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From conflict archaeology to archaeologies of conflict: remote survey in Kandahar, Afghanistan

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ABSTRACT

Emerging from research with the Afghan Heritage Mapping Partnership, a multi-year project using satellite imagery to detect, record and manage archaeological heritage, this paper examines the potentials of remote-sensing to not only monitor archaeological material culture, but also contemporary materiality as it is violently (re) assembled through conflict. Through systematic remote-sensed archaeological survey using diachronic imagery in Kandahar, Afghanistan, this work expands archaeological understanding of an under-surveyed region while exploring the impact of the region's expansive military infrastructural footprint on cultural heritage. Further, this research considers the long history of landscapes of control and successive military occupations. Remote survey allows for continued generation of archaeological data during conflict, thereby enabling more thorough heritage management. Finally, this survey demonstrates that, although remote aerial technologies have been criticized as tools of violence, surveillance and control, satellite imagery can be used analytically to generate new understandings of and challenges to military infrastructural reach.

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Introduction

Across the Middle East and Central Asia, conflict has increased the urgency and relevance of archaeological methodologies for heritage management (Bewley et al. 2016). This is particularly true in Afghanistan, where a series of conflicts from the 1979 Soviet invasion to the ongoing War in Afghanistan has halted archaeological work. This resulted in not only looting, but perhaps more critically, a breakdown in government oversight that has brought damaging and unchecked agricultural expansion, development projects, and mining (Hammer et al. 2018, 2). In what has been called the 'double-edged sword' of extended US military presence in Afghanistan, long-term conflict generates the resources – such as high-resolution satellite imagery and grant programs – that enable systematic research otherwise made impossible by war (Franklin and Hammer 2018, 71).

Previous remote research across Afghanistan demonstrates the impact of militarisation on archaeological sites (Hammer et al. 2018, 10). Reuse of archaeological sites (forts, enclosures and mounds in particular) by occupying military forces is prevalent across the Near East and Central Asia (Hammer et al. 2018, 10). Mounds often form a rare topographic

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high in otherwise flat terrain, enabling surveillance and prime placement of communication towers, radar dishes and missile launchers; further, the largest mounds are often situated along historically and contemporarily significant topographically defined routes through difficult terrain (2018, 10).

In this paper, data is presented from a systematic remote-sensed archaeological survey (hereafter referred to as 'remote survey') examining the impact of militarisation on archaeological sites around the southern city of Kandahar (Figure 1). Diachronic aerial and satellite imagery spanning from 1958 to 2018 is used to explore the intersections of the cultural landscape and the material footprint of military presence to both expand archaeological understanding of an under-surveyed region and examine the impact of militarisation on heritage. This study reflects on the methodological possibilities of remote survey as a means of looking with time-depth at the destructive reshaping of the landscape that threatens heritage during war. While attention has been devoted to the assessment of conflict-related damage and destruction to sites on an individual (such as the site of Lashkari Bazaar (Murdock and Hritz 2013)) and nationwide scale (see Hammer et al. 2018), there has been little regional work on the impact of long-term landscape-level militarisation in archaeologically rich areas of Afghanistan. Beyond the present conflict, this paper considers the entanglement of archaeological sites in the long and layered history of landscapes of control. Finally, this paper affords analytical attention to the urban, spatial and infrastructural dimensions of militarisation, in an attempt to practice not only *conflict archaeology* but an *archaeology of conflict*.

This project emerges out of the data and methodologies of the Afghan Heritage Mapping Partnership (AHMP), which began in 2015, supported by an institutional grant from the US Department of State and the US Embassy in Kabul to the Oriental Institute at the University of Chicago. The research was carried out in Chicago at the Centre for Ancient Middle Eastern Landscapes (CAMEL). Collaboration with the Kabul-based Afghan Institute of Archaeology and Kabul Polytechnic University allowed Afghan students to learn the developed methods. The partnership aims to build a foundation for long-term

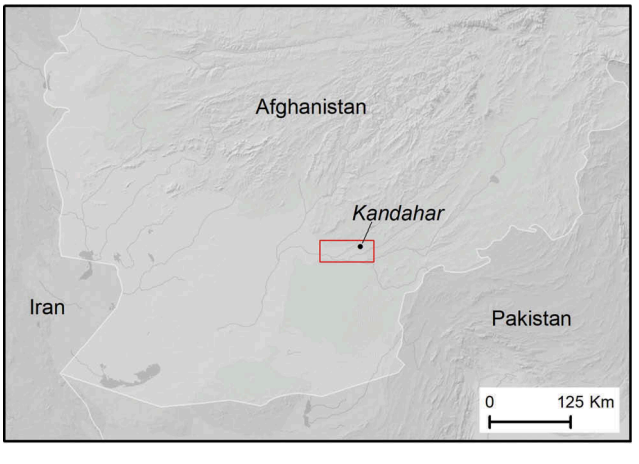

Figure 1. A general map of the region surrounding the survey zone (shown in red). *Source data: topography generated from SRTM 30-arcsecond elevation data, downloaded from usgs.gov; boundary data courtesy of ESRI; river data courtesy of hydrosheds.org.*

archaeological research and heritage management strategies by using satellite imagery and other geospatial technologies to create a GIS database of both known and previously unknown archaeological sites across Afghanistan and monitor cultural heritage preservation (Hammer et al. 2018). This is especially crucial in areas threatened by mining development, urban expansion, agricultural intensification, looting and military activity.

Kandahar

The survey zone encompasses the fertile irrigated plain at the confluence of the Arghandab and Dori rivers, tributaries of the Helmand (Figure 3). These zones encompass a range of landcover, from the sand-dunes of the Registan desert to the silty riverine fan and marshland bordering the Arghandab, to irrigated farmland and the rocky outcrops surrounding Kandahar city (Doebrich, Wahl, and Ludington 2006). The majority of Kandahar's poppy crop is grown in Panjwai, Zhari and Maiwand districts (Forsberg 2009, 12). While resisting the Soviets, Mujahideen took refuge in Arghandab and Panjwai district as they infiltrated Kandahar city; these districts and the densely cultivated and irrigated territory to the north, west and southwest of the city remain a critical zone for insurgents today (Forsberg 2009, 12). Finally, the eastern portion of the study zone includes Kandahar airfield, the main ISAF (International Security Assistance Force) base in the province, and the second-largest military installation in the country (Forsberg 2009, 12).

Within this region, there has been little extensive or intensive regional archaeological survey, with the primary archaeological investigations being the 1974 to 1978 Old City excavations (Helms 1983, 1997). The Archaeological Gazetteer of Afghanistan contains just 47 archaeological sites in Kandahar province (16 in this study's survey zone) and argues for the need for a systematic survey in Kandahar. Ball argues surveys can, in many ways, reveal more than excavation, as the wide coverage generates a picture of a region that is more representative than one site could provide (Ball and Gardin 1982, 20), allowing one to discuss patterns in damage, site location and infrastructural configuration. While remote survey renders the material more distant, it also materializes patterns visible only through such a broad view.

Methodology: systematic remote survey

In remote survey, satellite imagery is examined in a process designed to imitate a systematic pedestrian survey. In the past three decades, declassification and democratization of imagery (e.g. the Corona Spy Satellite program; Kurgan 2013, 99; Wilkinson, Beck, and Philip 2006), and the increasing availability of high-resolution commercial satellite imagery have enabled a rise in the use of remote methodologies by archaeologists. At the same time, since the multiple humanitarian and heritage crises following the Arab Spring and Syrian Civil War, there has been a proliferation of remote projects focused on monitoring cultural heritage in conflict zones (Hammer et al. 2018; Al Quntar et al. 2015; Danti 2015; Casana 2015; Casana and Panahipour 2014; Cunliffe 2013; Stone 2008).

In the Kandahar region, a 1 by 1 km grid was laid over the 1,500 sq km survey zone and a range of imagery examined in each square (Figure 4). A baseline assessment concerning site presence and preservation was made using historical aerial imagery (1 m resolution, 9/11/1958, courtesy Warwick Ball) and Corona satellite imagery (multiple

missions, maximum resolution 2 m, 5/26/1965); followed by examination of 1:50,000 scale Soviet topographic maps (1983–1985); and finally by survey of the ESRI ArcMap base map (1 m resolution, varying dates from 2001–2014), DigitalGlobe satellite imagery (33 cm–1 m resolution, 2002–2018, accessed through the US Department of State), and aerial imagery and LiDAR from the US Army Corps of Engineers BuckEye Program (10 cm resolution, 2007–2014, courtesy US Department of State). Due to the geopolitical reality in Afghanistan over the past century, imagery was generated for specific purposes at specific moments; thus, while historic imagery exists from the Cold War and 2001 onwards, there are notable gaps in the visual record, which are best illustrated by the timeline in Figure 4.

The database was configured to allow the site's visibility in each image to be tracked, generating a rough temporal record of damage to each site. The methodology outlined above has been designed to record previously unknown sites even when they are no longer visible in modern imagery. This was crucial in Kandahar, for the region is both under-surveyed and profoundly impacted by agricultural expansion, development and militarisation.

Differential visual signatures of military and insurgent presence

The distinctive visual signatures of modern military presence were compiled by examining the structures, equipment, earthworks and spatial configurations at archaeological sites known to be militarised. Known sites included, but were not limited to, the U.S. Operating Base upon a former Soviet base taken in 2001 at Bagram in Parwan Province (Gazetteer site 122; Englehardt 2009, 137), the military base on the northern palace of the Lashkari Bazaar complex in Helmand Province (Gazetteer site 685; Murdock and Hritz 2013, 255), the U.S. funded expansion of the military base at the Bala Hissar fortress in Kabul (Gazetteer site 483; Gascoigne, Thomas, and Kidd 2013, 152), and the border post at Islam Qal'a in Herat Province (Gazetteer site 454; Ball and Gardin 1982, 30) (Figure 2).

The initial aim of this survey was to record the impacts of military forces, but also insurgency; that is, to understand how the entire scope of the conflict has impacted heritage. However, differential conditions of visibility mean that insurgent presence is most often invisible through imagery alone and must be accompanied by intel. For instance, U.S. Army imagery of the archaeological site of Spirwan shows a roughly V-shaped building (a schoolhouse), and a spiralling path leading to the apex of the mound (Bradley and Maurer 2015, 294). The schoolhouse was used along with the rest of the mound as Taliban training space (Bradley and Maurer 2015, 294). Within 300 m of the mound, 400–600 Taliban fighters (2015, 184) used grape-drying huts as bunkers (Bradley and Maurer 2015, 293). As Taliban fighters intentionally use pre-existing structures such as schools and homes, the visual signatures of insurgents are indistinguishable from a typical village of the region, and the boundaries between military and civilian are blurred. The ongoing Taliban insurgency, however, is damaging to archaeological heritage through the sanctioning of looting (Lawler 2002, 1198; Feroozi and Tarzi 2004, 17; Hammer et al. 2018, 4) and smuggling of looted antiquities (Campbell 2013, 120–121), as well as in indirect ways, such as the expansion of agriculture for opium crops that encroach onto archaeological mounds (Hammer et al. 2018, 9). Militarisation, for insurgents, manifests through the creation of the economic conditions that sustain war, through forces that appear largely invisible when contrasted with the highly visible infrastructure of the U.S. and NATO coalition's presence. Thus, while this paper primarily

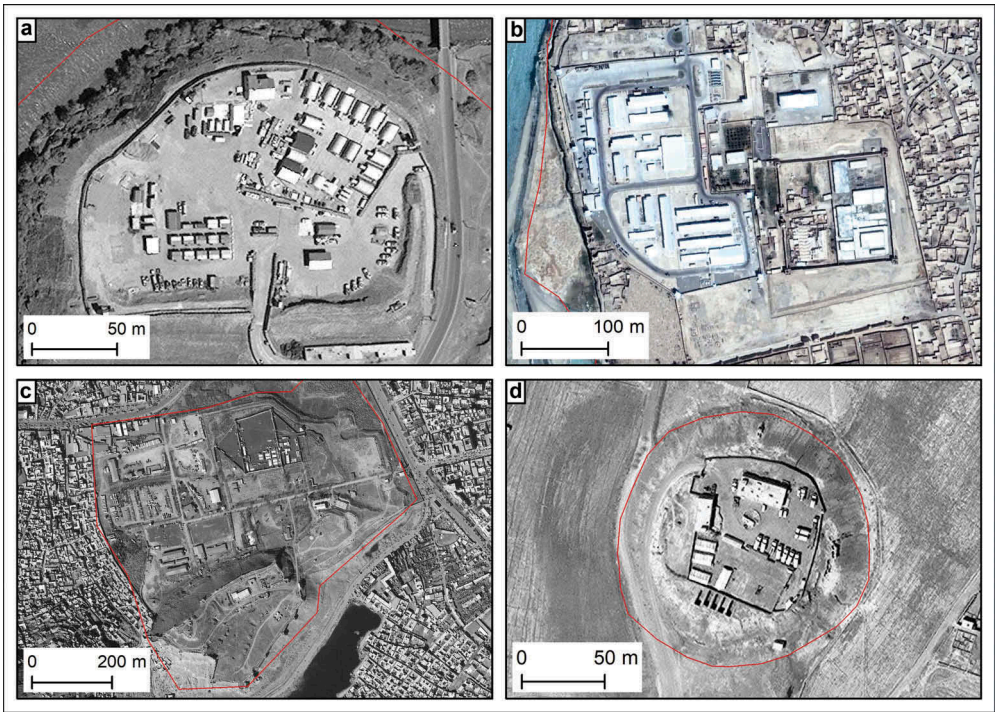

Figure 2. Military facilities on archaeological sites across Afghanistan: (a) US Operating Bases at Begram in Parwan Province (Gazetteer site 122); (b) a military base on the northern palace of the Lashkari Bazaar complex in Helmand Province (Gazetteer site 685); (c) the military base at the Bala Hissar fortress in Kabul (Gazetteer site 483); (d) border post at Islam Qal'a in Herat Province (Gazetteer site 454). *Imagery sources: 50 cm resolution Worldview satellite imagery from the DigitalGlobe Corporation.*

focuses on the impact of infrastructural militarisation on archaeological heritage, constituting a sort of 'archaeology of the invader,' it is important to underscore that militarisation also includes insurgent action.

Distinctive features of militarised sites in Kandahar (and across Afghanistan) include strict linear organization of structures and equipment in space, standardised modular or mobile shelters such as Quonsets and tents, and large paved spaces for the parking and operation of equipment, including artillery, armoured vehicles and tanks, fighter jets, drones, planes, helicopters, radio and cell towers, radar signal-jamming equipment, and aerostats (tethered blimps or dirigibles, also known as Persistent Surveillance Systems). The presence of 'HESCO concertainers,' barrel-shaped frames filled with earth to create a temporary to semi-permanent blast wall, is an additional diagnostic of modern military presence; walls, checkpoints and observation towers constructed with concertainers fortify bases, roads and towns. The shifting of key tactical zones means that a distinctive feature of military presence is the constant change from image to image in the number and configuration of mobile infrastructures and the expansion and contraction of vegetated space that occurs with build-up and takedown. Lastly, militarisation also often takes the form of earthworks – trenches, foxholes and berms – often seen on topographic high points (including archaeological mounds) along major roads.

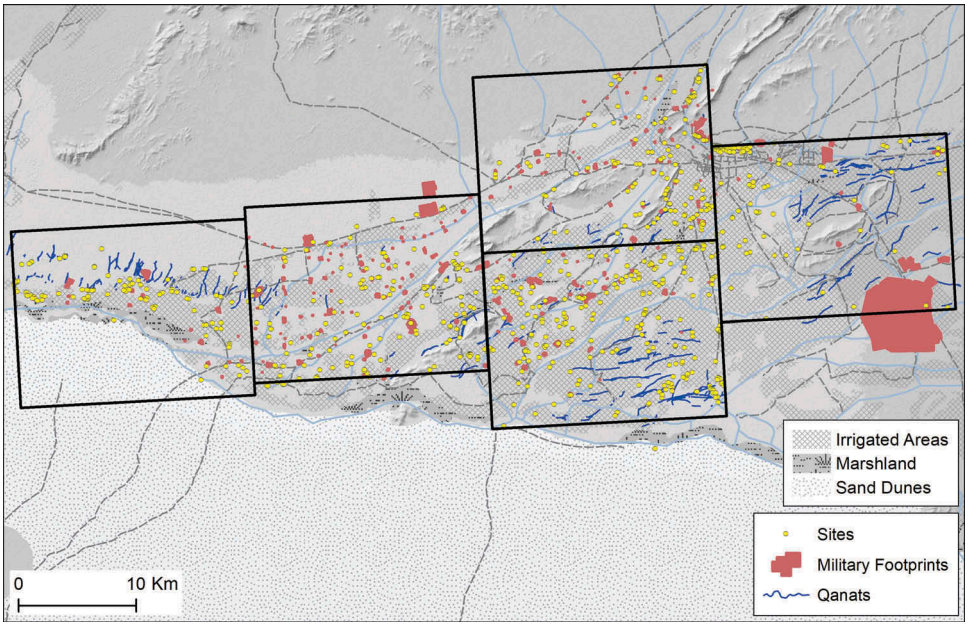

Figure 3. Results of remote-sensed survey in the environs of Kandahar city. *Source data: topography generated from SRTM 30-arcsecond elevation data, downloaded from usgs.gov; boundary data courtesy of ESRI; river data courtesy of hydrosheds.org.*

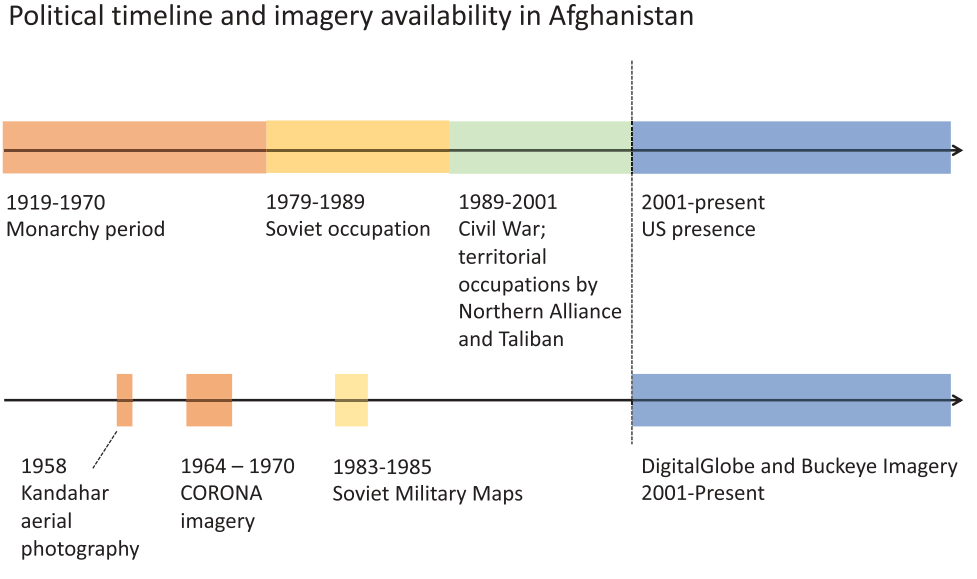

Figure 4. Timeline showing how major political changes in Afghanistan intersect with available satellite imagery and historic map datasets. Adapted from Hammer et. al. 2018.

Results

As a result of the dual research questions of this survey, the data both provides increased resolution to understandings of regional site distributions and evinces trends in archaeological site militarisation. As there are logics behind the distribution and location of military installations, archaeological structures and site distributions are unevenly impacted by military uses of space.

The 711 sites recorded included caravanserais, cemeteries, enclosures, relict field systems, forts, mosques and shrines, qalas, reservoirs and surface architecture, as well as 518 hydrological features (Figure 3). Damage was assessed for every site, and military presence was recorded as polygon footprints; across the survey zone, 299 footprints of military presence were recorded. Below, the most significant findings are discussed, including caravanserais, forts, qalas, mounds, and hydrological features.

Caravanserai, forts and qalas

Built to house travelling merchants, pilgrims, courts and soldiers, caravanserais are differentiated from forts by their distinctive courtyards bordered by cellular chambers (Hillenbrand 1994, 331–376). Six caravanserais were recorded, three of which share a standardised plan and dimensions: Alakadari Daman (Figure 5(a)), Howz-e Madad and Hushab (the latter two are visible only in earlier 1958 and 1965 imagery). It is essential to consider these caravanserais as part of a more extensive system of travel infrastructure that spanned Afghanistan, connecting the Safavid Isfahan to the Mughal empire (see Franklin and Boak 2019).

Caravanserais served an array of defensive roles, protecting resting travellers and merchants with valuable wares from thieves, garrisoning soldiers, and marking imperial borders (Campbell 2011). Ferrier, a French traveller through Persia (1838–1842), observed that during the first Anglo-Afghan war, the British army restored caravanserais as posts for horsemen along the Herat-Kandahar route to enable rapid communication (Ferrier, Jesse, and Seymour 1856, 263); further, he described caravanserai as 'capable of defending against any sudden attack' and 'indeed almost fortresses' (Ferrier, Jesse, and Seymour 1856, 74). The characteristics that made caravanserais defensible in the past – their thick walls, corner watchtowers and open courtyards that sheltered troops – have arguably led to their continued use by modern military forces.

Two of the three caravanserais within the study area exhibit significant damage from military presence. Alakadari Daman (Figure 5(a)), was intact in 2014,[1] but destroyed by 2017[2]; in the intervening years, BuckEye imagery dated to January 2013 shows the use of the southern wall of the caravanserai to enclose an area of Quonsets and equipment. Hushab (not pictured) is visible only in aerial photography dating to 1958[3] and Corona spy satellite imagery from 1965[4]; modern imagery shows the area is covered by the expansion of the Kandahar airport and airbase.[5] This demonstrates the importance of diachronic imagery in surveying zones that have undergone massive changes over the past decades, whether due to military occupation, urbanization, or agricultural intensification.

Along the same southern route, three additional caravanserais exhibit military damage (Figure 5). The caravanserai at Kishkinakout on the Kandahar-Farah road (Figure 5(b)) was described by the British travellers Steel and Crowther as a Mughal military outpost (Kerr 1813, 206–19); seen in 2013[6] incorporated into Forward Operating Base Maiwand, the

Figure 5. Caravanserais impacted by military activity: (a) Alakadari Daman seen 10 August 2014 and 1 January 2017; (b) Kishkinakhud, 25 August 2013; (c) Alakadari-Gelan, 10 July 2009; (d) Markazi-Khukumati-Sultani-Bakba, 10 November 2014. Imagery sources: 50 cm resolution Worldview satellite imagery from the DigitalGlobe Corporation.

caravanserai acts as an enclosure for personnel and equipment. The caravanserai at Alakadari-Gelan (Figure 5(c)) served as the centre of a large base until between 2011 and 2017,[7] when equipment was removed, leaving the structure intact but devoid of its interior architecture and with a damaged western wall. Finally, the caravanserai at Markazi-Khukumati-Sultani-Bakba (Figure 5(d)) sits between two sections of a base constructed between 2008 and 2010. An image from 2010[8] shows paths through the caravanserai and mechanised digging along the front towers and entrance; this soil harvesting, which destroyed the two front towers, was likely to fill HESCO concertainers. Strategic reuse demonstrates the ongoing role that caravanserais play in projects of control (Franklin and Boak 2019); however, it is incredibly destructive to the heritage of caravan travel, as caravanserais are both understudied and near strategic terrain along historic routes still in use.

Recorded forts do not follow a typology or share comparanda with known sites. Among known sites, the mountaintop fortress of Sang-I Sar (Ball and Gardin 1982, 234; Gazetteer ID 988) is heavily militarised, with a base constructed within its mudbrick fortifications. Additionally, a base was built within the fortified Old City of Kandahar (1982, 145; Gazetteer

ID 522). Another defensive structure, qalas are square fortified farm compounds, 40–80 m wide, with corner towers and thick *pakhsa* (pressed mud) walls (Szabo and Barfield 1991, 140–63). Given the continuing architectural tradition, most of the 12 qalas seen in the survey are likely modern; however, it is noteworthy that these qalas, like caravanserai, are often militarised, forming fortified enclosures within bases.

Mounds

The vast majority of sites recorded (56%, or 400 sites) and of sites militarised (58%) were mounds of varying scales, from which several trends in militarisation, as well as two typologies, emerge. In the study area, 16 previously known sites form limited and preliminary comparanda for typologies of remotely recorded mounds, spanning from the early bronze age (third-second millennium BC) to the early modern Safavid empire (Ball and Gardin 1982); it is essential, however, to note that ground-truthed data is necessary for definitive dating of sites.

The mounds shown in Figure 6 provide some of the most striking examples of militarisation. The archaeological site of Spirwan (Forward Operating Base Sperwan Ghar) is shown in Figure 6(a); the mound is carved into by equipment and a road that spirals to the top of the citadel. Figure 6(b) shows what I refer to as off base 'leakage' of militarisation. Tracks from heavy vehicles and equipment can be seen on the large and steep-sided mound in the south of the image; these tracks, which lead directly from the large military installation to the north of the mound, are contributing to a reshaping of the mound, which has a flattened

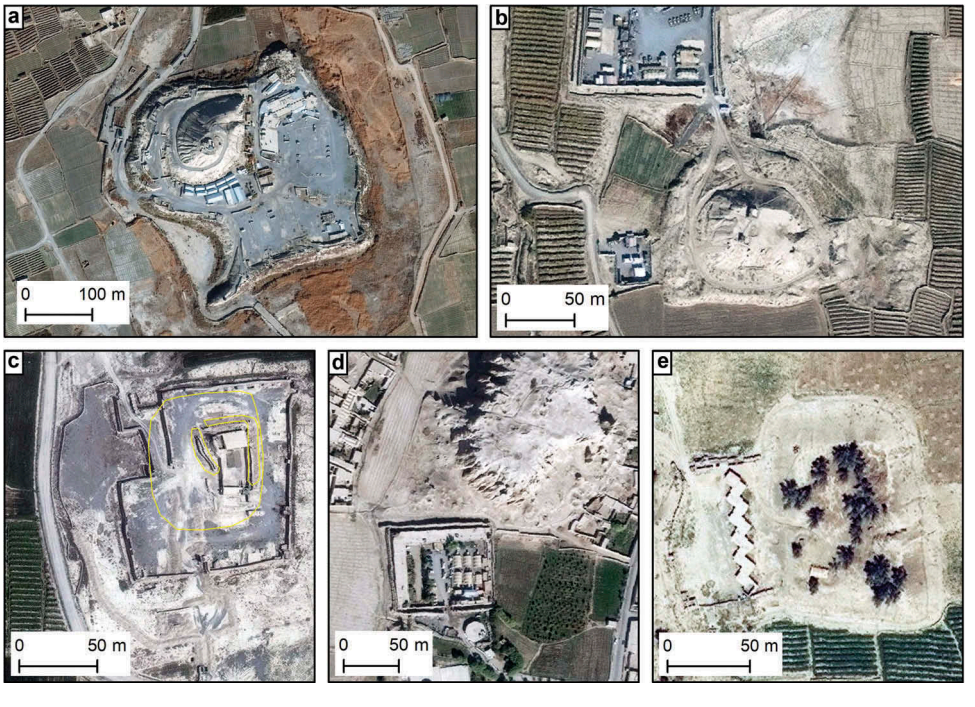

Figure 6. Mound sites impacted by military activity: (a) Spirwan (Gazetteer site 1109), 19 December 2016; (b) site K104, 10 August 2014; (c) site K898, 26 April 2015; (d) Citadel mound in the Old City of Kandahar (Gazetteer site 522) 10 August 2014; (e) site K109, 20 November 2013. Imagery sources: 50 cm resolution Worldview satellite imagery from the DigitalGlobe Corporation.

and paved top in subsequent imagery. In Figure 6(c), a military installation occupies the space of a former mound. In earlier 2010 imagery,[9] a mound is visible (original extent shown in yellow); this mound was built on top of, and soil was used to form the earthen berms that surround the structures in the centre of the installation (outlined in yellow). Figure 6(d) shows the citadel mound of the Old City of Kandahar, with a small military installation – a fortified enclosure sheltering rows of Quonsets – directly to the southwest of the mound. Finally, in Figure 6(e), walls surround a 'zigzag' shaped building (identical structures were seen in the northern portion of the base in Figure 6(b), not pictured), abutting the mound, which acts as the fourth wall in the enclosure.

Square citadel mounds

Two sites (K248 and K595) recorded within the study area share strikingly similar dimensions and architectural forms with the dated and published site of Ghundi Mansur (Figure 7; Gazetteer site 368). Ghundi Mansur is described as,

> a conspicuous, square artificial mound, formed by the ruins of a large ancient fort, with four corner towers still visible in the late nineteenth century (earliest period third-seventh century, Sasanian, but also occupied during the eighth-thirteenth century, Turki Shahi and Early Islamic periods; dating based upon diagnostic pottery) (Ball and Gardin 1982, 109).

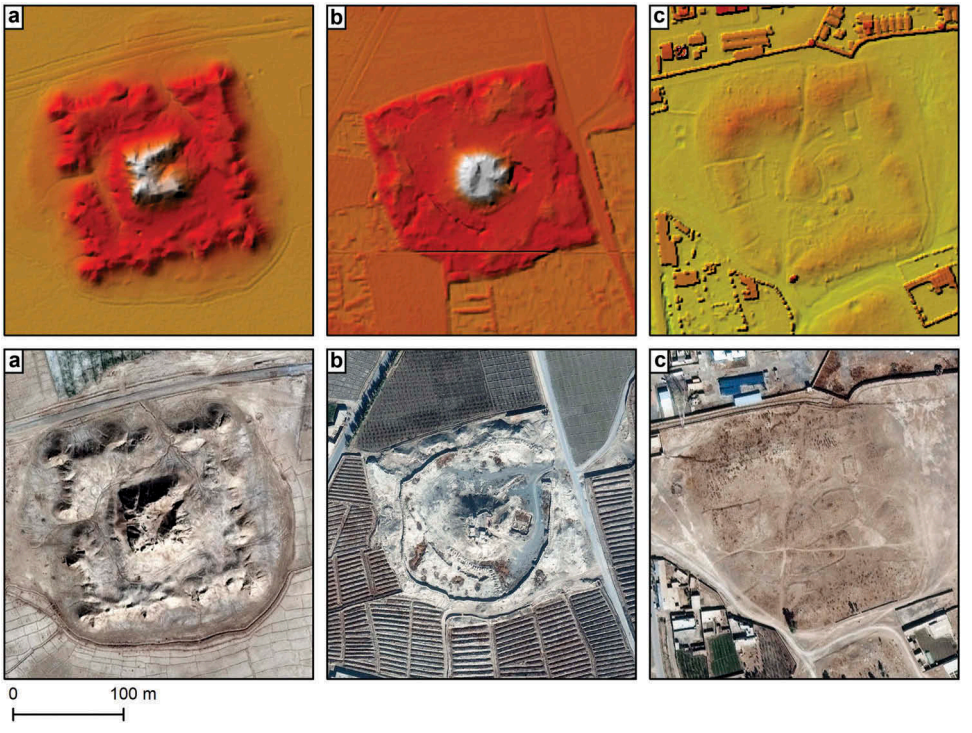

Figure 7. Side by side comparison of square citadel mounds: (a) Ghundi Mansur (Gazetteer site 368), 21 February 2018; (b) site K248, 15 January 2018; (c) site K595, 21 February 2018. *Imagery sources: 50 cm resolution Worldview satellite imagery from the DigitalGlobe Corporation.*

With Ghundi Mansur as a guide, I hypothesize that the two newly recorded sites also date to the Sasanian period. Ghundi Mansur (Figure 7(a)), K248 (Figure 7(b)) and K595 (Figure 7(c)) all measure approximately 170 m^2, with corner towers and a centre citadel, and are positioned in a roughly north-south line to the south of Kandahar city, sharing a cardinal orientation slightly west of north. Their differential levels of preservation are a result of modern use. While Ghundi Mansur has been relatively untouched (a road runs along its northern edge and agricultural activity surrounds its base), K248 and K595 are impacted in modern imagery. K248 is encircled by HESCO concertainers, and military structures are built into the central citadel; this military activity has resulted in flattening of the site, which was likely targeted for its proximity to an important road, and pre-existing elevated, fortified platform. The walls of a large military base encroach onto the edges of site K595, which has been significantly flattened for use as a cemetery. This set of sites, with differential levels of preservation, is demonstrative of the impact military activity can have in radically reshaping the topography of a site. However, these three sites also present the possibility of a more extensive network of Sasanian fortified architecture in Kandahar than previously discussed.

High square and rectangular mounds

Many steep-sided square and rectangular mounds were recorded in the survey, clustering at 85 m. The three mounds illustrated in the LiDAR models shown in Figure 8 are approximately 95 m across. The known sites in Kandahar are limited in their diagnostic potential for these sites; the published site closest in form is Gazetteer site 367, Ghundi Gurgan, which is described as 'a large, conspicuous artificial mound,' and is 100 m across, square, steep-sided, and with a moat/depression surrounded by a 'halo' of low mounding. The lack of diagnostic information prevents a hypothesis as to the period of these sites but presents questions for post-conflict investigations.

Hydrological features: karez

Hydrological features recorded (Figure 3) include 10 relict canal channels and 508 karez. Karez, often known as 'qanats' in Iran, are a form of underground irrigation tunnels most

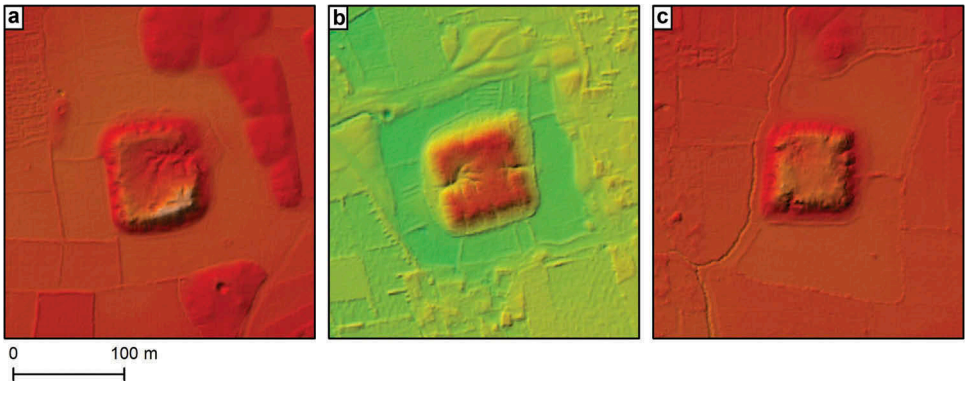

Figure 8. LiDAR models of high square and rectangular mounds: (a) site K196; (b) site K169; (c) site K735. Data source: LiDAR models courtesy US Department of State, provided by the US Buckeye Program

easily recognized on the surface by their linear patterns of round openings for the vertical air shafts used for ventilation and the removal of the soil excavated for the main tunnel (Thomas & Kidd 2017, 33). In karez systems, vertical shafts access underground channels that use gravity to funnel water from aquifers at the base of hills and mountains to irrigated fields, making irrigation possible and avoiding evaporation in arid environments with scarce groundwater (Beaumont 1989; Lightfoot 2000, 215). In Kandahar, karez systems stem from the western hills into the river valley, while to the east, karez curve around the rocky outcroppings surrounding Kandahar city. Findings align with those of Thomas and Kidd (2017, 33–34), whose adjacent ASAGE survey recorded 226 karez north of the Arghandab river aligned with natural hydrology. Dating these structures is difficult, and prior work in Kandahar by the AHMP suggests that rather than indicate extensive investment in irrigation during one or multiple periods, the large number of karez is evidence that the channels are short-lived due to seismic activity (Franklin and Hammer 2018).

While there have been no direct studies of karez use by insurgents or military forces, western media fell into a frenzy of speculation about potential Taliban use of karez tunnels throughout southern Afghanistan in the months following the 2001 U.S. invasion (Kelso 2001; Lumpkin 2001; Scarborough 2001; Vergano 2001). The use of karez by mujahideen fighters during the Soviet-Afghan war is widely noted (Kelso 2001; Lumpkin 2001), and the Soviet tactic of pouring diesel fuel into the tunnels led to discussions of the potential strategic value of karez to foreign forces (Scarborough 2001) who must be aware of the presence of karez to anticipate insurgent movement, supply transport and surprise attacks (Kelso 2001). Finally, the 2005 proceedings of the U.S. Naval Institute include the remark that the Taliban used the mujahideen technique of enlarging and fortifying karez to evade United States airpower (Crossland 2005, 40–42).

Damage analysis

This dataset provides an opportunity to examine stressors to archaeological sites in Afghanistan on a local scale, and it is necessary to discuss additional forms of damage observed briefly. By far, the most significant driver of damage to archaeological sites in the survey zone is agricultural expansion, observed on 32% of mounds. Across Afghanistan, 2013, 2015 and 2016 saw the highest increases in agricultural damage to archaeological sites (Hammer et al. 2018, 9), and it is likely not coincidental that *The United Nations' Opium Surveys* from 1994–2016 report the largest number of hectares (>175,000) under poppy cultivation in 2013, 2014 and 2016 (UNODC 2016, 14). Provincially, Kandahar consistently falls second behind neighbouring Helmand in opium cultivation (2016, 14–27), which is known to be an economic resource for the Taliban (Wilson 2015). The widespread damage linked to agricultural impacts demonstrates the necessity of an economic base for war to insurgency; additionally, this finding illustrates the impact of the breakdown in government oversight that accompanies decades of conflict.

A symptom of the same breakdown in government oversight, development accounts for damage to 39 sites, which cluster in a primarily north-south orientation around Kandahar City. An observation drawn by Kristy of the city of Herat holds true for Kandahar city as well; that is, given that Kandahar has historically been an urban centre, many of the most significant archaeological sites are part of the city's urban fabric (Kristy

2018, 2). Thus, many of the most important sites are at an elevated risk should unplanned urban growth continue in Kandahar. Further, it is essential to consider the enormous role played by foreign military powers in development in Kandahar as recorded footprints of military infrastructure in the survey zone total 47.5 km^2 in area.

Drastically diverging from the situation in northern Afghanistan, where the AHMP found the most substantial clustering of looted sites (Hammer et al. 2018, 8), looting is not a significant cause of damage in Kandahar, and the four sites marked as looted do not exhibit the systematic, extensive looting typical of Balkh. The AHMP found 47% sites looted nationwide, and the Kandahar data corroborate these findings in counteracting the oft-cited claim by Phillipe Marquis, former head of the Délégation Archéologique Française en Afghanistan, that 99% of sites have been looted (quoted in Wendle 2013). It is essential to note, however, that it is challenging to observe opportunistic looting through remote imagery, and thus we cannot know the degree to which looting occurs conjointly with agricultural, urban and military expansion onto archaeological sites. In the AHMP's nationwide study, where looting was visible at archaeological sites, this form of destruction was accompanied by another type of damage 80% of the time (Hammer et al. 2018, 11). Accordingly, management strategies must be aimed not just at looting, but at the many activities that impact archaeological heritage in Afghanistan.

Archaeology of conflict: military infrastructural landscapes

In the course of generating the archaeological data discussed above, 299 instances of military infrastructure were recorded and typologically categorized as installations, fortifications, checkpoints, or earthworks/entrenchments. Beyond the question of the impact on cultural heritage, the dataset calls for further consideration as a record of the materiality of militarisation surrounding Kandahar city.

Conflict poses ethical and political challenges that unsettle disciplinary predispositions: should archaeologists be concerned wholly with the past, or engage as well with the contemporary? Commitment to contemporary materiality acknowledges the 'mutual constitution of people and things,' and brings attention to the ways through which various meanings of the past are shaped in the present (Pollock 2016, 219). To shift commitments away from solely the conventional archaeological sites and objects (what Hamilakis terms a 'narrowly' defined conception of archaeological material) allows ethical responsibilities to extend to the contemporary, encompassing the entirety of material culture (Hamilakis 2009, 56). This survey aims, thus, to expand from a 'narrow' definition of archaeology in order to consider an archaeology that affords attention to the material configurations of war, constituting not only *conflict archaeology* but an *archaeology of conflict*.

The global footprint of the U.S. military has been discussed extensively (cf. Vine 2015; Bélanger and Arroyo 2016; Lutz 2009); however, the American public continues to have little understanding of this reality (Bélanger and Arroyo 2016, 15), for after all,

> the Pentagon doesn't go out of its way to inform the U.S. or 'host' nation publics about the number, missions, or impacts of its web of foreign fortresses that surpass those created by Genghis Khan, Julius Caesar, Alexander the Great, or Queen Victoria (Gerson 2009, 51).

While GIS, much like traditional cartography, has been criticized as a tool of violence, power, surveillance and control (e.g. Warf 2012; Smith 1992), it also can be used analytically to

'foreground spatial relationships that challenge and subvert structures of authority' (Stewart et al. 2016, 164).

Archaeologists have used GIS to reverse the powerful aerial gaze; for instance, Myers (2010) used GoogleEarth imagery to track and record the construction of new prison camps at Guantanamo. Through analytical attention to the material configurations in Kandahar, this paper attempts a similar reversal, a counter-mapping, of the militarised landscapes of southern Afghanistan. Counter-mapping, as imagined here, follows Tazzioli's definition of a twofold practice: both revealing the effects of authority and contesting the notion that these effects are mappable (Tazzioli 2015, 4). Maps of the Kandahar region often follow a set convention, marked with small flags illustrating troop commitments (NATO 2018). This form of military geography demonstrates nothing of the material realities. In order to reveal the military infrastructure of Kandahar, one which spans 47.5 square kilometres of the surveyed zone, it is necessary to approach mapping differently.

I have called the recorded zones of military infrastructure 'footprints' to describe their polygonal delineated areas, but it is important to attune to the leakages where the line between militarised, demilitarised and non-militarised landscapes is blurred. To allow the notion of 'footprint' to evoke enclosure obscures the potential to see the flow of operations as an ever-permuting 'logistical landscape' (Bélanger and Arroyo 2016, 25). In other words, bases are not enclosures, but the 'most visible centrepieces' of military presence (Lutz 2009, 6). The 299 military installations recorded cover 3% of the land in the survey area. Viewshed analysis using SRTM1 digital elevation data demonstrates that within that area, nearly 40% of land is within view of an installation. In mapping and visualizing these logistical infrastructures, the urban, spatial and infrastructural dimensions of militarisation, which often fade to the backdrop in the discussion of war, are brought to the forefront (Bélanger and Arroyo 2016, 21–23). The most notable infrastructural configuration seen through this survey is the system of aerostats spread across Kandahar. Aerostats, first used in Iraq in 2004 and deployed to Afghanistan in 2007, are 75–300 feet long dirigibles tethered 1,500–10,000 feet in the air,[10] and present at nearly every military base in Afghanistan (Bowley 2012). Seventeen aerostats were recorded in imagery spread among the largest bases in the region; the visual reach of these apparatuses coupled with the number and geographic spread makes it likely that every square kilometre of the survey zone is under surveillance by these blimp-like devices.

Counter-mapping is a tool through which one can surveil surveillance, by re-appropriating military surveillance imagery to see the devices spread across Kandahar that oppressively recondition daily life. This data gives us a chance to expand to think of the materiality of war, rather than just the material effects of war on ancient heritage.

Layered landscapes of military infrastructure

Successive periods of military optics, going back to the fortresses that now fall into the category of 'heritage site,' have left their infrastructural mark on Kandahar. Across Afghanistan, Corona imagery demonstrates that military utilization of some archaeological sites stretches back to the 1960s [see, for example, the border post-installed within Islam Qal' a (Gazetteer site 454) in Herat] (Hammer et al. 2018, 10; Ball and Gardin 1982, 130). In Kandahar, military infrastructure forms a layered palimpsest, of which the British, Soviet and American presence in the past two centuries are just a few layers. Surveying along the Helmand river

between Kandahar and Lashkar Gah in the South of Afghanistan during the Second Anglo-Afghan War (1879–1880), British Major Waller Ashe recorded observations of ruins, writing

> remains of fortifications show how highly these strategic points were estimated … these points, no doubt, we shall utilise before long" (Ashe 1881, 37–38)

Within the Old City of Kandahar, the British made extensive strategic modifications, reconfiguring the entryways, surrounding trenches and emplacements of the citadel (1881, 59); military structures have been constructed within the Old City during the current and ongoing war (see Figure 6). Records of this sort of strategic modification are ubiquitous in the journals of soldiers and in the records of the British Afghan Boundary Commission, which left many detailed illustrations of Afghan forts (Peacocke 1887, 21, 26, 32, 33, 90, 110), including detailed cross-sections of fort walls annotated with descriptions of wall strength and potential modifications (Peacocke 1887, 32, 110). One such depiction is reproduced in Figure 9 (Peacocke 1887, 280). Similarly, the British 1879 Ordnance Survey records the 'present state and nature of [the] defences' of the Bala Hissar fortress of Kabul and points to 'improvements recommended for its better security' (Gascoigne, Thomas,

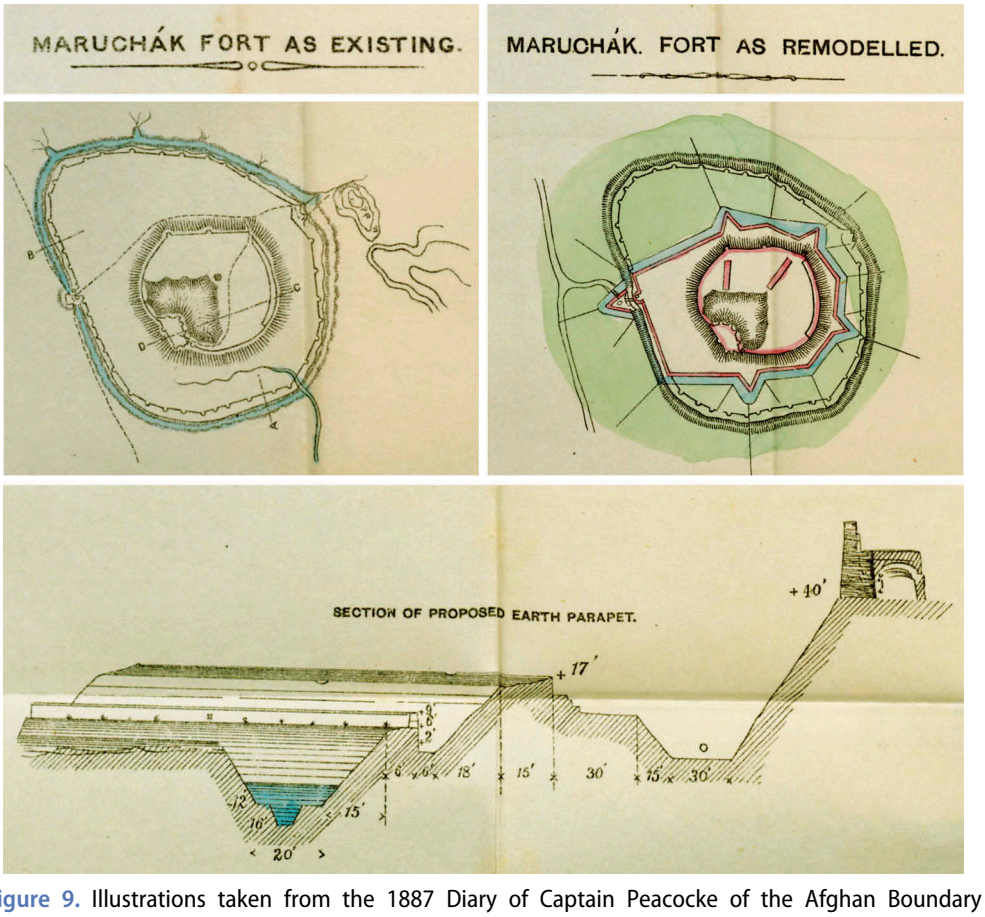

Figure 9. Illustrations taken from the 1887 Diary of Captain Peacocke of the Afghan Boundary commission depicting plans to remodel an Afghan fort north of Herat; similar strategic diagrams are dispersed throughout the volumes produced by the commission. *Images from* Peacocke (1887, 280), *figure by the author*.

and Kidd 2013, 152). A British officer during the second Anglo-Afghan war, wrote of the Kandahar citadel with a mix of romanticism and strategic consideration, noting that they 'have made these ruins less aesthetic but more practical,' while subsequently quoting Byron's verse of 'the 'magic and the poetry in the ruined battlement' (Ashe 1881, 59).

The romantic fascination soldiers hold of the ruins they encounter and occupy carries through today, pervasive in the blogs of soldiers which are filled with musings on the awe of 'seeing things from Alexander the Great's point of view' (Bohmer 2012) and of the 'mystique' of operating out of a fortress used by the Greeks, Russians, British, Taliban and now Americans (Bohmer 2012; Combat Granny 2012). Of a fortress in Zabul, to the northeast of Kandahar, a soldier said, 'I'm not the first Soldier to walk up the hill to use "The Castle" for military purposes and I probably won't be the last,' while a fellow soldier expressed a dual-hope that the vantage point would help 'secure [their] operations' and that 'one day it [could] be a place that people just come to and visit' (Jefferson 2010). These sentiments suggest a sort of romantic awareness that someday the material imprint of Operation Enduring Freedom will be another set of impressive ruins. Chivers argues that some of the US military's former bases are already taking on meaning as historic sites or ruins; returning to an abandoned compound was 'like an unexpected archaeological find' (2019). As campaigns come to periods of drawdown, HESCOs are becoming the 'characteristic' and enduring ruin of Operation Enduring Freedom (Chivers 2019).

Conclusion

The methods discussed as well as the data presented here demonstrate the multi-fold value of high-resolution satellite imagery; that is, it allows for the continued generation of archaeological data during conflict, which by extension can lead to more thorough heritage management and protection. Simultaneously, it allows for the study of the impact of militarisation on archaeological sites and generates new understandings of the extent of military infrastructures. Dual-use technologies are one of many ways through which archaeology is militarised (Pollock 2016, 220), and the use of military imagery regularly involves parsing the entanglement inherent in seeing through military surveillance. Despite the extensive debate, especially following the events of 2003 in Iraq, there has been little consensus in the archaeological community on how to ethically engage. Without explicit dedication to collaboration with local scholars, the imperial gaze that created datasets like topographic maps and surveillance satellite imagery is perpetuated (Franklin and Hammer 2018, 71). The AHMP's larger grant project encompasses a multi-year GIS and survey archaeology training program intending to place these tools and data in the hands of Afghan students and professionals so that they have the tools and skills for cultural heritage management and archaeological research. These dual-use tools, when used with careful consideration, enable and *force* the analyst to look not just at archaeology, but at how military infrastructure violently shapes the landscape and allows a *material* approach to the pervasiveness of military infrastructure, expanding from thinking of the impact of conflict on heritage to a larger archaeology of conflict.

Notes

1. DigitalGlobe image from WV02 satellite, 10 August 2014.
2. DigitalGlobe image, 1 January 2017.

3. Aerial imagery courtesy Warwick Ball, 11 September 1958.
4. Corona Spy Satellite imagery, 26 May 1965.
5. DigitalGlobe image from the WV02 satellite, 9 June 2014.
6. ESRI Basemap satellite image dated 25 August 2013.
7. Structures removed prior to DigitalGlobe image from 6 February 2017.
8. BuckEye image, June 2010.
9. Image from the QuickBird-02 satellite, 8 June 2010.
10. Aerostat size varies from 75 feet in outlying areas to 117 feet in length in Kabul, and 300-foot-long models are in development (Bowley 2012). They are tethered about 1,500 to 10,000 + feet in the air (Bowley 2012, Timberg 2014). The range of numbers are a result of both the variety of models and the constantly improving technology.

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