Figure 2.70. Map of Jund al-Urdunn and adjoining districts. Reprint of Walmsley and Damgaard, 2005, fig. 1.
Figure 3.1. Schematic hierarchical representation of water sources (Potable sources in blue). By author.
Figure 3.2. Plan of water-table well sites in the study area. By author. Adapted from Google Earth image © 2017 CNES/Astrium & © 2017 DigitalGlobe.
Figure 3.3. 1953 Aerial photograph showing the location of the main springs in Upper wadi Suf. Adapted from HAS 5-015, courtesy of APAAME.
Figure 3.4. Aerial photograph showing the main springs in central Jarash valley north of Birketein. Adapted from HAS 6-114, courtesy of APAAME.
Figure 3.5. Aerial photograph showing the location of the Birketein South spring. Adapted from APAAME_20080918_DDB-0037, photographer D. Boyer.
Figure 3.6. Plan showing the location of Tell Jarash North spring. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 3.7. Spring locations and terrain in the southern Jarash valley; the spring legend is as for figure 3.6. (a) Plan showing spring locations. Adapted from Google Earth image © 2017 CNES/Astrium & © 2017 DigitalGlobe; (b) Image of the same area showing slope (5-degree increments) highlighting the incised nature of the valley. AW3D satellite data © 2014 NTT RESTEC data on image supplied by Geoimage Pty Ltd.
Figure 3.8. Location of the three zones of springs recognised in the city area. Adapted from Lepaon, 2011, p. 416 fig. 2.
Figure 3.9. 1930s photograph of parapet wall at Qairawan spring. Reprint of Ionides, 1939, p. 154.
Figure 3.10. Plan showing the location of Qairawan Cave spring in relation to Qairawan spring and the Church of the Prophets. Adapted from 1:500 plans drawn 1928-1934, Yale University Art Gallery, Gerasa Archive Collection, 1938.5999.5004.30; 1938.5999.5004.32.05.
Figure 3.11. Early plans of the Qairawan spring area. (a) Part of a plan of the city drawn during Bankes’ visit in 1816 showing structures near Qairawan cave spring. Adapted from D-BKL/H/3/7/3/27, ©National Trust Images/ DHCC; (b) Plan of Jarash by Charles Barry, 1819; (b) Enlargement showing details of Qairawan spring and adjacent 20 m long wall; (c) Enlargement of the area highlighted in (b). (b) and (c) adapted from D-BKL/H/3/7/3/29, ©National Trust Images/ DHCC
Figure 3.12. Comparative views of Qairawan Cave spring area. (a) Modern view of cliffs to the north of the entrance to the spring. By author; (b) A watercolour drawn by William Bankes from the same location in 1816 (note cliffs on RHS). Reprint of D-BKL/H/J/7/3/3, ©National Trust Images/DHCC.

Figure 3.13. Site of Hellenistic spring in Gerasa’s south-west quarter. (a) Aerial view, showing the spring located at the south-west corner of a later Roman reservoir. Adapted from APAAME_20130413_DDB-0413, photographer D. Boyer; (b) Detailed view of excavated spring entrance, looking westerly. Adapted from Blanke, 2018, p. 31, fig. 28, courtesy of Late Antique Jarash Project.
Figure 3.14. Interpreted relict spring site associated with a reservoir (southern reservoir) in the city’s north-west quarter. (a) Plan of the site recorded by Yale Expedition ca. 1930, showing the interpreted southern entrance to the spring. Adapted from Yale University Art Gallery, Gerasa Archive Collection, 1:500 Sheet NW A3; (b) View of the interpreted spring site at the eastern end of the reservoir in 2011, showing the interpreted blocked up southern entrance to the spring on the RHS. By author.

Figure 3.15. Interpreted relict spring site located 150 m north of the site in Figure 3.19 in the city’s north-west quarter, looking south. (a) Aerial view taken in 2008, looking south. Adapted from APAAAME_20080918_DDB-0104, photographer D. Boyer; (b) Modern ground view, looking south. By author.
Figure 3.16. Historical aerial views of the Bab Amman Mesa showing the interpreted location of spring outlets at the Qwneit spring locality. (a) RAF vertical view, 1926, showing the springs in the context of the Hippodrome and the Bab Amman necropolis. Adapted from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b207-01 b-207; (b) German oblique aerial view 1918, looking south. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 459.
Figure 3.17. Modern oblique aerial view of the Ficus Springs locality, looking north, highlighting the interpreted position of the original gorge (now buried). Adapted from APAAME_19990613_DLK-0032; photographer D. Kennedy.
Figure 3.18. Modern aerial view of the relict spring site JWP173 east of the waterfall at the Shallal locality, showing 5 m contours. Image from Bing © 2017 DigitalGlobe. AW3D satellite data © 2014 NTT RESTEC Data on image supplied by Geoimage Pty Ltd.

Figure 3.19. Detailed ground views of the relict spring site JWP173 showing the specus of the spring outlet emerging from the foot of the cliff and a small rock-cut basin nearby. By author.
Figure 3.20. Examples of tufa encrustations exposed on the rock-face above the north-south aqueduct close to site JWP173, demonstrating groundwater sourced from the overlying Jarash Conglomerate formation. (a) Aqueduct passing through Kurnub Group sandstone outcrop encrusted with cascade tufa (scale 1 m). By author; (b) Close-up of cascade tufa beside the aqueduct (scale 20 cm). By author.

Figure 3.21. The location of the spring at site JWP181. Adapted from DigitalGlobe and CNES/Astrium 2017. Inset shows spring location on 1953 photograph. Adapted from APAAME_19530000_HAS-6-112, courtesy of APAAME.
Figure 3.22. Location of main springs in Majarr-Tannur valley. Adapted from DigitalGlobe and CNES/Astrium 2017 image.
Figure 3.23. Oblique aerial photograph showing the location of Riyashi spring. Adapted from APAAME_20130428_DDB-0953; Photographer D. Boyer.
Figure 3.24. Photo-interpreted evidence of archaeological features in the Riyashi spring locality. (a) An overview of the interpreted features; (b) Enlargement showing interpreted features adjacent to the Riyashi springs. Adapted APAAAME_19530000_HAS-6-112, courtesy of APAAAME.
Figure 3.25. Modern aerial view of Tannur spring, looking south. Adapted from APAAME_20130428_DDB-DSC0135, Photographer D. Boyer.
Figure 3.26. Relationship between strong springs and Hellenistic sites. Adapted from DigitalGlobe and CNES/Astrium 2017 image.
Figure 3.27. Relationship between strong springs, Hellenistic and Roman sites. Adapted from DigitalGlobe and CNES/Astrium 2017 image.
Figure 3.28. Relationship between strong springs and Late Roman–Byzantine sites. Adapted from DigitalGlobe and CNES/Astrium 2017 image.
Figure 3.29. Plan showing the relationship of late Roman–Byzantine sites and all spring locations (spring dot size reflects discharge strength); areas rich in springs, but with few settlement sites, are highlighted. Adapted from DigitalGlobe and CNES/Astrium 2017 image.
Figure 4.1. Schematic diagram highlighting structures associated with surface water collection. By author.
Figure 4.2. 1953 aerial photograph of the western side of central Jarash valley showing historic terracing and cross-wadi walls. Reprint of APAAME_19530000_HAS-6-113, courtesy of APAAME.
Figure 4.3. Historical and modern terraces on hill slopes and cross-wadi walls in a tributary wadi east of Wadi Riyashi. There is archaeological evidence of EBI and Roman-Byzantine occupation on adjacent hilltops, but the dating of the terracing is not known. Adapted from APAAME_20130428_DDB-0130, photographer D. Boyer.

Figure 4.4. 1953 aerial photograph of the Riyashi spring locality in the Majarr-Tannur valley showing the location of the barrage constructed in Wadi Umm Qantara upstream of the springs. Adapted from APAAME_19530000_HAS-6-112, courtesy of APAAME.
Figure 4.5. Isometric drawing of an interpretation of the area around the Zeus Temple and Camp Hill ca. AD 30, showing the location of the interpreted barrage dating to the late Iron Age-early Roman period. Adapted from Seigne, 1987, p. 58 fig. 5.
Figure 4.6. Location of hypothetical barrage site near Birketein. (a) 5 m contours draped over satellite image. Image © 2018 Microsoft, AW3D satellite data © 2014 NTT RESTEC data on image supplied by Geoimage Pty Ltd; (b) Same area as (a) showing 5 m contours from AW3D data and natural constriction point in Jarash valley in the vicinity of Birketein.
Figure 4.7. Examples of rock-cut conduits in rainwater catchment systems. (a) Sketch plan of site JWP162; (b) Photo of site JWP162 with a reservoir in the foreground; (c) Rock-cut conduits in the bedrock below original steps to the Artemis temple podium, looking east; (d) Detailed view of the scene shown in (c). By author.
Figure 4.8. Examples of rock-cut conduit profiles. (a) Large trapezoid cross-section in Naur limestone—conduit JW01, site JWP128 (scale 2 m). By author; (b) Large trapezoid cross-section of a channel from a spring cut into Kurnub Group sandstone, spring channel—Ficus Springs site JWP146(N) (scale 0.2 m). By author; (c) Small trapezoid cross-section in Kurnub Group sandstone with recut specus—Ficus Springs site JWP146 (scales 0.2 m). By author; (d) Conduit with a large rectangular cross-section cut into calcretised bedrock—conduit JW01, site JWP112 (scales 0.5 m). By author; (e) Rectangular cross-section with U-shaped specus in calcretised Jarash Conglomerate—site JWP147. By author; (f) Trapezoid cross-section with U-shaped specus in calcretised Jarash Conglomerate—conduit JW01, site JHS143 (scale 1 m). Courtesy of Jerash Hinterland Survey.
Figure 4.9. Evidence of conduit roofing on conduit JW01 where it appears to have been used to contain water in full conduits or areas of turbulence. (a) Two roof blocks preserved at site JHS143. Courtesy of Jerash Hinterland Survey; (b) Bedrock cut to receive roof blocks over a stepped cascade at site JWP127. By author.
Figure 4.10. Evidence of pick marks on conduit walls. (a) Conduit JW01, site JWP128; (b) Spring conduit Ficus Springs, site JWP146(N); (c) Conduits below tunnel Ficus Springs, site JWP146. (By author).
Figure 4.11. Evidence of pecked tool marks on conduit floors. (a) Ficus Springs, site JWP146; (b) Conduit SW02, site JWP165. By author.

Figure 4.12. Examples of repeated plaster applications (arrowed) on conduit JW01. (a) Site JHS143 (scales 0.5 m). Courtesy of Jerash Hinterland Survey; (b) Site JWP128 showing the location of the three main plaster layers (scale 10cm). By author.
Figure 4.13. View of Ficus Springs locality, looking north, showing the location of the tunnel (RHS) in the context of the local landscape. By author.

Figure 4.14. Evidence of earlier steep wadi walls. (a) An 8 m high vertical wall forming the west side of gorge exposed in looter’s excavation—site JWP140 (scale 2 m); (b) Subvertical walls forming the east side of the gorge—site JWP146. By author.
Figure 4.15. Views of the Ficus Springs site. (a) General view of the Ficus Springs tunnel, looking east; (b) View of the north end, looking north; (c) View of the south end (2 m pole); (d) Internal view of the tunnel (small scale 20 cm). By author.
Figure 4.16. View of the eastern side of the Ficus Springs site showing the location and impact of a historic landslide—site JWP146. By author.

Figure 4.17. Examples of tunnel “windows” at Ficus Springs. (a) and (b) East bank, site JWP146. By author.
Figure 4.18. Ficus Springs, site JWP146, showing examples of change in tunnel direction and uncut wall sections. Direction of tunnel cutting shown with yellow arrows. By author.
Figure 4.19. Ficus Springs, site JWP142, showing examples of tunnel damage caused by spring flow. By author.
Figure 4.20. Overview of the tufa cascade tunnel location, central Jarash. Photo courtesy of APAAAME; APAAAME_20151001_MND-0345, Photographer M. Dalton.

Figure 4.21. Relict cave spring (Tufa Cascade spring) that supplied the tufa cascade tunnel aqueduct, site JWP178. By author.
Figure 4.22. Tufa cascade tunnel profiles. (a) Site JWP177; (b) Site JWP178a; (c) Site JWP178b; (d) Site JWP156. By author.

Figure 4.23. Interior views of the tufa cascade tunnel. (a) Site JWP156 (scale 0.5 m); (b) Site JWP178a (scale 0.5 m); (c) Site JWP156; (d) Site JWP 178b. By author.
Figure 4.24. Ca. 1903 photograph showing half-tunnel conduit JE04a running north from Qairawan cave spring along the foot of the cliff. Adapted from Princeton University, Howard Butler archive, photo 734.

Figure 4.25. Walled structures north of Church of the Prophets that may have been reservoirs. Adapted from George Horsfield Collection, North Theatre_2_14324353753_actd3907668, © UCL Institute of Archaeology.
Figure 4.26. Views of Qairawan Cave spring showing tunnel. (a) View looking north showing tunnel location; (b) and (c) Tunnel profiles. By author.
Figure 4.27. Plan showing the location of sites with conduit blocks. Five-metre contours from AW3D data draped over image © 2018 Microsoft.
Figure 4.28. Examples of conduit blocks from a supply aqueduct on an old excavation dump located south of St Theodore-Cathedral complex in 2011. (a) Two aqueduct conduit blocks with rectangular specus lined with opus signinum plaster (scale 30 cm); (b) Detailed end view of conduit block showing 3 cm thick opus signinum plaster (scale 10 cm); (c) Close-up of plaster detail (scale 10 cm). By author.
Figure 4.29. Conduit blocks from aqueduct DW01 on the El-Hammar plain north of the city. (a) & (b) Examples of large dressed conduit blocks; (c) Conduit block cut from column drum; (d) & (e) Examples of conduit blocks with relict plaster. By author.

Figure 4.30. Examples of conduit blocks with a narrower specus from the El-Hammar plain north of the city. (a) Block with a specus 10 cm wide. By author; (b) Conduit block with sediment trap (small scale 20 cm). Reprint of Kennedy & Baker, 2009, p. 24, fig. 11.
Figure 4.31 Views of conduit DW01, Wadi ed Deir, 2008. Site JHS 405.3 showing large conduit blocks that may be in situ. Photos courtesy of Jerash Hinterland Survey.

Figure 4.32. Pile of conduit blocks beside the road from Mukhayyam Suf to Asfur recorded in the late 1990s. Photo P. Freeman.
Figure 4.33. Examples of conduit roofing types in the city area. (a) Masonry conduit with a flat roof that carried water to a “Canal chamber west of clergy house, room B76” (castellum divisorium). Yale University Art Gallery, Gerasa Archive Collection, negative B.34.100 B517 B-517; (b) View of the gabled roof to masonry conduit in “House VI, Area West of St Theodore”. Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-a165~01 A-165.
Figure 4.34. Views of conduit JE02 from Qairawan spring. (a)-(d) Site JWP111. (a) 3D view of substructio adjoining Small East Baths. Adapted from Lepaon 2012b, Pl. CLII; (b) Cross-sectional view through substructio, looking north. Adapted from Lepaon 2012b, Pl. CXLVII; (c) Side view of substructio 3.25 m high (scale 2 m). By author; (d) Vertical view showing canal on top of substructio (scale 0.5 m). By author; (e) Vertical view showing canal detail (scale 0.5 m). By author; (f) Sectional view through substructio wall. Opus cementicium enclosing specus to RHS (scale 0.5 m). By author.
Figure 4.35. Views of the conduit carried on a substructio of the Dille-Raphana aqueduct, southern Syria. (a) External view of the southern substructio of the Wadi Qanawat bridge. Reprint of Döring, 2016, fig. 4.9-2 (photo: M. Döring); (b) Cross-section through the southern substructio of the Wadi Qanawat bridge. Reprint of Döring, 2016, fig. 4.10 (photo: M. Döring).
Figure 4.36. An example of conduits bordered by stones at site JWP121, Kh. esh Shawahid. (a) Side view; (b) More detailed view from above. By author.
Figure 4.37. Examples of conduits bordered by dressed and partly dressed masonry. (a) Conduit at base of fill in first century AD gateway, north end of the Oval Piazza. Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b224-01 b-224; (b) Conduit adjoining podium of Artemis cella (Byzantine—? Early Islamic). By author; (c) Roofed conduit JW05 at city’s South–west Gate (Early Islamic). By author.
Figure 4.38. Varieties of ceramic pipe found in Gerasa by the Yale Expedition in 1930. (a) Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b-177 (scale 15 cm); (b) Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa b-178 (scale 15 cm).
Figure 4.39. Examples of water supply pipes intra muros. (a) Ceramic pipe (lower) east of Cistern 1, West of St Theodore’s church. Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-a39–01 A-39; (b) South Decumanus, south sidewalk, ceramic pipe (RHS) that probably supplied the fountains on the North Tetrapylon. Reprint of Ball & Bowsher 1986, pl. XIV; (c) Ceramic pipe at the foot of western city wall. Reprint of Kehrberg & Manley 2003a, fig. 3;(d) Ceramic pipe inside masonry conduit in Street West of St. Theodore, June 1930. Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative number: gerasa-a19–01 A-19.
Figure 4.40. Examples of lead piping in the city. (a) Lead pipe supply line beside the southern colonnade, South Decumanus. Reprint of Department of Antiquities photo, Jerash 1976, 10); (b) Lead pipe beneath the sill of South gate, 1930. Yale University Art Gallery, Gerasa Archive Collection, negative A131 A-131.
Figure 4.41. Watercolour view of the west bank of Wadi Jarash near the West Baths drawn by William Bankes in 1818 showing the absence of any bridge crossing the wadi upstream of the city’s North Bridge. Adapted from D-BKL/H/J/7/3/28, ©National Trust Images/ DHCC.

Figure 4.42. View of a bridge crossing Wadi Jarash near the West Baths photographed by Guillaume-Rey in 1858. Adapted from Rey 1861, pl. 20.
Figure 4.43. Satellite image showing the location of sites on aqueduct JW01 where aqueduct flow rates have been calculated. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.44. Examples of flow diversion devices at spring heads. (a) Qairawan spring showing the opening in the parapet wall that may have been used to redirect flow from the spring as well as serving as a service portal. By author; (b) Flow redirection device in tunnel aqueduct JE01 located ca. 15 m downstream of the Tufa Cascade spring head. By author; (c) Aerial view of early flow diversion arrangement at the eastern outlet of Tannur spring. Adapted from APAAME_20130428_DDB-0136, photographer D. Boyer; (d) Ground view of the same location shown in (c) showing the arrangement of the overflow basin and cascade. By author.
Figure 4.45. Examples of conduit type with a stepped specus sectional profile. (a), Conduit SW02, Site JWP164, showing narrow specus cut into the floor of wider conduit, separated by plaster wall (LHS) (scale 0.5 m). By author; (b) Conduit DW05, Site JWP144 (scale 0.2 m). By author; (c) Conduit JE01, site JWP169 (scale 0.5 m). By author; (d) Conduit JSE01, site JWP146, showing narrower, deeper specus cut the floor of a tunnel. By author; (e) View of a primary drain west of St Theodore’s church showing a gutter cut into the floor. Reprint of Yale University Art Galley Gerasa Archive Collection, negative gerasa-a59-01 A-59.
Figure 4.46. The stepped chute cascade installation at site JWP127. (a) View looking upstream; (b) View looking downstream (to south-east). Adapted from Boyer, 2016b, p. 524, fig. 6.

Figure 4.47. Examples of pressure control devices built into pipelines in the city. (a) A device comprising a vertical ceramic pipe (arrowed) encased in concrete in the pipeline supplying the Cardo street fountains. The site is on the west side of the Cardo immediately south of fountain 8. Reprint of Department of Antiquities photo Jerash 1976_107; (b) A device embedded in concrete (arrowed) built into the lead pipeline supplying the fountain in Fountain Court. Reprint of Yale University Art Galley Gerasa Archive Collection, gerasa-bookIII-III6~01.
Figure 4.48. Examples of tufa (arrowed) deposited around spring outlets in the study area. (a) Ficus Springs, site JWP146 (scale 10 cm); (b) Site JWP172. By author.

Figure 4.49. Diagram showing Carbonate sinter deposits in aqueducts at Aspendos and Patara in Turkey. Reprint of Sürmelihindi, Passchier, Spötl et al. 2013, fig. 2.
Figure 4.50. Comparison of calcareous sinter examples from various Roman aqueducts. (A) Aspendos; (B) Vaison; (C) Cologne; (D) Pergamon, (A–D reprinted from Wenz et al., 2016, fig. 2: © Elsevier); (E) Example from site JWP-128 (scale 10 cm). By author.
Figure 4.51 Satellite image showing the location of the aqueduct network sectors referred to in the text. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.52. Satellite image of the Upper Wadi Jarash spring-fed canal network, showing sources, canal alignments and location of known Byzantine sites. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.53. Types of conduit construction used in upper Wadi Suf irrigation networks. (a) Field-stone conduit lined with lime plaster, supplied from a source upstream of Umm Qahara spring. By author; (b) Cross-section through unlined earth canal and embankment, upstream of Umm Qahara spring; the developed soil profile suggests some antiquity. By author; (c) Probable field stone conduit, Nablan spring network, site JWP189. By author; (d) Rock-cut canal, Maghasil spring network. By author.
Figure 4.54. Plan of ancient aqueducts and their sources in the central Jarash valley. The inset shows conduit details west of the Birketein reservoir. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 4.55. Plan of the Umm Qahara aqueduct network in the central Jarash valley. Adapted from Google Earth image © 2019 CNES/Airbus & © 2018 ORION-ME.
Figure 4.56. Views of a rock-cut conduit on the alignment of aqueduct SUFW02 at site JWP 117. (a) General view, looking north-west showing the main conduit flanked by possible conduits above and below; (b) Detailed view showing the fractured south-eastern end of the conduit and plaster lining the specus. By author.
Figure 4.57. Plan showing the possible continuation of aqueduct SUFW02 southwards to join with aqueduct SW02a. Adapted from APAAAME_19530000_HAS-6-113, courtesy of APAAAME.
Figure 4.58. Satellite image showing the location of conduit SE04 from Bisas er Rum spring and the Roman road from Gerasa to Adraha. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.59. satellite image showing the location of conduits SE05 and SE06 from Es Soda spring. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.60. Satellite image showing the location of the DE02 aqueduct system from Tell Jarash North Spring. Adapted from Google Earth image © 2019 CNES/Airbus & © 2018 ORION-ME.
Figure 4.61. Satellite image showing the location of ancient aqueduct systems probably sourced from Birketein. Inset shows a section of aqueduct DW01 recorded on plan “Scale 1:2000, Area of Large Birketein Sheet” in YUAG Jerash archive. Google Earth image © 2017 DigitalGlobe.
Figure 4.62. Satellite image showing the location of JHS sites 221 and 274 on aqueduct SW01/02. Adapted from DigitalGlobe 2017. Inset: photos courtesy of Jerash Hinterland Survey; inset plan adapted from Yale University Art Gallery, Gerasa Archive Collection, 1:500 Sheet NW C2.
Figure 4.63. Interpreted and inferred locations of the main northern aqueducts approaching the western side of the city superimposed on an oblique aerial photograph taken in 1918 to show the relative positioning of the alignments. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 463.
Figure 4.64. Evidence of sections of conduit from aqueduct DW04/5 removed by later quarrying. (a) Aerial view at JHS site 485, west side of El Hammar plain Adapted from APAAME_201304213_DDB-0477, photographer D. Boyer; (b) Ground view of JHS site 485. By author; (c) Aerial view of aqueduct site JWP 144 adjacent to a monumental tomb just north of the city. Adapted from APAAME_201304213_DDB-708; (d) & (e) Detailed ground views of quarrying evidence at site JWP 144. By author.
Figure 4.65: Plan of the north-west aqueduct networks and their spring sources. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 4.66. Plan showing JWP and other sites mentioned in the text on aqueduct JW01. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 4.67. Detailed satellite image of En Busat Zreg spring locality showing the relative locations of the current and historical spring sites. Adapted from Pleiades satellite data processed by Geoimage Pty Ltd, pseudocolour; image date 19/06/2013.
Figure 4.68. Plan of known and interpreted aqueduct conduits to the west of the city, with an inset showing details of the conduit recorded at site JWP 166. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.69. Views of early aqueduct passing through the west wall of the city in City walls Project trench 500. (a) General view of the inside of the city wall showing the aqueduct entry point (arrowed); (b) Detailed view of aqueduct entry. Reprint of Kehrberg-Ostraz & Manley, 2019, pl. 1.14.
Figure 4.70. 1939 aerial view of conduits of the north-west aqueduct system close to the city showing the location of the Trapezoid Precinct. Adapted from British Academy Stein archives, Stein-BA-ASA-3-0685, courtesy of the British Academy. Inset shows the internal detail of precinct. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 470.
Figure 4.71. Satellite image showing the disposition of aqueduct systems sourced from east bank springs located in the city area. Inset shows the area in the vicinity of Qairawan spring and Qairawan cave spring in more detail. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.72. Satellite image showing the disposition of ancient aqueduct systems in city area sourced from west bank springs. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.73. satellite image showing conduits sourced from Qwndeit spring. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.74. Photographs showing the interpretation of elements at site JWP147a near Qwndeit spring. (a) View along the conduit, looking south, showing the landslide fracture running along the eastern edge of the conduit and the tomb dromos that cuts through the conduit; (b) view of conduit from below showing the alignment of the landslip backscarp along the axis of the conduit; (c) Detailed view from below showing the tomb dromos cutting through the conduit. By author.
Figure 4.75. 1918 aerial photograph showing the interpreted alignments of conduits JW05 and 05a, the possible sources for conduit JW05, and the location of ancient reservoirs. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 450.
Figure 4.76. 1918 aerial photograph showing the interpreted alignment of conduit JW05 and the evidence of pre-Islamic date. (a) Alignment of JW05 showing the location of the possible sources and ancient reservoirs. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 450; (b) Details of the possible spring site adjacent to the South Bridge. Adapted from Lepaon, 2011, p. 416 fig. 2; (c) Location of a possible source south of the North Bridge. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 450.
Figure 4.77. An overview of main aqueducts in southern Jarash valley between Bab Amman and the Wadi Tannur Junction showing ancient settlements and the Philadelphia–Gerasa Roman road. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.78. View of tunnel aqueduct and surface rock-cut canals (jointly designated JSE01) on the eastern wadi bank at Ficus Springs (site JWP146). By author.
Figure 4.79. Views of springs and conduits on the east wadi bank at the Shallal locality. (a) View of Shallal East spring centre from the east showing the ancient canal alignment and the location of sites JWP173 & 174; (b) Detailed view of spring outlet at site JWP173; (c) and (d) Detailed views of an ancient rock-cut canal at site JWP174 showing the canal entering short tunnel beneath a fallen boulder. By author.
Figure 4.80. Views of aqueduct JSW01 at site JWP175. (a) View looking south: canal 0.8 m wide at bottom, up to 1.85 m high, with modern concreted floor; (b) View looking south showing rock-cut side channels and modern canal in distance. By author.
Figure 4.81. Views of relict west bank spring outlets at Ficus Springs (Site JWP 140). (a) General view (from the east) of the main west bank spring outlets that were the initial source for aqueduct JSW02; (b) Close-up of the southernmost outlet showing the rock-cut entrance and an equine petroglyph within a rectangular border (arrowed). (Vertical pole 2 m). By author.
Figure 4.82. Possible ancient rock-cut section of aqueduct JSW05 recorded at site JWP176a (scale 0.5 m). Conduit is 0.25 m W, 0.35 m H. By author.
Figure 4.83. Plan showing the location of the Haud Abu el Hajal aqueduct network. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.84. Satellite image showing the Jermish-Mesar Tokh valley aqueduct system. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 4.85. Views of the relict spring and basin at site JWP 170. (a) View of the basin from the south (scale 1 m); (b) View of relict spring outlets from the west (scale 0.5 m). By author.
Figure 4.86. Plan showing the aqueduct networks in the lower Jarash valley near the Zarqa river junction. Adapted from HAS 6111_1953, courtesy of APAAME.
Figure 4.87. Satellite image showing the layout of aqueducts supplied from Riyashi springs displayed over 5 m contours from AW3D data. Adapted from image © 2017 DigitalGlobe; GeoEye Earthstar Graphics SIO; © 2017 Microsoft Corporation.
Figure 4.88. View of installations at site JWP187 near Riyashi spring. (a) View of relict spring site (JWP187) on east bank of Wadi Riyashi that contributed water to the lower east bank aqueduct (looking south); (b) View of lower east bank rock-cut aqueduct (0.18 m W, 0.18 m H) downslope of site JWP187 (looking south; scale pole 0.5 m). By author.
Figure 4.89. Layout of aqueduct system supplied from Tannur spring. Adapted from Google Earth image © 2017 DigitalGlobe.
Figure 4.90. Vertical aerial view of Tannur spring (site JWP 135) looking eastwards, showing the location of the spring outlets and the disposition of the aqueducts. Adapted from APAAME_280428_DDB-0136, photographer D. Boyer.
Figure 4.91. Views of aqueduct TE01 at Tannur Spring (site JWP135). (a) View looking north; (b) View looking south. By author.

Figure 4.92. Views of conduit TE01 from Tannur spring at site JWP179. (a) View looking west (scale 2 m); (b) View looking east (scale 20 cm). By author.
Figure 4.93. Plan of civic aqueducts supplying the city area in the Roman–Byzantine period. Adapted from Google Earth image © 2019 CNES/Airbus.
**Figure 4.94.** Plan showing the main long-distance irrigation conduits likely to be civic aqueducts. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 4.95. Location of aqueduct sites where 14C dates were obtained. Adapted from Google Earth image © 2019 CNES/Airbus.
Figure 4.96. Chart of calibrated 14C AMS dates of organic materials from aqueducts. OxCal v4.3.2 Bronk Ramsay (2017); r:5 IntCal13 atmospheric curve (Reimer et al., 2013).
Figure 4.97. Diagram of site JWP 128 on aqueduct JW01 showing a well-preserved section through alternating layers of laminated sinter and plaster from a sealed archaeological context in the specus of the rock-cut aqueduct. Sampling sites and 14C AMS dates are highlighted. By author.
Figure 4.98. Chart of calibrated radiocarbon dates obtained from charcoal bearing plaster lining the specus of aqueduct JW01, showing median calibrated date. OxCal v4.3.2 Bronk Ramsay (2017); r:5 IntCal13 atmospheric curve (Reimer et al., 2013).

Figure 4.99. Radiocarbon AMS dates from plaster at site JWP 143 on aqueduct DW01, showing median calibrated date. OxCal v4.3.2 Bronk Ramsay (2017); r:5 IntCal13 atmospheric curve (Reimer et al., 2013).
Figure 4.100. Examples of possible early (pre-Roman) conduits in bedrock downstream of springs. (a) Alaya spring, central Jarash valley; (b) Meisar el Liyat spring, north-west of Jarash. Adapted from Google Earth image © 2017 CNES/Airbus & © 2017 DigitalGlobe.
Figure 5.1 Location of reservoirs identified during the study. Adapted from CNES/Airbus 2018.
Figure 5.2. Plan showing the location of intramural reservoirs and storage basins recognised during the study. Plan adapted from Lepaon, 2011, p. 416 fig. 2.
Figure 5.3. Plan views of the city’s north-west quarter showing the location of the south and north reservoirs. (a) The reservoir locations on a modern plan. Adapted from Lichtenberger et al., 2019, p. 3 fig. 2; (b) 1920s aerial view of the north-west quarter showing the location of the reservoirs. Adapted from APAAME_192x_OGSC_RAF-AP1074, courtesy of APAAME.
Figure 5.4. Images of the south reservoir in the city’s north-west quarter. (a) Early 1930s plan of the reservoir. Adapted from Yale University Art Gallery, Gerasa Archive Collection, 1:500 sheet NW A3; (b) Ground view of the reservoir from the west, 2011. By author.
Figure 5.5. Detailed aerial view of north reservoir in the city’s north-west quarter. Adapted from APAAME_20130428_DDB-0438, Photographer D. Boyer.
Figure 5.6. Aerial views of the so-called central reservoir. (a) Low-level oblique view looking west taken in 1918; (b) Detailed view of interpreted reservoir site. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 456.; (c) Vertical view taken ca. 1929; (d) Detailed view of interpreted reservoir site. Adapted from APAAME_192x_OGSC_RAF-AP1079, courtesy of APAAME.
Figure 5.7. Images showing the location of the reservoir in the city’s south-west quarter. (a) The location of the reservoir on a modern plan. Adapted from Lichtenberger et al., 2019, p. 3 fig. 2; (b) 1918 aerial view of the south-west quarter of the city taken with the location of the reservoir highlighted. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 453.
Figure 5.8. Modern views of the reservoir in the city’s south-west quarter. (a) 2017 aerial view, looking north. Adapted from APAAME_20170927_DDB-0134, photographer D. Boyer; (b) Ground view of a rock-cut section of the southern wall of the reservoir, April 2013. By author.
Figure 5.9. Evidence of aqueduct conduits that may have supplied the reservoir in the city’s south-west quarter. (a) View of excavation at the city’s South-West Gate looking west showing the route of an Early Islamic aqueduct conduit passing through the gateway from a source to the west; earlier conduit on RHS. By author; (b) View of the same site looking north, showing earlier conduit from the north at lower elevation in the trench. By author; (c) 1918 AP showing hypothetical routes of aqueducts that may have supplied the reservoir based on contours. Aerial photo adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 453.
Figure 5.10. Location of possible reservoir site in the city’s north-east quarter. (a) Site location on 1966 plan of the city. Adapted from Jordan Planning Team, 1968, fig. PER-11; (b) Site location on 1926 AP. Adapted from APAAME_19261105_OGSC_RA14-AP1085, courtesy of APAAME.
Figure 5.11. Detailed views of the possible reservoir in the city’s north-east quarter. (a) Detailed aerial view of the site (highlighted), 1926. Adapted from APAAME_19261105_OGSC_RAF14-AP1085; (b) 1930s ground photograph of possible reservoir (structure highlighted). Adapted from c027Jerash019 from the Archives of the American Schools of Oriental Research, Nelson Glueck Photograph Collection.
Figure 5.12. Location of possible reservoir sites (in red) associated with the northern aqueduct system to the city. (a) Vertical AP. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 450; (b) Low oblique AP, looking south. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 459.
Figure 5.13. Plan of Birketein precinct showing main archaeological structures. Reprint of Lepaon, 2012b, pl. CIV.
Figure 5.14. Early 19th-century plan and sketches referring to the Birketein reservoir. (a) The General Plan compiled by Charles Barry ca. 1820. (Inset A) Enlargement of “Reference 31” on the plan referring to “A great tank” [Birketein]; (Inset) Enlargement of the sketch of the reservoir on the plan. Adapted from D-BKL/H/J/7/3/1, ©National Trust Images/ DHCC; (b) Field sketch of the reservoir drawn by Bankes in 1818. Adapted from D-BKL/H/J/7/3/54 Sheet 19, ©National Trust Images/ DHCC.
Figure 5.15. Plans of Birketein reservoir at the end of the 19th century. (a) Plan. Reprint of Schumacher, 1902, fig. 41; (b) Cross-section. Reprint of Schumacher, 1902, fig. 42.
Figure 5.16. Early photographs of Birketein reservoir. (a) Late 19th-century view of reservoir looking east. Reproduced from Schumacher, 1902, fig. 39; (b) View of the reservoir from the southwest in April 1931, Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b255-01 b-255.
Figure 5.17. Early 20th century photographs of Birketein reservoir. (a) Excavation in the north-east corner of the northern compartment, looking north-east. Reproduced from Kraeling, 1938, pl. XXXIIIb; (b) View from the northern end of the reservoir looking south (Reproduced from Kraeling, 1938, pl. XXXIVa; (c) View along the west wall of reservoir 1928, looking south. Reproduced from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-bookIII-III21-01.
Figure 5.18. Plan of Birketein reservoir in its final form showing all 12 known outlets. Measurements from the new total station survey (this study). By author.
Figure 5.19. Diagrammatic representations of the interpreted stages of construction of Birketein reservoir (this study). By author.

Figure 5.20. Birketein reservoir, showing elements of a water delivery system to the west wall of the northern compartment. (a) View of the west wall showing water inlets between outside blocks in course one (scale 0.5 m); (b) Internal view behind inlet blocks showing cavity (spring chamber) ca. 2 m deep containing spolia, including an entablature block (scale 0.2 m). By author.
Figure 5.21. Water delivery to the Birketein reservoir. (a) Plan showing the interpreted locations of the springs delivering water to the reservoir’s northern compartment. Adapted from Lepaon, 2012b, pl. CIV; (b) View of looters hole containing the delivery pipe. By author; (c) Detailed view of ceramic delivery pipe exposed in looters hole. By author.
Figure 5.22. Water delivery system from spring located north of the Birketein reservoir. (a) View inside vaulted chamber constructed on the outside of the north wall of the northern compartment that gives access to supply conduit from spring, looking west; (b) View of arch springer at the west end of the chamber, with delivery conduit to the north wall of the compartment below, looking east. By author.

![Figure 5.22](image_url)

Figure 5.23. Chart of calibrated 14C AMS dates of mortar samples from Birketein reservoir. OxCal v4.3.2 Bronk Ramsey (2017); r:5 IntCal13 atmospheric curve (Reimer et al. 2013).

![Figure 5.23](image_url)
Figure 5.24. Diagrams showing examples of Roman two-compartment reservoirs. (a) Sketch (by author) of the reservoir at La Valduerna, Spain, drawn from details in Viollet, 2007, p. 179; (b) Plan of the reservoir at Al-Manqoura, Syria. Adapted from after Poidebard, 1934, pl. XXI.
Figure 5.25. Plan of reservoirs identified from APs in the Wadi Suf valley. Adapted from Google Earth image © 2017 CNES/Airbus.
Figure 5.26. Aerial views of the reservoir on the Bab Amman Mesa. (a) Vertical AP, with reservoir site arrowed. Adapted from APAAME_19530000_HAS-6-112, courtesy of APAAME; (b) Oblique AP showing the reservoir in the context of the mesa hilltop. Adapted from APAAME_19261105_OGSC RAF14-AP1085, courtesy of APAAME; (c) Vertical AP with possible aqueduct conduit or contour channel (arrowed) carrying water to reservoir (ca. 25 by 15 m). Adapted from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b207-01 b-207; (d) Enlarged oblique AP showing bedrock features in vicinity of reservoir. Adapted from APAAME_19261105_OGSC RAF14-1085, courtesy of APAAME.
Figure 5.27. The reservoir on the site of the Jarash University. (a) Site of the reservoir visible on 1953 AP. Adapted from APAAAME_19530000_HAS-6-112, courtesy of APAAAME; (b) Modern aerial view of the same site. Adapted from CNES/Airbus 2016; (c) spring head at site JWP172 (scale 1 m). By author; (d) and (e) Views of sections of rock-cut conduit at site JWP172 that carried water from the spring to the reservoir (small scale 0.2 m). By author.
Figure 5.28. Aerial views of Der Abu Saedi settlement, southern Jarash valley. (a) Site location on a vertical AP taken in 1953. Adapted from APAAME_19530000_HAS-6-111, courtesy of APAAME; (b) Enlargement scene in (a) showing structures identified from stereoscopic analysis, including an interpreted reservoir. Adapted from APAAME_19530000_HAS-6-111, courtesy of APAAME.
Figure 5.29. Spring basin on the upper east side of the city. (a) Aerial view. Adapted from Aerial photo: APAAME_192x_OGSC_RAF-AP1072, courtesy of APAAME; (b) View from west. Adapted from Library of Congress, Prints & Photographs Division, Gerasa_06964u; (c) Site JWP138, view of the east wall. By author; (d) Site JWP138, South-west corner of the basin, showing what appears to be an inlet canal. By author.
Figure 5.30. Location of the Placcus Baths Basin. (a) Plan of the Placcus bathhouse at the end of the fifth century AD showing the location of the basin in the context of the known archaeology. Adapted from Lepaon, 2012b, pl. CCXIX; (b) Plan of Placcus baths at the end of the sixth century AD, showing basin location and water circulation from the basin (blue). Adapted from Lepaon, 2012b, pl. CCXLII.

Figure 5.31. Ground view of the Placcus Baths Basin. (a) View in 1931 (scale 1 m). Reprint of Fisher, 1931, p. 153; (b) Same location viewed in September 2017. By author.
Figure 5.32. Detailed plans of the Placcus Baths Basin. (a) Plan view highlighting the location of the two outlets in the south wall. Adapted from Lepaon, 2012b, pl. CCVIII; (b) Section views showing the location of top and bottom outlets. Adapted from Lepaon, 2012b, pl. CCIX.
Figure 5.33. Detailed view of the basin supplying the Placcus bathhouse showing the block against the south wall of the basin. Reprint of Lepaon, 2012b, fig. 372.
Figure 5.34. Plan showing the location of basins identified in the area west of St Theodore’s church. Basins and supply conduits highlighted in blue. Adapted from Yale University Art Gallery, Gerasa Archive Collection, negative D30 D-30.
Figure 5.35. The basin below “House VI”. (a) Plan showing the location of the basin and interpreted route of supply conduit. Adapted from Yale University Art Gallery, Gerasa Archive Collection, negative D30 D-30; (b) View of the basin from east, rooms R 21 and R 27. Reproduced from Kraeling, 1938, pl. LVlc; (c) Detailed view of the entrance of delivery conduit into the basin. Reproduced from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-a165-01 A-165.
Figure 5.36. Views of “Cistern 1” west of St Theodore’s church. (a) View of the east wall of Cistern 1 from the north, showing vaulting associated with stage one roof. Reproduced from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-a33~01 A-33; (b) Interior view of Cistern 1 showing inverted columns used to support the stage two arched roof. Reprinted from Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-a3~01 A-3; (c) View from south showing supply conduit to Cistern 1 located at LHS of the photo. Adapted from Kraeling, 1938, pl. LVIIV.
Figure 5.37. Location of the interpreted Nymphaeum supply basins showing possible supply sources. Adapted from 1:500 plan in Yale University Art Gallery, Gerasa Archive Collection, 1:500 Sheet NW A1.
Figure 5.38. Details of the fragment of earlier plastered wall preserved in south wall of room remodelled in the fifth century AD; (a) Oblique aerial view, looking west. Photo adapted from APAAME_20081029_DLK-0115, photographer D. Kennedy; (b) View of the earlier plastered wall in the south-west corner of the room. By author; (c) Detailed view of plaster and opus caementicium on the lower south wall of the room. By author.
Figure 5.39. Details of a masonry pier probably dating to the Roman period exposed in the later fifth-century room to the west of the Nymphaeum. (a) View of the south wall of the room, looking to the south-east. By author; (b) Close-up view of the same site as seen in (a), highlighting the main architectural details. By author; (c) Detail of the impost blocks supporting the vaulted roof of the chamber beneath the lower terrace of the temple of Zeus. Adapted from Department of Antiquities photo, Jerash 1976_170.
Figure 5.40. Details of the postulated stage 2 supply basin to the Nymphaeum. (a) Oblique aerial view from the west showing the location of the stage 2 basin in the context of the adjacent postulated stage 1 basin and the rear of the Nymphaeum. Adapted from APAAME_20060911.FR-0054, photographer F. Radcliffe; (b) and (c) Views of the later aqueduct to stage 2 basin blocked off by mid-fifth century structures (scale 30 cm). By author; (d) View down the rear wall of Nymphaeum showing fill in the void above the basin ca. 2m below. By author.
Figure 5.41. Views of the North Theatre storage basin. (a) Aerial view, showing the location of the basin with respect to the fountains and pipeline beside the North Decumanus. Adapted from APAAME_20080918_DDB-0078, photographer D. Boyer. (b) Ground view of the basin from the north-east. By author; (c) Close up of the eastern basin compartment showing the opening in the north wall. By author.
Figure 5.42. 1918 aerial view of basins on the west bank of Wadi Jarash adjacent to aqueduct conduit JW05. Adapted from DAI, AdZ, Nachlass Theodor Wiegand, Luftbild Nr 453.

Figure 5.43. Examples of offtake basins beside aqueduct conduit JSE2 south of Jarash. Adapted from Bing (DigitalGlobe & CNES 2018) overlain by 5 m contours processed from AW3D satellite data.
Figure 5.44. Quarry/cave-basin at site JWP147 (site JHS786). (a) Interior view, looking north (scale 2 m); (b) Exterior view showing quarried area, looking south (scale 2 m); (c) View of the aqueduct from Qwneit spring with side outlet into the basin (scale 1 m); (d) Exterior view looking north. Photos courtesy of Jerash Hinterland Survey, photographer D. Boyer.
Figure 5.45. Plan showing the location of known and possible cisterns on the west side of the city. Adapted from Lepaon, 2011, p. 416, fig. 2.
Figure 5.46. Intramural cistern puteals. (a) South-west quarter (b) St. Theodore’s Church. By author; (c) Cross Church, North-east quarter. By author; (d) Zeus lower terrace. Adapted from Rasson & Seigne, 1989, fig.2.

Figure 5.47. Examples of the necks in intramural cisterns. (a) Cave in Mortuary Church (scale 1 m); (b) Byzantine building east of the Cardo; (c) Atrium of St. Theodore’s Church (scale 30 cm). By author.
Figure 5.48. Cross-section through the podium of the Temple of Artemis showing pear-shaped profile of cistern. Source: site diagram, photographed by author.
Figure 5.49. Closed cistern on the lower terrace, Temple of Zeus. (a) Plan view. Reproduced from Rasson & Seigne, 1989, fig. 2; (b) Section profile. Reprinted from Rasson & Seigne, 1989, fig. 4.
Figure 5.50. Modern aerial view of the site of the cubic cistern beneath Bishop Genesius Church. Adapted from APAAAME_20081029_DLK-0050, photographer D. Kennedy.
Figure 5.51. Cubic cistern beneath Bishop Genesius Church. (a) Surface view looking east showing the location of both access shafts. By author; (b) Detailed surface view of the eastern access showing a mortared wall constructed over tomb dromos and two water inlets. By author.
Figure 5.52. Cubic cistern beneath Bishop Genesius Church. (a) Vertical view looking north showing architraves covering eastern cistern access and later conduit from the basin. Adapted from APAAME_20080918_DLK-0134, photographer D. Kennedy; (b) View with one architrave roof block removed showing the detail of later conduit from the basin and early cistern inlet (arrowed) in north wall of the cistern. By author.
Figure 5.53. Views of Byzantine cisterns on Camp Hill. (a) General view of the location of the cisterns excavated at the southern end of Camp Hill, looking south-east. Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative gerasa-b213~01 b-213; (b) View inside one of the Byzantine cisterns (scale 1 m). Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative B225 B-225; (c) View inside another Byzantine cistern showing stepped access, springer for the arch, and sediment trap in the floor (scale 1 m). Reprint of Yale University Art Gallery, Gerasa Archive Collection, negative number: gerasa-b235~01 b-235.
Figure 5.54. Gerasa showing the location of main public monuments and spaces generating runoff listed in Table 4 (Artemis upper terrace in red). Adapted from Google Earth image © 2017 CNES/Airbus.