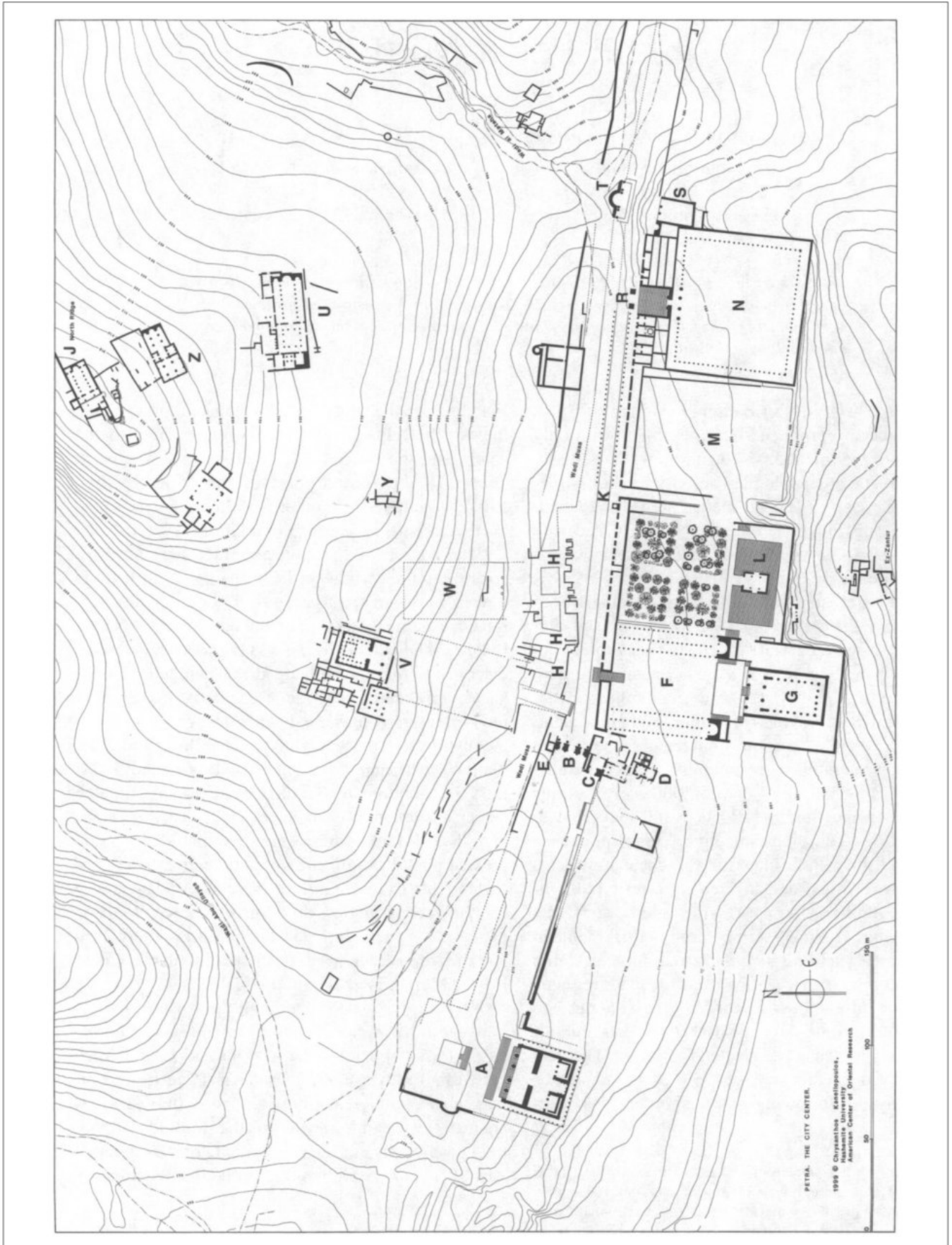
/Ma’in fossiliferous stone (Kanellopoulos 2001: 21; Rababeh 2005: 39); the extant curbing stones lining the *decumanus maximus* are made of much less stout local red sandstone, the most common building material found at Petra (cf. Rababeh 2005: 37, 39).

The length of the primary area surveyed during the 2008 season was 569.94 m east - west; more than 25,100 survey points were recorded. The Delaware survey documented a total of 5,095 paving stones and fragments in the *decumanus maximus* itself. Other pavers, clearly not part of the street, but associated with the gate at the western end of the *decumanus maximus*, are not included in this count. In addition, more paving stones survive, but these are covered by an extremely hard rubble and mud concretion (noted above) washed and deposited onto the street towards its eastern end by a *seyl* (flash flood) from the *wadi* lying just to the north. A local *bedouin* reported that this episode of flooding occurred in summer 1998, but the survey could not independently confirm this date. The concretion remaining on the street covers an area of 25.20 x 5.82 m (or 140.664 m²); the survey could not estimate how many additional street pavers this concretion covered. Hand picks were only partially efficacious in removing this overburden. At one point the survey employed a front-end loader on loan from the Department of Antiquities to try to loosen some of this concretion, but with very limited success as extreme care had to be exercised to avoid any damage to the street itself and areas immediately adjacent to it. Other areas of missing flagstones towards the eastern end of the extant

3. Main Delaware survey point (from which three other subsidiary points were also taken): 30°19.45.3’ N 35°26.35.3’ E. Peter Parr’s datum point in his trench 3 (south side of street): 30°19.45.4’ N 35°26.34.1’ E. David Graf’s trench HPP2007-9 datum point (south side of street): 30°19.44.8’ N 35°26.35.0’ E. ACOR survey point (no 3) [south-south-east of Qasr al-Bint]: 30°19.40.5’ N 35°26.26.0’ E. ACOR survey point 12 (“12” in red / orange paint; “6-7-77” carved into concrete when wet) (south of street above ‘Great Temple’): 30°19.39.3’ N 35°26.31.4’ E. ACOR survey point 13 (“13” in concrete) (north of street

above nymphaeum): 30°19.45.8’ N 35°26.45.3’ E. Brown University survey point (south and above ‘Great Temple’): 30°19.39.5’ N 35°26.30.8’ E. Unlike the total station survey, the GPS coordinates taken by our survey are, unfortunately, no more accurate than to within a few meters. Should they wish to do so, future scholars may relocate these points with minimal effort to incorporate our local survey into real-world coordinates more precisely.

4. Picks, shovels, trowels, wheelbarrows and brushes were borrowed from the University of Brussels (Belgium) equipment stored at Petra.



2. Plan of central Petra by Kanelopoulos and Akasheh (2001): 6.



3. View of decumanus maximus from gate looking east. Photo by S.E. Sidebotham.

decumanus maximus may be the result of flood damage Kirkbride observed during her work in the area (Kirkbride 1960: 117; throughout she refers incorrectly to the extant paved east - west street as a “*cardo maximus*”).

Lying above at least one and perhaps several gravel surfaced predecessors (Kirkbride 1960: 121; Parr 1970: 369; Fiema 1998: 397, 416; Graf *et al.* 2005: 419, 427-428, 432) and beneath a very late dirt road (Kirkbride 1960: 117), the *decumanus maximus* at Petra in its current manifestation from the easternmost extant paving stones just north of staircase A to the eastern face of the gate / arch at the western end of the street is 234 m long (cf. Kanellopoulos 2001: 14 who records a length of 233.40 m) and an average of 5.94 m wide (**Figs. 3 and 4**). In some areas the street is 6.04 - 6.34 m wide.

The survey also recorded the general location, orientation and outlines of another street east of the *decumanus maximus* (**Fig. 1** inset at top left and **Fig. 29**). The latter had clearly been recorded (though in what detail remains uncertain) previously as the identification of two survey points marked in green paint at two locations along the northern edge of this road indicate (cf. Kirkbride 1960: 121). The easternmost of these green-painted survey markers was

indistinct, but appeared to read: “X 218”, while the second farther west along this road segment read “X 233”. Stones in this street were, on average, significantly smaller than those used to pave the *decumanus maximus*, but appear to be of a similar material: a durable, light-colored limestone. The Delaware survey had insufficient time to clean adequately and record this more easterly thoroughfare. Instead, we documented only the visible outlines of this street, but not the individual paving stones; a thorough cleaning would reveal many more. Our survey recorded an area of this street of 69.30 m x 4.77 m.

The Decumanus Maximus at Petra and Parallels

The width dimensions of the *decumanus maximus* at Petra are similar to those of some streets in Alexandria, Egypt (van Tilburg 2007: 29-30) and the main streets in Priene, Asia Minor (van Tilburg 2007: 29-30, cf. 31). The *decumanus maximus* at Hippos-Sussita is 4.2 m wide (Segal *et al.* 2005: 9). Thus, the Petra *decumanus maximus* is about as wide as those in some urban areas of the eastern Roman Empire (van Tilburg 2007: 27-31) and wider than in others (van Tilburg 2007: 30-31).

The Romans referred to this type of thoroughfare topped with cut paving stones, common within cities throughout the empire,



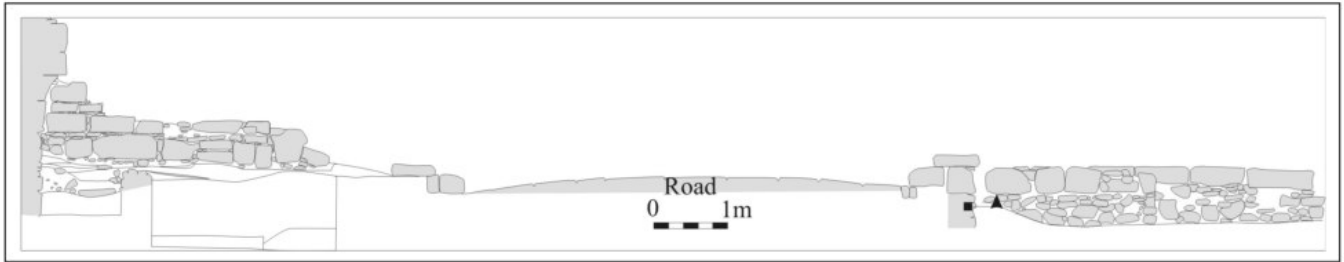
4. View of the decumanus maximus looking east northeast.
Photo by S.E. Sidebotham.

as a *via silice strata* (van Tilburg 2007: 15, note 139); variants included the *via munita* and *lapide quadrato strata* (Smith and Cornish 1898: 668). Colonnaded streets were common features in many Roman-era cities in the Levant (MacDonald 1986: 43; Fiema 1998: 395); those of Alexandria, Egypt (van Tilburg 2007: 30), Ephesus (Scherrer 2001: 64-65 fig. 3-9 no 83; 72, fig. 3-13) Antioch-on-the-Orontes (Downey 1963: 82-83, 90, 99, 203; Liebeschuetz 1972: 56), Caesarea Maritima (Holum *et al.* 1988: 175-176), Apamea (MacDonald 1986: 44, 45 fig. 40), Gerasa (Browning 1982: 133-147; MacDonald 1986: 38 fig. 35), Tyre (Jidejian 1969: photo p. 84, 160, figs 67-68), Bosra (Ball 2007: 89-90 & fig. 5), Phillipopolis (Ball 2007: 101 & fig. 8) and Palmyra (MacDonald 1986: 45 fig. 39; van Tilburg 2007: 30; Ball 2007: 120-122 & fig. 36) are especially noteworthy examples.

Details of Construction and Phasing

Typical of many roads and city streets throughout the Roman world, the Petra *decumanus maximus* crowns to a high point along the central east - west axis and slopes down towards the edges with curb stones lining the northern and southern boundaries of the thoroughfare (Fig. 5). Calculating the average / median of the height difference between the crown of the street and the northern and southern edges is difficult as the points taken by our survey are not in perfect alignment, but are instead where the pavers fall. We present here the height differences at various points along the street: easting 1894.5 (by the gate) is 19 cm; easting 1950 is 25 cm; easting 2000 is 21 cm; easting 2050 is 13 cm; easting 2100 is 13 cm. From this small sample the average elevation differences between the highest point of the street at its center crown and the edges (inside the sandstone curbing) is 18.2 cm. This crowning technique, found on many paved roads throughout the empire, prevented water from pooling on road surfaces. Of course, in most desert areas, this would not have been a major concern much of the time. This type of street construction is, however, difficult for camels to negotiate as it is quite slippery (Sidebotham pers. obs.; Kirkbride 1960: 117, 121-122), suggesting that camel caravans did not normally enter this part of the city or that those who built the street were not familiar with the limitations of that beast of burden. If the latter is the case, then this must certainly point to engineers and builders who were not originally from this part of the Roman world. In addition, the street slopes 4.26 m throughout its length from a high in the east down to a low point in the west (at the gate).

The sizes of paving stones in the street vary significantly in different areas that may relate to phasing and function. The paving slabs measure from 0.001106 m² (smallest) to 0.762425 m² (largest), with the mean average being 0.211154 m² (with 68% standard deviation falling between 0.112301 m² and 0.310006 m²). The median average is 0.198501 m² (mid value) and



5. Cross section of decumanus maximus showing crowning of the street. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas.

mode average is 0.224949 m² (most frequent). Pavers used to construct the *decumanus maximus* average 0.208 m² (standard deviation 0.303 - 0.113 m²), with a minimum of 0.001 m² and maximum of 0.762 m². However, pavers associated with the gate at the western end of the *decumanus maximus* average 0.298 m², (standard deviation 0.450 - 0.146 m²), with a minimum of 0.003 m² and maximum of 0.745 m². Thus, the paving stones associated with the gate have higher standard deviations (i.e. are less regular) and are nearly 50% or *ca* 10 cm² larger than those comprising the *decumanus maximus*.

In order to illustrate graphically patterns of construction represented by different paver sizes, each street paver is color coded by size on the plans presented here. Those highlighted in solid black are unusually large (greater than 1 standard deviation of the mean average noted above), while those coded in white are unusually small (smaller than 1 standard deviation of the mean average noted above). Those in gray are within 1 standard deviation of the average size and represent the majority of the paving stones comprising the *decumanus maximus*⁵.

In addition to recording in detail the *decumanus maximus* and its environs immediately north (up to the *wadi* bed) and south (up to the northernmost extant east - west retaining wall running approximately parallel to the street), the survey documented the western side of the gate / arch and as many of the paving stones inside the gate / arch as possible (cf. **Figs. 6 and 24**). There

were also large slabs west of the gate and on the eastern side of the northern and southern gate openings. The eastern side of the middle (main) opening of the gate has relatively small slabs that seem to have been designed to be part of the *decumanus maximus* itself; these were probably reworked / recycled from some previous use. There are also large slabs in front of one set of steps (staircase D) (**Figs. 1 and 7**) leading to the so-called 'Great Temple', which are similar in size and general appearance to those in the immediate vicinity of the gate. Excavators of the 'Great Temple' posit a construction date of first century BC with Nabataean renovations in the first century AD, possibly as late as the very early second (Joukowsky 2003: 220-221; Joukowsky 2007: 22, fig. 1.18). The latest published on the chronology of the 'Great Temple' notes an earthquake early in the second century AD, which then resulted in repairs to the propylaeum (including staircases C and D leading up to the area?) (Figs. 1 -7) in the mid second century (Joukowsky 2007: 22, fig. 1.18)⁶. If this is the case, then those areas of the temple complex abutting the street would most certainly have postdated the *decumanus* by a few decades. The excavators of the 'Great Temple' believe that that edifice originally aligned with a street that predated, but had a similar orientation to, the extant *decumanus maximus*. Unfortunately, the staircases (C and D) in their current manifestation that now lead up to the temple area from the *decumanus maximus* are part of

5. One standard deviation either side of the mean average accounts for 68% of the sample. This is a common statistical tool to identify outliers within any given

statistical sample.

6. Earthquake damage in Aqaba supports a date of early second century AD for this event (Thomas et al. 2007: 63).



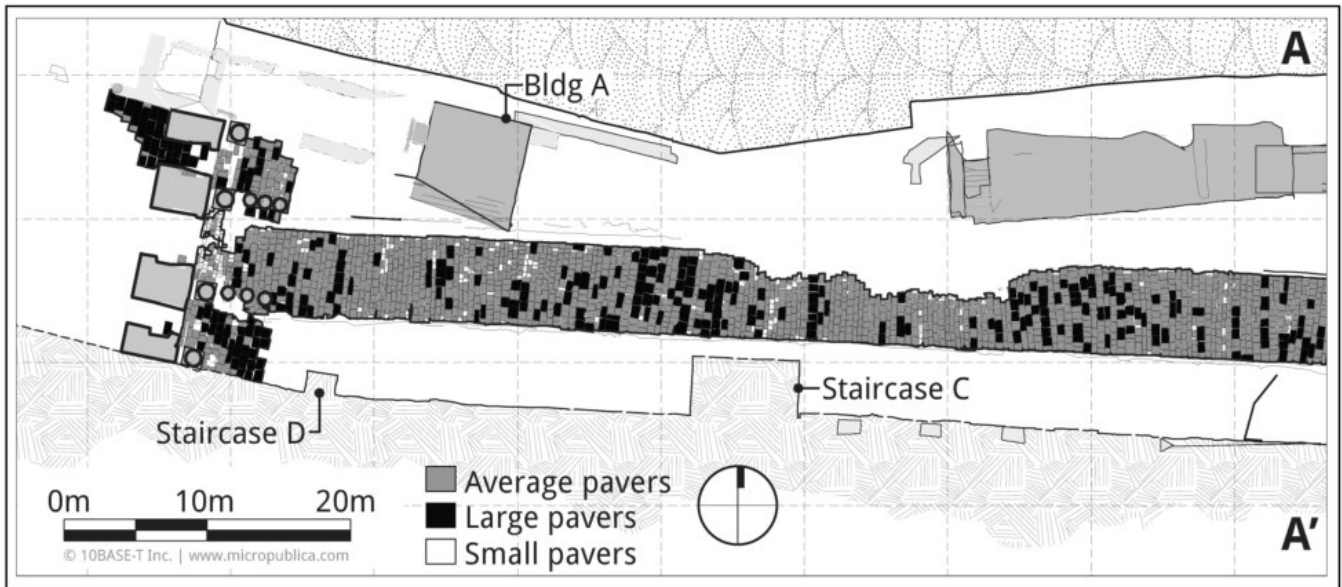
6. Paving associated with the northern-most opening of the gate looking west. Scale = 120 cm. Photo by S.E. Sidebotham.

a modern reconstruction making their ancient chronological relationship to the *decumanus maximus* impossible to ascertain. Aside from the staircases (C and D) leading to the ‘Great Temple’ from the south and their immediate environs, all the other evidence may suggest an approximately contemporary construction date for the slabs adjacent to the gate and the gate itself. If so, then this indicates that these features postdate the construction of the extant *decumanus maximus*. There may have been some additional modification of staircases C and D after the *decumanus maximus* was built and after the posited earthquake of the early second century AD, but we cannot be certain given the current state of the modern reconstructed remains in this area.

Graf’s excavations documented that the larger slabs associated with the gate to its west were

built over Nabataean structures and a street, but that those larger pavers west of the gate dated likely to no earlier than the last quarter of the first century AD (Graf *et al.* 2005: 431). We believe these larger slabs / paving stones around the gate to be somewhat later, certainly postdating the *decumanus maximus* itself. Other indications that the extant *decumanus maximus* east of the gate is likely a later manifestation of some earlier street can be seen in the alignment of buildings A and B and the structure / wall between buildings A and B on the northern side of the *decumanus maximus* towards its western end, just east of the gate (Figs. 1, 4, 7 - 9 and 11). All these structures are at noticeable, but dissimilar angles to the course of the extant *decumanus maximus*. Bridge A has a NNE - SSW orientation similar to building A, while bridges B and C have orientations similar to the wall / installation between buildings A (but not building A itself) and B, and also building B, *viz.* NNW - SSE. These orientations, none of which are parallel to the extant *decumanus maximus*, suggest not one, but at least two different street alignments prior to that now visible, at least at the thoroughfare’s western end (cf. Kanellopoulos and Akasheh 2001: 6). Since the extant evidence points to an Augustan construction date for the Temple of the Winged Lions and, by association, bridge A and building A and those must have aligned with some pre-*decumanus maximus*, likely unpaved street, we must assume that the orientation of bridges B - C and associated building B and wall between buildings A (but not building A itself) and B were built at a different time and aligned with yet another pre-paved *decumanus maximus*-era thoroughfare. We cannot be sure, however, whether these latter structures predate or postdate the Temple of the Winged Lions and associated building A and bridge A.

On the basis of these measurements and observations, the following conclusions can be made. The plan of that portion of the street marked ‘section A’ (Fig. 7) is the westernmost zone measured by the survey. Here the Petra *decumanus maximus* terminated at a main gate



7. Plan of western end of decumanus maximus. Note location of Building A. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.

comprising three arches; west of the gate the area widened into a broad plaza (**Fig. 30**) with a *temenos* area beyond (cf. MacDonald 1986: 33) in which was located Qasr al-Bint, a temple likely dedicated to the principal Nabataean deity Dushara (Healey 2001: 41-42; Graf 2006: 449). This religious structure seems to date, in its earliest phase, to sometime in the first century BC with subsequent renovations / additions (Graf 2006: 446-447; Renel *et al.* 2012: 39, 51).

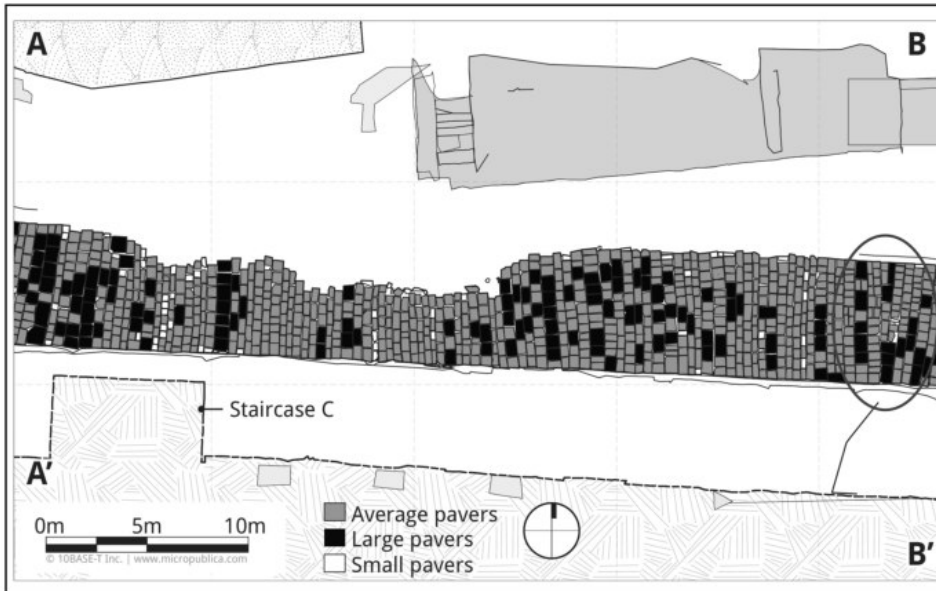
Several areas of the *decumanus maximus*, especially towards its western end ('section A'), have sunk substantially (**Fig. 10**) suggesting the presence of subterranean channels or canals. These likely carried water from the higher ground south of the street to debouche into the *wadi* to the north (cf. Graf *et al.* 2005: 420, 421 and fig. 5). The presence of oleander bushes along the street (especially on the southern side) may be another indicator of the presence of subterranean water channels and the water that still accumulates in them during occasional rains.

At the very eastern edge of "area A - B" / western edge of "area B - C", three rows of blocks on the southern side of the street become five to six rows on the northern side of the street just opposite (circled on **Figs. 9 and 11 - 12**).

This clever sleight of hand by the builders suggests an alteration of the street's original orientation in a more south-westerly direction. This may indicate that the original intention of the builders was for the orientation of the *decumanus maximus* to lie in a more north-westerly direction than its current manifestation. This modification also directed the road more towards the steps of the 'Great Temple', likely constructed before the *decumanus maximus*, but with possible modifications to staircases C and D after the appearance of the *decumanus maximus*. This change of direction of the *decumanus maximus* seems to have taken place immediately before the construction of the gate in its current manifestation or when those altering the orientation of the street became aware that a gate would soon be added. This would have taken place at some point in the early Roman period (along with the large pavers). There are concentrations of large stones within this street segment, probably owing to a rebuild / repair (see 'section A' above). This apparent realignment of the *decumanus maximus* by the builders, if it was intended to lead to Qasr al-Bint, suggests at that point in time a more holistic approach to city planning than had been the case previously. Clearly, later and larger paving stones were



8. Western end of decumanus maximus with Building A in middle foreground (looking northeast). Photo by S.E. Sidebotham.



9. Plan of section A-B of decumanus maximus. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.

then placed to form a plaza west of the gate and between the gate and Qasral-Bint (Fig. 30).

That part of the plan depicting 'section C - D' (Fig. 13) is a fairly even and intact stretch of road with pavers consisting of a mix of sizes, but no concentrations of specific sizes within the area; the majority of pavers are average in their dimensions. This area may comprise part of the earliest extant section of the *decumanus maximus*. If our interpretation is correct, then the street sections east and west (i.e. sections B - C and D - E respectively) of 'section C - D'

were built later. Of note towards the eastern end of 'section C - D' is a paving stone measuring 75.5 cm x 43.0 cm marked with a cross or 'X' measuring 15.5 cm x 15.5 cm carved in the center of the slab (Fig. 14). The relatively unworn condition taken together with exactly the same lengths of each bar of the cross may indicate a relatively modern date for its carving. While the precise function of this cross remains uncertain, it may have served as either an ancient or modern survey point. In the immediate area of this cross the paving stones are generally larger. There



10. Collapsed southern portion of decumanus maximus towards its western end (looking south): scale=60 cm. Photo by S.E. Sidebotham.

are repairs, odd-shaped smaller ‘filler’ stones, including what appears to be a recycled stone door pivot, and a number of other stones, likely reworked and / or recycled (**Fig. 15**), south of the slab containing the cross. Here we posit that a large staircase (B) (**Fig. 13**) originally debouched and intersected with the *decumanus maximus*, the southern edge of which was later blocked by red sandstone curbstones at this location.

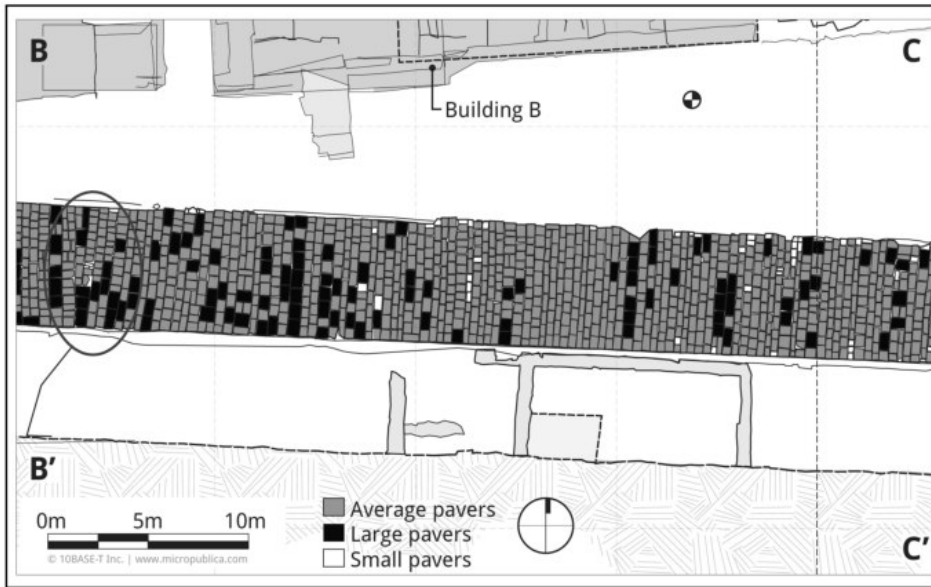
The plan of ‘section D - E’ (**Fig. 16**) shows a straight length of the street, but one that clearly sustained damage and partial destruction from *seyul* overflowing from the *wadi* situated to the north. The overburden resulting from this flooding was described above. The plan of ‘section E’ (**Fig. 17**) the easternmost end of the extant *decumanus maximus* - depicts a straight portion of road, but like ‘section D - E’ one that has been damaged and partially destroyed by one or more *seyul*, and perhaps by some human activities.

From the extant evidence, which should be tested by additional excavations along the southern side of the *decumanus maximus* more towards its eastern end (east of Graf’s excavations), we can make the following tentative observations. It appears that there was at least one and perhaps more Nabataean streets, of which little survives (Kirkbride 1960: 121; Parr 1970: 369; Fiema 1998: 397, 416; Graf *et*

al. 2005: 419, 427-428, 432; Hoffmann 2013: 102-3). This was followed by construction of the Roman thoroughfare which one sees today. Numismatic evidence from excavations conducted late in the twentieth century suggested a *terminus post quem* for this Roman street of the late first or early second century AD, likely during the reign of Trajan (98-117) (summarized by Fiema 1998: 397); its construction sometime after the Roman annexation of the Kingdom of Nabataea as *Provincia Arabia* in 106 AD is most likely.

The Decumanus Maximus and Adjacent Structures

Parr’s excavations (Parr 1970) and Graf’s in 2004 (Graf *et al.* 2005), 2005 (Graf *et al.* 2007) and 2007 (Graf 2013a, 2013b; Graf *et al.* forthcoming) placed trenches on both the eastern and western sides of the gate. Those west of the gate and on the southern side of the *decumanus maximus* towards its western end (east of the gate) and in its central portion provided evidence of earlier occupation. Parr suggested that remains he excavated farther west along the street were Hellenistic / Nabataean “dwellings” (Kanellopoulos 2001: 11, citing Parr 1970). Coins and pottery pointed to activity in this area (prior to the extant street) by at least as early as the third and second centuries BC and perhaps earlier (beneath Qasr al-Bint: possibly the fourth century BC: Renel *et al.* 2012: 45, 49 [figure 8], 50, 51; Renel and Mouton 2013: 72-5; Hoffmann 2013: 102-3; Mouton and Schmid 2013; elsewhere in the city center Graf *et al.* 2005: 436; Graf 2013a: 38, 40-46; Graf 2013b: 29-34). Whether this early occupation was domestic, religious or commercial / industrial could not, however, be conclusively determined. Occupation into at least the fourth century AD is evident from Graf’s excavations (Graf *et al.* 2005: 426; in general see Fiema 2012: 31-32). Other testimony for later activity in this area of the city are remnants of tower-like features flanking the northern and southern sides of the gate / arch. One or both of these may belong to a late Roman / Byzantine phase of fortification.



11. Plan of section B-C of *decumanus maximus*. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.



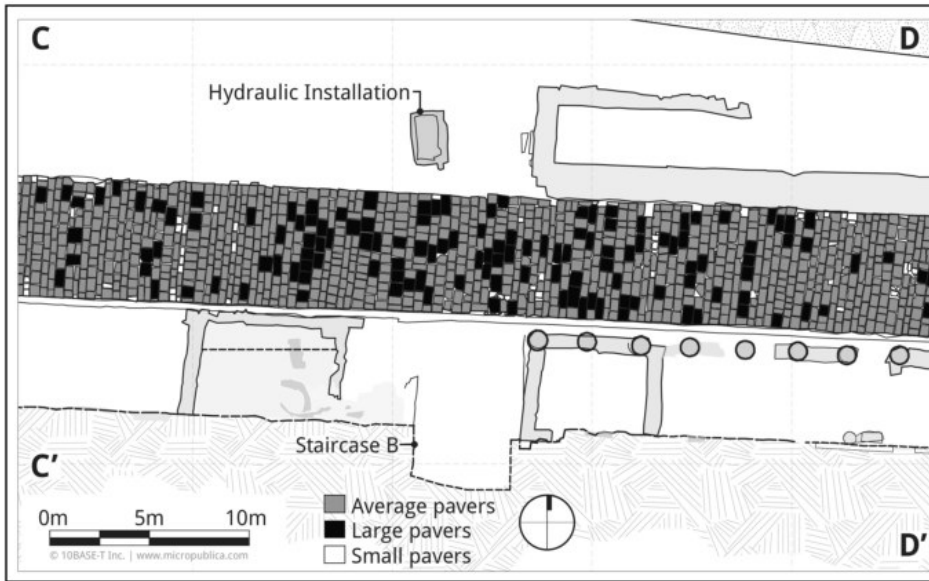
12. Section B-C of *decumanus maximus* looking south. Photo by S.E. Sidebotham.

Thus, the latest activity along and adjacent to the *decumanus maximus* in antiquity appears to have been commercial or domestic as well as military or, perhaps, all three.

Rooms, blocked doorways and window-like features in the main ‘portico’ wall (cf. Bedal 2001: 24, fig. 1; Kanellopoulos 2001: 10, fig. 1) (Figs. 18 and 19) that runs roughly parallel to and south of the extant street suggest that earlier rooms and structures lay inside and behind that wall, making use of it as the front, northernmost facade of those establishments. Kirkbride believed that at least some of these blocked features dated to the time of the construction of the *decumanus maximus* (her “cardo”; Kirkbride 1960: 118). Graf’s excavations and the appearance of column drums and bases recycled

into clearly later rooms (likely shops or taverns: cf. Fiema 1998: 396) on the southern side of the street towards the eastern end (e.g. Fig. 20) suggest that these rooms, approximately 30 in total (Kanellopoulos 2001: 11), had been blocked sometime in late antiquity, perhaps earlier, and that rooms (later shops?) were then built farther north extending onto what had originally been the sidewalk adjacent to the southern side of the *decumanus maximus*. This extension of rooms from the northern face of the retaining wall onto what had been the sidewalk south of the street’s curbing stones and colonnade effectively covered the sidewalk (cf. Kanellopoulos 2001) and eliminated the colonnade if, indeed, there had ever been one along these portions of the street.

At least 11 rooms (possibly shops) can be identified along the southern side of the *decumanus maximus*. In their present manifestation most, if not all, are likely late Roman / Byzantine in origin, though limited excavations by Graf in 2007 indicate activity in some areas beneath these late Roman rooms that dates to Hellenistic times (Graf *et al.* forthcoming; Graf 2013a: 38, 40-46, 2013b: 29-34). Walls of these late Roman / Byzantine structures located up and down the street clearly make use of much recycled architectural material including column drums, bases and ashlar (cf. Fig. 20). The survey recorded 26 doors piercing the northernmost (and likely latest) retaining



13. Plan of section C-D of decumanus maximus. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.

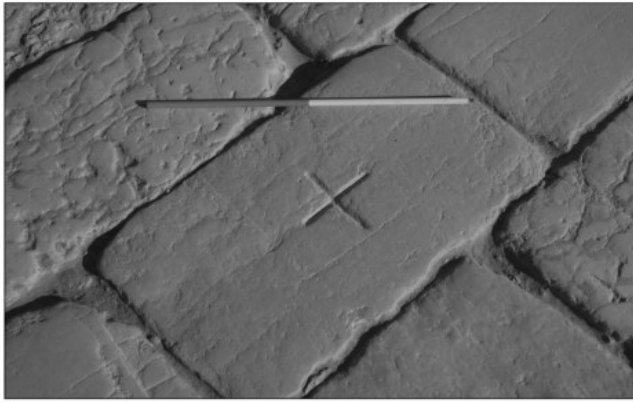
wall, which runs approximately parallel to and south of the *decumanus maximus*. A number of these portals had been blocked (e.g. **Fig. 18**) or partially blocked in some later phase of activity along the street. The survey could not determine precisely when these blockages were put in place, though Kirkbride (1960: 118) believed them to be contemporary with the construction of the street. In addition, there are four window- / niche- / alcove-like features (e.g. **Fig. 19**) in the central southern portion of that retaining wall in the area of Graf's trenches 1, 3 and 8 - 9. These may have adjoined storage rooms behind and to the south of the rooms now exposed adjacent to the southern side of the *decumanus maximus* (e.g. **Fig. 21**).

There is little evidence for the use of permanent roofing materials (e.g. terracotta roof tiles. etc.) in the structures abutting the street on its southern side in late antiquity. Instead, in some instances at least, we posit the appearance and use of awnings made of textile, woven wool or goat hair, or animal hide / leather above and in front of shops or other structures located in this area, especially in its central and western portions.

These awnings might have been held in place by poles with their ends slotted into movable stone bases to anchor them. The identification of one approximately square / rectilinear shaped stone with a round hole in the center and two circular disc shaped stones, one with a round hole and the other with a rectilinear shaped hole (pierced all the way through each disc) found in the central and western areas of the street may be the only extant evidence for the existence of these putative late antique awnings (**Fig. 22**). Graf recorded similar holed stones in his 2004 excavations (Graf *et al.* 2005: 426, 427, fig. 17)⁷. The documentation of at least one other of these anchors for awnings in a likely Nabataean context (Graf *et al.* 2005: 425, fig. 15 and 426) may indicate that awnings were used in earlier times as well, but perhaps on a more limited scale. These presumptive awning pole anchors may have been recycled from architectural elements / column drums. The earthquake of 19 May 363 AD damaged or destroyed some, if not all, of the structures adjacent to the street (Fiema 1998: 398)⁸. The survey could not determine, however, whether the supposed awnings would

7. We are not certain, but it is possible that the putative awning anchor stones documented by Graf 2005: 426, 427 (fig. 17) may have been removed from his trench and might be the same ones we photographed from the surface of the site in the general vicinity of his earlier trench.

8. See Thomas *et al.* 2007, 66 on the frequency and magnitude of earthquakes, including that of AD 363 and less well-known events from the historical sources that are, nevertheless, attested archaeologically.



14. Cross (possible ancient surveyor's mark?) carved on a paver on the *decumanus maximus* in "Section C-D." Scale = 60 cm. Photo by S.E. Sidebotham.



15. Recycled (pivot stone and other stones in a secondary context) and filler cobble-sized and smaller stones in the middle of the *decumanus maximus* adjacent to lower (northern) end of missing Staircase B (looking south): scale=60 cm. Photo by S.E. Sidebotham.

have been deployed after the earthquake in lieu of any substantive rebuilding of the damaged / destroyed structures or had been used prior to that event. Given the sketchy evidence from Graf's excavations (noted above) it appears likely that awnings were used on an *ad hoc* basis in adjacent structures throughout the history of the street.

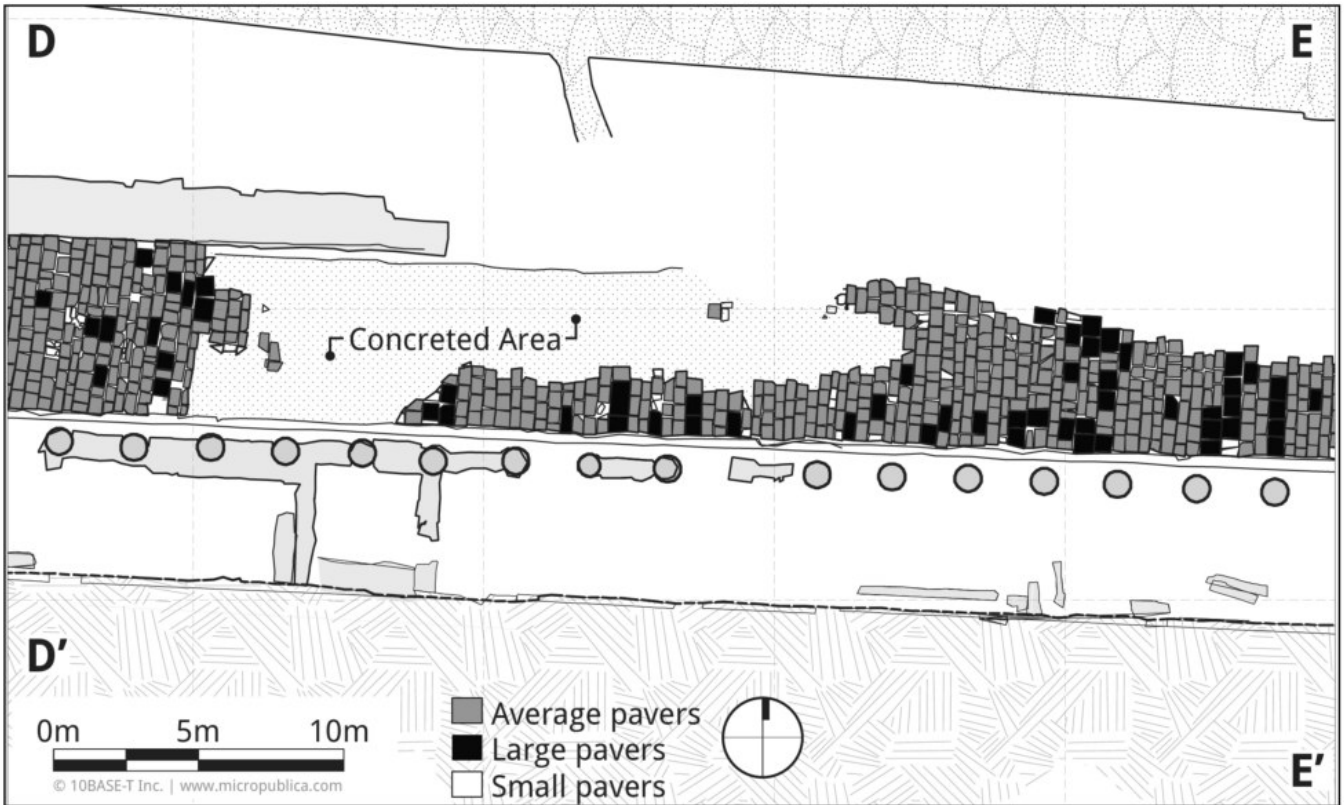
The sandstone curbing appears not to have been contemporary with the original paved

street, but seems to have been added at some later date (Figs. 23 and 24). Towards the western end of the *decumanus maximus*, those curbstones do not sit atop the extant northern edge of street paving, but are offset and form, instead, the southern edge of the larger slabs associated with the gate itself (Fig. 24). It was with these larger pavers that the tripartite gate was clearly contemporary and it was in this period when the gate and larger pavers were installed that the curbing stones appear to have been placed. Thus, the extant red sandstone curbstones seem to have been added at about the same time that the gate and the large slabs associated with it were built, *viz.* sometime after the initial construction of the *decumanus maximus*. The reddish sandstone curbstones may have been quarried specifically for the use in which we now find them. However, they may have been recycled from some earlier structure(s) (perhaps portions of one or more staircases or other edifices) from elsewhere on site. Sample measurements of randomly selected steps in staircase A (Figs. 1 and 25)⁹, were compared with those of curbstones measured along different sections of the *decumanus maximus*¹⁰. While some of the curbing stones might have been recycled from now missing (and presumably robbed) staircase B (*ca* 5.50 m wide) (Figs. 1 and 13), which originally led to the upper level south of and above the street, comparison of stones from extant staircase A (assuming that stones comprising staircase B had similar dimensions as staircase A) with randomly selected curbstones in the street does not invariably support this hypothesis. Lengths and thicknesses of both sets of stones (steps in staircase A and curbstones) suggest that an approximately similar set of dimensions was applied to the quarrying of both, but the thicknesses of the curbstones

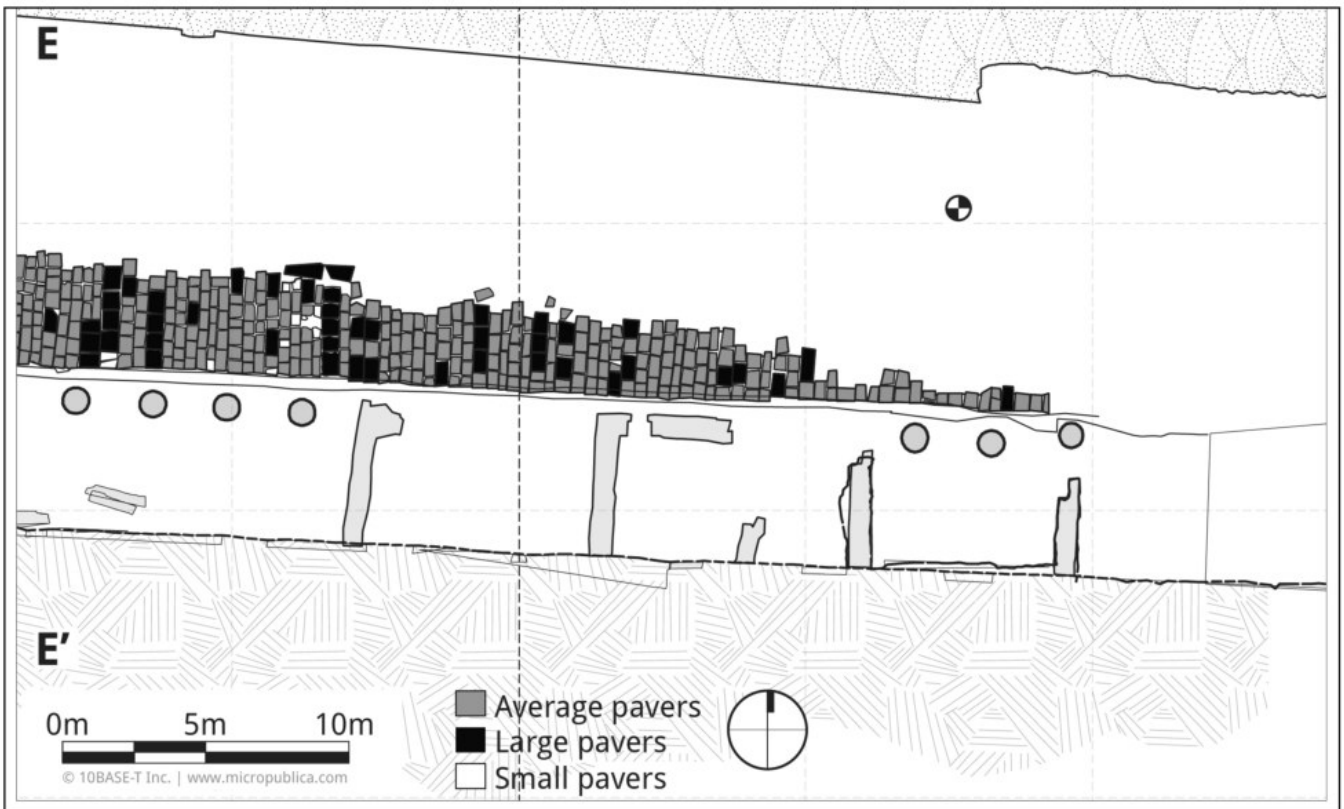
9. Measurements taken at the extreme eastern end of the street on its southern side provided the following dimensions: (1) 1.25 m x 0.39 m x 0.12 m; (2) 1.10 - 1.11 m x 0.39 - 0.40 m x 0.15 - 0.16 m; (3) 0.99 m x 0.41 m x 0.13 m; (4) 0.97 m x 0.40 - 0.41 m x 0.09 - 0.10 m; (5) 0.94 m x 0.37 m x 0.14 m; (6) 0.93 m x 0.37 - 0.38 m x 0.14 m.

10. Measurements taken of the curbstones had the following

dimensions. Southern side of street near the arch: (1) 0.79 m x 0.46 m x 0.18 m; (2) 0.78 m x 0.45 m x 0.20 m; (3) 0.67 m x 0.35 m x 0.14 m. Northern side of street mid section: (1) 0.80 m x 0.43 - 0.44 m x 0.20 m; (2) 0.69 m x 0.40 m x 0.20 m. Southern side of street slightly west of mid-section: (1) 0.90 m x 0.45 m x 0.18 m; (2) 0.75 m x 0.36 - 37 m x 0.23 - 0.24 m; (3) 0.67 m x 0.45 m x 0.19 - 0.20 m; (4) 0.64 m x 0.35 m x 0.19 m.



16. Plan of section D-E of decumanus maximus. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.



17. Plan of section E of decumanus maximus. Surveyed by S.E. Sidebotham, R.I. Thomas and M.A. Sidebotham. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.



18. Blocked doorway (survey no. 17) on the southern side of *decumanus maximus*: scale=60 cm. Photo by S.E. Sidebotham.



19. Blocked window/niche/alcove-like feature (survey no. 3) on the southern side of *decumanus maximus* (looking south): scale=60 cm. Photo by S.E. Sidebotham.

are generally greater than those of the steps in staircase A, which would preclude it as their original provenance as would the fact that no stones are missing from staircase A in its current manifestation. Of course, since the steps of staircase B are missing, we have no way of

ascertaining whether the stones comprising it might have been generally thicker than those in staircase A. If so, then it is possible that at least some of the curbstones may have come from the dismantling of staircase B. In the final analysis, however, the question of the recycling of at least some of the extant curbstones of the street from steps now missing from staircase B remains unanswered.

Thus, it appears, at its western end at least, that the paved *decumanus maximus* predates, though by how much is unclear, the gate, its associated larger paving stones and the curbstones lining both sides of the *decumanus maximus* itself. The similarity in size, appearance and materials of the paving stones around the gate and those lying between the gate and Qasr al-Bint suggests that both were laid down at the same time, i.e. after construction of the *decumanus*. Qasr al-Bint itself, however, seems aligned with the *decumanus maximus*, though the former certainly predates the street. It seems that the paved plaza, the gate and those pavers immediately abutting the gate were built after Qasr al-Bint and the *decumanus maximus*. The relative chronology of Qasr al-Bint appears to be:

- Phase I: Simple installations preceding construction of Qasr al-Bint (4th - 3rd centuries BC)
- Phase II: Architecture predating Qasr al-Bint (3rd - 1st centuries BC)
- Phase III: Qasr al-Bint (mid 1st century BC - levelled for cultic complex currently visible [see Renel and Mouton 2013: 72-75])

Thus, the general relative chronology of this area of Petra appears to be: (1) original construction of Qasr al-Bint and its related *temenos*; (2) construction of the *decumanus*; (3) construction of the gate and the pavers of the plaza between it and Qasr al-Bint. As noted above, staircases C and D leading to the 'Great Temple' may also have been modified at this time (i.e. after construction of the *decumanus maximus*), though their current modern reconstruction precludes any definitive conclusions. Complicating more precise dating



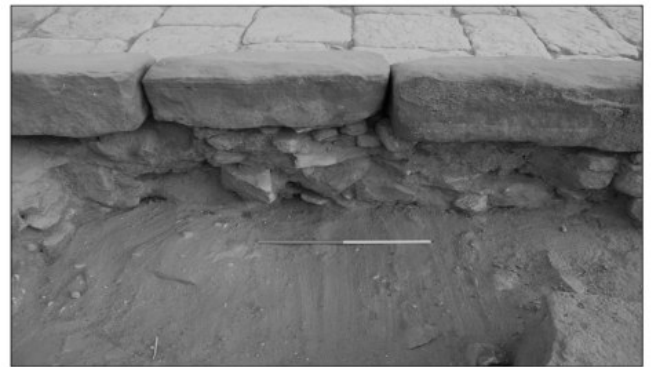
20. Late Roman/Byzantine shop wall made of recycled architectural elements on the southern side of decumanus maximus: scale=60 cm. Photo by S.E. Sidebotham.



22. Worked stone discs possibly used as moveable anchors for poles to support awnings: scale=50 cm.



21. Possible storage room connected by door (survey no. 26) to the southern side of the decumanus maximus: scale=120 cm. Photo by S.E. Sidebotham.



23. Northern side of decumanus maximus: street foundation, paving stones and curbing (looking south). Scale = 60 cm. Photo by S.E. Sidebotham.

are, most certainly, various subsequent repairs and reconstructions of these major features that may have taken place over an undetermined period of time during the ancient occupation of this portion of the city.

If the *decumanus maximus* itself were to be extended along its current alignment towards the west, it would terminate approximately in the center of the main eastern wall of Qasr al-Bint. Yet, the extant three-arched *temenos* gate does not align with the street's orientation / extension to Qasr al-Bint. This suggests that the gate and the street lying to the east (the *decumanus maximus*) were not configured as a single project. Indeed, the paving beneath the gate on its western side and north of the street on its eastern side is not only different in appearance - as noted above with stones generally larger than the pavers of the decumanus - but was clearly laid down at

a different time from the street pavers (and as is also evident from the location of curbstones at the northern side of the street at its extreme western end [visible in **Fig. 24**]). Careful cleaning and examination of all these paving stones by our survey and the results of Graf's excavations conducted adjacent to the gate in 2004 suggest that the time differential between the laying down of the pavers in the area west of the gate, the construction of the gate itself and the creation of the paved *decumanus maximus* was minimal. Undoubtedly different construction crews were responsible for each of these features and their completion dates may have varied by as little as a few weeks, a few months or by as much as several years, perhaps decades. Clearly, however, in their latest manifestation all these features were designed to be seen as a single, though not seamlessly executed, organic feature



24. Realigned curbstones at western end of *decumanus maximus* adjacent to gate/arch (looking west): scale=60 cm. Photo by S.E. Sidebotham.

of Petra's city center by sometime in the first half of the second century AD. In addition, the column base moldings from Graf's excavations west of the gate vary in appearance from the other three types found east of the gate. These variations suggest that different architects and masons worked in the areas west and east of the gate, which may provide further evidence for different phases / dates of work in this part of Petra. Alternatively, these differences in the styles of column base moldings may only reflect the activities of different work crews who may well have labored simultaneously. Finally, that the columns currently visible immediately east of the gate seem to have been placed there in about 1960 and from locations unknown may

not allow us, of course, to draw any conclusions about relative dating based on the shape of their moldings alone when compared to those west of the gate.

Some of the column elements found along the colonnaded street are variations of the Attic column base (with upper and lower torus, scotia between and fillets) (**Fig. 26**). The Attic type became the most popular column base used by Roman architects (Anderson and Spiers 1907: 195-205, 322; Adam 1990: 84, 92, 98)¹¹. This base form appears in a range of contexts, from the early colonnaded street of Antioch dated to *ca* 170 BC (Anderson and Spiers 1907: 195-205) and Hadrian's retreat in Tivoli (second century AD). The Attic base appears within Petra as part of a mixed order; it exists in both freestanding columns and also in engaged columns / pilasters appearing on the carved façades of its famous rock-cut tombs, such as ed-Deir (Wilson Jones 2000: 111-112). It is likely, however, that many of the freestanding bases at Petra represent architectural phases that post-date the Roman annexation of 106 AD (Ward-Perkins 1981: 328-9; Rababeh 2005: 126-134).

Though Kanellopoulos (2001: 11) asserts that there were originally 72 columns, 36 along each side of the street, the Delaware survey found no such evidence. In late antiquity, by which time shops or other facilities encroached onto areas of what had previously been the walkway south of and parallel to the street, the columns, if they had existed here initially, had been removed. There is no extant evidence that the entire length of the street examined by the survey had a colonnade in late antiquity. Possibly only its eastern end possessed columns by that time; the ones currently visible on the southern side of the *decumanus maximus* at its eastern end were re-erected in 1960 (Fiema 1998: 396). Columns re-erected in modern times (also in or about 1960) at the western end of the street near the *temenos*

11. This type of base was popular beginning with its development as part of the Ionic order. Found in architecture from the late fifth century BC, such as that on the front (eastern) porch of the Erechtheion on the

Acropolis in Athens, the Attic column base continued to be used in the Corinthian order from the late second century BC and the Roman Composite order from the first century AD.



25. Staircase A at eastern end and on southern side of decumanus maximus (looking east). Photo by S.E. Sidebotham.

gate may or may not have originally been part of the street colonnade. They may have been recycled here from other locations remote from the street itself, a hypothesis with which Kanellopoulos (2001: 9, 11) seems to agree.

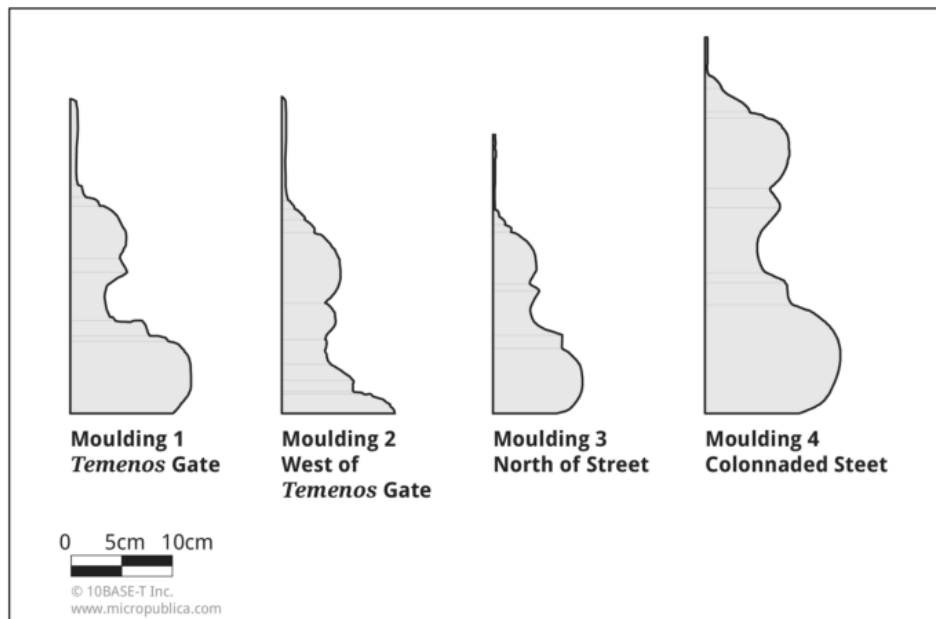
At least three bridges of varying dimensions spanned Wādī Musa north of and roughly parallel to the *decumanus maximus* itself towards the central part and western end of the street (**Fig. 1**). There may have been one or more bridges farther east; all would have facilitated communication between areas north of the *wadi* (e.g. the Temple of the Winged Lions, the later church etc.) with the southern side, i.e. where the *decumanus maximus* is now and points uphill and to the south including the ‘Great Temple’ (Kanellopoulos and Akasheh 2001: 6), the pool / garden (Bedal 2001) etc. The Delaware survey plotted the general outlines of three of these bridges, but could not determine with certainty when they were erected in relation to the decumanus. It is evident, however, that bridge A was associated with and probably erected at the same time as the Temple of the Winged Lions, *viz.* sometime during the last quarter of the first century BC up to 27 AD with continued use until the earthquake of 363 AD (Hammond 1996: 7). The director of the Temple of the Winged Lions Cultural Resources Management Initiative, Dr . C. A. Tuttle, reports that his team is currently “re-examining the evidence and assessing the original proposed chronological phasing” of

this key edifice (C. A. Tuttle pers. comm.). In addition to the remnants of the bridges, the project also plotted a hydraulic feature north of the street (**Figs. 27 and 28**).

Conclusions

It is clear that the extant manifestation of the *decumanus maximus* at Petra is a composite of several different phases of use and repair. While its general date of ‘Roman’ must be accepted, it is uncertain how many earlier Nabataean versions of the street may have existed, what these earlier versions looked like or how orientations of the *decumanus maximus* may have changed with the addition of new buildings along its periphery (cf. Seigne 1999). The *decumanus maximus* may represent, along with the reconstruction of a variety of other structures in Petra at that time, a significant change in the use of space in the center of Petra that saw the reorganization of the format and use of funeral complexes, tribal gathering places, and sanctuaries and houses following the Roman annexation in AD 106 (Schmid 2103: 265-266). The western end of the *decumanus maximus* has a number of construction / use phases. The arch / gate in its current manifestation is not aligned with the extant pavers of the decumanus, but sits slightly off-center and askew to the north-west (**Figs. 1 and 7**). This indicates that the present arch / gate was not designed in tandem with the extant decumanus, but postdates it, a conclusion that Kirkbride (1960: 120-121) supports. This does not preclude the existence of an earlier arch / gate in this area, which may well have been modified by and / or incorporated into this later edifice (also Graf *et al.* 2005: 427, 432). The extant arch / gate postdates the larger pavers (**Figs. 6 - 7, 24**) (cf. Graf *et al.* 2005: 431-432), though both these larger pavers and the arch likely belong to the same construction phase. These larger pavers continue west into the area between the arch / gate and Qasr al-Bint and form the open plaza (**Fig. 30**).

Street pavers of substantially smaller sizes immediately east of the gate’s central opening



26. Sections of Attic style column bases from the gate area. Drawn by R.I. Thomas, edited and redrawn by J.-L. Rivard.

and the various recycled stones (including the pivot block) opposite staircase B (Fig. 15) point to repairs / alterations. The likely change in orientation of the *decumanus maximus* seen towards its western end where curbstones have been moved to align with larger and later pavers associated with the arch / gate on its eastern face (Fig. 24) and, possibly, the variant designs of some of the column bases found near the gate all point to different orientations of the *decumanus maximus*. The angles of the entrances of buildings A and B and of the wall that lies between these two edifices lying on the northern side of the *decumanus maximus* towards its western end (Figs. 1 and 7 - 8) likely point to different orientations of thoroughfares that predate the extant paved street. On the western end of the plan representing 'section B - C' the road clearly changed direction from its original projected course (Figs. 9 and 11 - 12), and headed more towards the south-west, viz. more aligned with Qasr al-Bint which lies west of the gate. These structures and other architectural and exposed archaeological evidence should, along with additional excavations, provide some future project with the information necessary to phase more definitively activities under and along the *decumanus maximus* and determine the number, appearance and orientation of any streets in the

area predating that thoroughfare.

Three extant staircases, and the robbed remains of a fourth, debouche onto the *decumanus maximus* from its southern side (Fig. 1). Two (reconstructed, at least in part, in modern times) descend from the 'Great Temple' (C and D) and one (A) (just east of the easternmost extant end of the *decumanus maximus*) from the Trajan-era 'market'. There is a fourth now robbed staircase (B). Extant walls perpendicular to and piercing the main east - west retaining wall of the high ground behind the street suggest that this staircase B connected the main street with the 'pool complex / lower market' or 'middle market'. Alternatively, staircase B may have led to both. In any case, curbstones adjacent to the street and the lower portions of this 'staircase' are clearly different from other curbstones in the vicinity, in that they have more roughly cut faces. The street pavers in this location are also recycled (pivot stones / other stones in a secondary context), with smaller filler cobble-sized and smaller stones (Fig. 15). In the middle of the street, where these 'repairs' appear and opposite where staircase B would have met the *decumanus maximus*, is the cross carved into a paver described above (in 'section C - D') (Fig. 14). It is in remarkable condition, placed as it is at the crown of the thoroughfare. The survey



27. Hydraulic feature north of decumanus maximus (looking east). Scale = 60 cm. Photo by S.E. Sidebotham.



28. Hydraulic structure north of decumanus maximus (looking northwest). Scale = 60 cm. Photo by S.E. Sidebotham.



29. View of street east of the decumanus maximus (looking west). See Figure 1 (inset at top left). Photo by S.E. Sidebotham.

could not determine whether this cross was modern or ancient; if the latter, it could possibly represent an ancient surveyor's point.

Farther east, opposite the extant colonnade, the entire curb structure and northern part of the street are missing, undoubtedly washed away by



30. Area between gate and Qasr al-Bint looking west. Photo by S.E. Sidebotham.

periodic *seyul* that have overflowed the banks of the *wadi* over time. Further evidence of this water- and sediment-borne damage may be apparent on the surviving curbstones bordering the southern side of the street on its eastern end. Here, significant segments of the softer red sandstone curbstones have been damaged, perhaps by water washing up against and past them (**Fig. 31**). Kirkbride believed that the eastern end of the *decumanus maximus* had been built first and the western end later, arguing that the sizes of the paving stones suggest a reduction in funds available for construction (Kirkbride 1960: 120-121). While we would, in general, agree with her chronological conclusions, her belief that differences in sizes of pavers reflect funding issues is less convincing.

There is little evidence that the entire street was colonnaded at least in late antiquity. All the extant evidence suggests that perhaps only the eastern end had a colonnade up to the juncture of putative staircase B joining the 'lower / middle markets' to the street near the cross, a presumed ancient or modern surveyor's point ('section C - D') (**Figs. 13 and 14**). This may be additional evidence for some redesign / reorientation of the street at its central and western end and its varying appearances from approximately this point along the street to the gate / arch at the western end.

Thus, we posit the following general chronology for those areas near the *decumanus*



31. Damaged curbstones on southern side of *decumanus maximus* at its eastern end (looking south). Scale = 60 cm. Photo by S.E. Sidebotham.

maximus and for that street itself for which we have some evidence:

Phase I: Pre-paved decumanus maximus period

Sub-phase Ia

4th - 2nd century BC activity (domestic / commercial / industrial?) adjacent to the street at least in its central and western portions on its southern side; likely unpaved street/s in this area oriented approximately east - west; earliest pre-Qasr al-Bint construction activities.

Sub-phase Ib

1st century BC / 1st century AD activities: likely an unpaved street; Temple of the Winged Lions and associated bridge A and building A; the 'Great Temple'; the extant southern portico wall and some rooms piercing its façade; possibly staircases A - D.

Sub-phase Ic

Building B and wall between buildings A (but not building A itself) and B at the western end - central portion / northern side of the extant *decumanus maximus* and bridges B - C. Not certain if sub-phase Ic might predate sub-phase Ib.

Phase II: Extant decumanus maximus

Sub-phase IIa

Construction of the extant *decumanus maximus* early in the 2nd century AD.

Sub-phase IIb

Addition of red sandstone curbstones;

remodeling of staircases A - D to accommodate the paved street; construction of the gate at the western end of the *decumanus maximus* and associated large pavers around the gate, between the gate and Qasr al-Bint and below staircases C - D leading to the 'Great Temple'. Some of this activity may have been due to the putative earthquake of the early 2nd century AD.

Phase III

Middle - late Roman period (3rd - 4th centuries AD and later, including earthquake of 363 AD) removal of some of the columns of the *decumanus maximus* at its central and western ends; creation of shops and other installations encroaching onto the southern side of the street (i.e. north of the portico wall and south of the street's southernmost curbstones); more extensive use of putative awnings; construction of later 'Byzantine' towers adjacent to extant gate at western end of *decumanus maximus*.

At this time we cannot place putative bridge D or the hydraulic feature north of the *decumanus maximus* into the chronology presented here.

Plans for future work and thanks

Funding and permit allowing, the University of Delaware would like to extend its survey in the future to include the following: detailed drawing of a plan of the area between the gate / arch at the western end of the *decumanus maximus* and Qasr al-Bint, and detailed drawing of a plan of the street situated east of the *decumanus maximus*.

We would like to thank the Department of Antiquities of the Hashemite Kingdom of Jordan and its director general, the late Dr Fawwaz al-Khraysheh, for kindly granting us a permit to conduct our work in 2008. A special thanks must go to our inspector Mr Ahmad Juma' al-Shami. Ahmad was instrumental in so many ways in smoothing the way for our project's ultimate success. Prof. David F. Graf read a version of this manuscript and provided very useful comments and bibliography. Dr Chris A. Tuttle also provided bibliography and his latest views on the dates for the Temple of the Winged Lions

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