Platforms and Palimpsests: Urban Landscapes of Data in Northern Virginia

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Abstract

Data platforms increasingly mediate the relationship of society to the data it produces and therefore form a critical layer of the contemporary link between data and urbanisation. However, the current discussion of the impact of data platforms on urbanisation is limited on one hand by an overly metaphoric articulation of platforms, which obscures the material geographies and infrastructural landscapes of data production; and on the other hand, by an administratively bounded reading of platforms, which confines the discussion to only their most visible impact in cities. In this article I argue that to fully capture the impact of platforms on urbanisation we need to overcome these limitations by examining the 'operational landscapes' of data production and circulation. This extended ontology of platforms positions the spatial discourse of technology in relationship with other forms of capitalist spatial production and opens up the material geographies and infrastructural landscapes of data production for critical engagement as integral parts of the sociotechnical construction of platforms. By examining the data landscapes of Northern Virginia, I illustrate how historic and contemporary forces, actor networks, and urban dynamics contribute to the construction and maintenance of the extended geography of data platforms.

Keywords

platforms, platform urbanism, data production, operational landscapes, neoliberal urbanism, Northern Virginia

The Washington and Old Dominion (W&OD) trail is a forty-five-miles (seventy-kilometres)-long multi-use trail outside of Washington DC, on the southern banks of the Potomac River. It stretches from Arlington to Purcellville, close to the Virginia-West Virginia border. If the name is not enough of a giveaway, there are plenty of clues along the length of the trail that connect it to its railroad predecessor. The entire length of the trail is converted from a series of failed railroads, the earliest of which dates back to 1859. But it is not only weekend joggers, weekday commuters and parents pushing strollers that occupy the right-of-way of the old railroad. Underground fibre optic cables share space with high voltage transmission lines above. It is estimated that around 70 per cent of global internet traffic passes through the data centres and exchange hubs of this part of Virginia.[1] This unassuming geography is an important part of the operational landscapes of data: where global data circulates, where it is exchanged and stored, and where it takes on its value. This is where data platforms assemble and expand their infrastructure and hence their territorial claim over data. Given the importance of data to all aspects of contemporary urban life, operational landscapes like those surrounding the W&OD trail, which so heavily contribute to the circulation, storage, and otherwise production of data, become potent sites for the examination of the spatial imprints and urban agency of technology platforms. The W&OD plays an unintentional but significant role in the development of the technology corridor for which it serves as the unofficial spine.

In the first quarter of the twenty-first century, advanced capitalism has been largely reoriented toward the extraction, management and operationalisation of data.[2] The platform has emerged as a new model of capitalist corporate entity in response to the ascendance of data and the long decline in the profitability of the manufacturing sector. A platform is a hybrid mix of software and hardware that enables and facilitates the data operations at the core of the contemporary information economy. While platforms often grow from the internal needs of technology companies to handle their own data, they have quickly become

an 'efficient way to monopolise, extract, analyse, and use the increasingly large amounts of data' for other companies and organisations.[3] The platforms' domination over data resources has positioned them as powerful infrastructural entities for other sectors, businesses, and organisations who depend on data but often lack the resources and capacity to handle massive amounts of data on their own.

And while platforms like Amazon and Google seem to operate outside of traditional capitalist economies, they very much depend on strategies of enclosure and expansion at the core of capitalism. So even though platforms are 'asset- and employee-light, low on liability and high on upside', they 'aspire to monopoly, often unapologetically, and have been instrumental in rehabilitating the concept'.[4] In their simultaneous capacity as 'organizational forms that are highly technical, and technical forms that provide extraordinary organizational complexity to emerge,' platforms 'take on a powerful institutional role, solidifying economies and cultures in their image over time'.[5] In their basic role as technical infrastructures, societal armatures and organisational forms, platforms prepare the ground for actions, and hence prompt conformity to their rules, limits and politics. Platforms are at once, and inherently, concentrative and expansive: they 'centralize and decentralize at once, drawing many actors into a common infrastructure'.[6]

In this article I argue that two readings within the discussion of data platforms and urbanisation have resulted in a limiting of scope within critical examination of how technology and data are transforming urban environments, their conception and their future. On one hand, metaphoric readings of technology and data have been instrumental in establishing and maintaining the sociotechnical imaginaries of platforms that propagate myths of immateriality, inherent sustainability, and ideologies of technologically driven social progress. While problematic metaphors abound in the discussion of data platforms, scratching their surface can often reveal the very systems, spaces, and politics that metaphors try to hide as they attempt to iron out the wrinkles of the messy geopolitics of technology. On the other hand, scholarship at the intersection of technology, data and urbanisation is still largely confined to the city. While recent literature, mainly from media studies, has explored the materiality of data and its infrastructure, a broader discussion of the complex relationship between global urban processes and data platforms is still lacking.[7] Examining the 'operational landscapes' of data production and circulation enables an extended reading of platforms and urbanisation that positions the spatial discourse of technology in relationship with other forms of capitalist spatial production and opens them up for critical engagement as integral parts of the sociotechnical construction of platforms.[8] While seemingly unrelated, these two readings have been essential to the conception of data platforms and their urban operations. To fully ground the spatial and material impact of technology platforms on contemporary processes of urbanisation we first need to unpack the limitations of each of these readings. This is followed by an analysis of Northern Virginia's data landscapes and their histories as an example of the specific ways in which planetary platforms and their construction are grounded within the complexity of local geopolitics.

Pushing back on metaphors

In a 2010 special report on managing information, *The Economist* outlined the ways in which cloud companies profit from internet data. Writing specifically about Google, the article details the various ways in which the company exploits the 'by-product' data generated from millions of user interactions on the web. The report calls this by-product 'data exhaust'.[9] While this may not be the first instance of the use of data exhaust to refer to the digital footprint of web activity, it is conceptually and operationally significant. First, by not granting any value to digital footprints, Google positions itself as a pioneering company that is generating value and profit out of nothing, as if by alchemy. And second, as Shoshana Zuboff elaborates, 'once the data are redefined as waste material, their extraction and eventual monetization are less likely to be contested'.[10] In a similar vein, the 'data is the new oil' metaphor argues that data has supplanted oil as the world's most valuable resource.[11] The metaphor has become commonplace not only in business and technology publications but also within the literature of global organisations such as the World Economic Forum or the International Monetary Fund.[12]

These metaphoric characterisations of data have consequences beyond buzz words. They directly contribute to the material construction of technology platforms and their operational logic. As media theorist Shannon Mattern reminds us, 'metaphors give rise to technical models, which inform design processes, which in turn shape knowledges and politics, not to mention material cities'.[13] Metaphors are in this sense instrumental in establishing and maintaining the sociotechnical imaginaries of technology platforms, which Sheila Jasanoff describes as 'collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology'.[14] While within this formulation the state is typically the main actor in the construction and expansion of sociotechnical imaginaries, in the case of contemporary data platforms it is largely technology firms that 'set the tone, enroll other actors, and weave the narratives' necessary

for their establishment and expansion.[15] Devaluing data as waste or presenting it as raw material through these metaphors has been instrumental in establishing and maintaining the sociotechnical imaginaries of platforms that in turn propagate myths of immateriality, inherent sustainability and ideologies of technologically driven societal progress.

Furthermore, as scholars of technology have long maintained, data does not exist in a raw state.[16] Hence, it cannot simply be extracted like oil. Instead, data is actively produced.[17] The production of data is always a material operation and – unlike the amorphous clouds that represent it – entails an uneven planetary geography. In a process parallel to other capitalist modes of production, the production of data and its mobility necessitate the spatial (re)production of operational landscapes of extraction, storage and processing, as well as infrastructural geographies of circulation that accommodate the continual expansion of data platforms as capitalist entities.[18] From the collection of data through smartphones and sensors, and their transmission through a global network of cables and exchange facilities, to their storage and processing in data centres and their ultimate visualisation on urban dashboards, the production of data entails a material geography that not only rivals any other economic sector, but it surpasses them in scale and importance. Once you consider the mining and extraction practices of elements critical to electronic devices and the supply chain of their delivery, the material geography of data forms a truly planetary condition. Metaphors actively obscure these material processes and the infrastructural mediations necessary to the construction and maintenance of this planetary geography. Platforms in turn leverage this same geography to wield power in cities and to dominate the production and management of the valuable data that is exchanged within them.

Urbanising platforms

In parallel to the metaphoric representations of data, the way platforms are viewed in relationship to urbanisation presents inherent spatial limitations that undermine the extended geographies of their production in favour of a more normative analysis of their transformative effects in cities. While population-based thresholds and statistic or administrative definitions of urbanisation have been questioned since the early twentieth century, the current perceptions of platforms and technological urbanism seem to suggest the resilience of the city as the dominant site of urban discourse.[19] This is particularly visible within the emerging discourse of platform urbanism. Within much of the literature platform urbanism is presented as a nascent assemblage of urban visions, ideologies, practices, and materialities largely promoted, driven and dominated by technology platforms. Partly in response to the conceptual uncertainty of smart urbanism, platform urbanism attempts to go 'beyond the smart city' by positioning itself as more of a template applicable to multiple urban conditions, and 'not primarily defined and delineated by set urban geographies, but rather by novel, digitally-enabled assemblages of technology firms, providers of goods and services, users/consumers'.[20]

But while the potential for an extended reading is introduced in the literature on platform urbanism, so far it has not been taken up as a serious component of studying the relationship between platforms and urbanisation. Much of the material on platform urbanism is still largely contained within the city and constrained by a 'methodological cityism' that has limited a broader and more complex understanding of how urban technology regimes are constructed atop globally extended material geographies with inherent political, social, and spatial intricacies.[21] Instead, the emerging literature on platform urbanism focuses on the most visible impacts of technology platforms in cities by exploring delivery and dating apps, ride-sharing platforms, or the city as a data marketplace, which are inherently administratively bounded, anthropocentric, and which further emphasise population densities as sites of analysis and platform operations.[22]

The relationship between platforms and urbanisation in these discussions is often portrayed as a one-dimensional process of data extraction and service provision. Platforms are rendered as black boxes that provide an array of services to the city and in exchange extract data from users. So while the dependency of platforms on population centres – for the cache of data that they hold – is clearly articulated, how these relationships are mediated and the extended reach of data infrastructures and their dependence on other geographic and environmental conditions are only hinted at and not fully considered. This is important as these extensions are the operational landscapes that underwrite the power platforms wield in cities, and precisely how they have positioned themselves as harbingers of new models of urbanism. Hence, the 'where' and the 'how' of platform urbanism needs to be complicated to capture the intricate relationship between cities and the operational landscapes of data production and circulation that may be found outside of the typical notions of urbanity.

Towards an extended ontology of platforms

Metaphoric representations and geographic limitations do not only hide the means of production of data, but they also tend to obscure the *longue durée* of technical landscapes and how contemporary landscapes of data have evolved in direct relationship to previous rounds of infrastructural development. By so doing they conceal the spatial dependence of data production on other infrastructural

systems and material geographies that continue to enable the ascendance of data platforms, even as the resources essential to the storing, processing and circulation of data dwindle.[23] Alternatively, conceptualising platforms through their territorial processes allows for capturing the palimpsest of dynamics that contribute to the construction and continual maintenance of technology platforms. This problematises the dominant understanding of platforms as already existing conditions, and instead positions them as evolving assemblage of processes and conditions that enable the competitive territorial expansion and enclosure of resources at the core of twenty-first-century data capitalism.[24] Rematerialising the discussion of platforms through an infrastructural perspective allows for an examination of the contours of production and circulation of data in platforms and the intricate relationships and interdependencies they create with ecological, environmental, and political conditions.

Recent debates on planetary urbanisation in urban studies and cyborg urbanisation in urban political ecology allow for the construction of a hybrid analytical framing that collapses the natural/social, human/non-human, and concentrated/extended dichotomies of urbanisation.[25] In the critical analysis of the operational landscapes of data, like those stretched along the W&OD trail in Northern Virginia, historical narratives of the forces and actors that contribute to their emergence and construction illustrate the inherent fallacy of weightlessness and sustainability that accompanies much of the sociotechnical imaginary of platforms. These narratives ultimately redraw the territorial footprint of platforms into the extended moments of urbanisation, to incorporate the human and more-than-human agencies contributing to the sociotechnical production of platforms, and to capture the full spectrum of their social, environmental and ecological impact. The case of Northern Virginia is especially interesting in this context as it captures the full range of urban landscapes that are operationalised through the process of data production. From dense population and commercial centres in Arlington and Tysons where urban data is extracted and consumed, to the pathways and corridors of data circulation along highways and trails, to the more than seventy-five data centres that store and process the massive quantities of data and that underwrite the computing power of platforms.

Decoding the palimpsest:
spatiotemporal contours of a tech corridor

The northernmost edge of Virginia, stretched along the southern banks of the Potomac River, is shaped equally by history and the future. Straddling the line between the North and the South, Northern Virginia's multilayered urban landscapes reflect a patchwork of American history. Home to over 3.2 million residents, Northern Virginia is among the fastest growing urban areas in the country. The region is also home to some of the richest counties in the United States. Loudoun County in Northern Virginia has the highest median household income in the country, followed by Falls Church City (second), Fairfax County (fifth) and Arlington County (seventh), all of which form the core of the region colloquially referred to as NOVA.[26] Urbanistically, Northern Virginia presents a dizzying array of uses and stakeholders. Federal agencies share space with current and future tech campuses; historic plantations butt up against nature reserves; airports, logistics hubs, office parks and data centres mingle with breweries, shopping centres, senior living facilities, golf courses and gated communities. A thickening infrastructural mesh connects these spaces while further fragmenting the urban landscape of a region that until fifty years ago was largely farmland. [Fig. 1]

Among technopoles in the world Northern Virginia holds an understated centrality.[27] Around 70 per cent of all global internet traffic passes through the data centres and exchange hubs that dot the region. This figure alone is significant, but all other identifying factors are also present in NOVA: an entrepreneurial attitude and the presence of venture capitalists; highly ranked research universities; a cooperative infrastructure of zoning boards, developers, marketing firms and lawyers that helps companies get established quickly and efficiently; a high quality living environment including good schools and access to parks and recreational facilities; and the presence of governmental and military institutions that provide access to federal funding.[28] This last point, the region's relationship to federal institutions, has been a constant and defining factor in the technological growth of the region and one that has influenced all other factors. However, much like its other American counterparts, Silicon Valley and Route 128 in Boston, the growth of Northern Virginia in this way has been significant but largely unplanned.[29]

As historians would remind us, the formulaic packaging of the factors that contribute to the emergence of these technological poles only makes sense in retrospect. Original technopoles were not purposefully designed or thought out along these rigid formulations. Yet within the organic nature of technological development in these regions certain forces and actors catalyse, drive or direct the growth. In Silicon Valley, for example, the role of research universities, especially Stanford, cannot be underplayed. High tech industry in Boston's Route 128 has taken over from previous rounds of industrialisation in the region.[30] In Northern Virginia, in the absence of major research universities specialising in technology and any previous industrial activity, the increasing dependency of

federal defence and intelligence agencies on technology contractors in the wake of the Cold War and the area's convenient proximity to the seat of government provided an initial and sustained spark for development. Federal decisions and actions at the local, national and international scales, coupled with a specific series of developments provide the ground for the rapid and particular growth of the region after the 1960s. Peeling back the various layers of this development as well as the forces and actors that have contributed to the build-up of the spatial palimpsest that is Northern Virginia provide insights into the current spatial characteristics of the region and how they maintain the continual production and expansion of data platforms in the area.

From coal to bits

As one of the earliest regional infrastructural developments in Northern Virginia, the Washington and Old Dominion railroad perfectly captures the unintended, yet critical, role that early infrastructural pathways and decisions play in defining and directing the future development of Northern Virginia. Established in 1855 as the Alexandria and Harper's Ferry Railroad, the railway was intended to cross the Blue Ridge Mountains to connect the port city of Alexandria to the coal fields of West Virginia. However, the railroad would face a number of financial problems and was never able to go beyond the Shenandoah River, ultimately terminating in Bluemont, VA. Instead of coal, by the early 1900s the railroad carried passengers, mail, milk and freight as an interurban trolley (tram) system between Alexandria and Western Loudoun County, where several resorts catered to vacationers and day trippers.[31] [Fig. 2] By the middle of the twentieth century and in the context of growing automobile ownership and the extension of highways and roads in the region, ridership on the W&OD dwindled significantly. As its final curtain call the W&OD would deliver aggregate for the construction of the Capital Beltway and the runways of Dulles Airport in the early 1960s, in a symbolic way helping to construct its replacements. In 1968, the W&OD ceased all rail operations. The towns and villages that were stitched together along its track were now hubs within a rapidly expanding urban region flanked by two major airports and crisscrossed by a web of interstate highways and roads.

Over the next three decades the W&OD would be transformed into a recreational and bike trail extending from Arlington to Purcellville. The W&OD regional park is now considered one of the most successful rail-to-trail projects in America. In its current incarnation as a regional trail and a linear park, the W&OD achieves something that its rail-based predecessor could not: a truly regional (even global) connective infrastructure. Sharing the trail with commuting bikers are extra high voltage transmission lines and fibre optic cables that use the right-of-way established by the nineteenth-century rail line to mediate the region's growing dependence on electricity and to bolster its position as a global node for data traffic. Like an infrastructural palimpsest, successive lines and forces have built on the trajectories and rights-of-way established by previous connective infrastructure, creating a dense network of dependencies that mediate the flows at the heart of this contemporary urban landscape. [Fig. 3]

Anchors and institutions

Northern Virginia's proximity to Washington DC and its close relationship with intelligence and federal agencies have heavily contributed to the rapid urbanisation of the region. The establishment of the Pentagon in Arlington in 1943 and of the CIA headquarters in Langley in 1961 were catalytic to the development of the region following World War II. One can draw a clear correlation between these anchor institutions and the suburban development of Northern Virginia. The historian Andrew Friedman has captured how the emerging suburban landscape of Northern Virginia provided the perfect cover for the globally extended operations of American imperial power and an 'imperial home front' for the US after the war.[32] In a way, speculative real estate and the resulting unassuming low-density urban landscapes of Northern Virginia that became home to the growing number of military personnel and intelligence officers, disrupted only by an archipelago of office parks and fragmented by regional transportation lines, provided the perfect cover for the region's many critical infrastructures and the globally extended operations of this 'covert capital'.

As new technology and scientific methods began to inform not just military operations but also other governmental activities, these institutions became the anchors from which the federal support of research was directed during the Cold War. As federal funding support grew, so did the pace of development in the region. Proximity to these institutional anchors together with the general shift of government and military institutions towards private contractors, coupled with relaxed local land use politics and the post-war movement from central cities to suburbs would heavily contribute to the rapid development of the area of Northern Virginia between the Pentagon and the CIA headquarters in the 1960s.[33]

Highways, office parks and shopping malls

It is well documented that the threat of nuclear attack after the Second World War contributed to a push towards dispersal and suburban growth. Following the destruction of Hiroshima and Nagasaki, the scientific community, whose

efforts had helped create the atomic bomb, was quick to offer solutions for the reconfiguration of cities to minimise damage to their populations or industries in the event of a nuclear attack. One such plan came from Norbert Wiener, the intellectual father of cybernetics. In a 1950 issue of *Life* magazine, under the title 'How U.S. Cities Can Prepare for Atomic War', Wiener laid out a plan to decentralise American cities.[34] Using a system of arterial roads and a beltway ten miles out from the centre of the city, the plan called for the dispersal of the functions and living environments of the city as a defensive measure against a nuclear strike, as well as to 'thwart the extreme and unhealthy internal growth' of America's large cities.[35] While other factors such as rising automobile ownership and lending policies that favoured single family homes were also significant contributors to the rise of suburbia in post-war America, for Washington DC during the Cold War the dispersal of industries, government and residences seemed like an operational necessity.

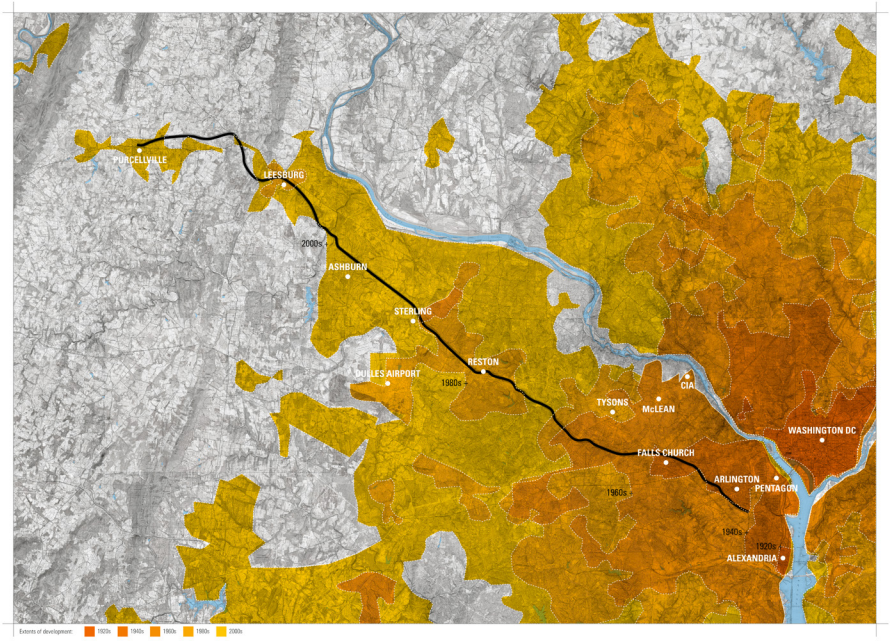
It was in this defensive climate that the idea of a series of loops around Washington was first proposed in 1950. The outermost loop – the only one to be fully completed – was proposed to be outside of a possible atomic blast zone at a ten-mile radius from the White House, matching the radius of the proposed beltway in Wiener's plan.[36] This outer loop would become the Capital Beltway, the completion of which in 1964 was essential to the urban growth of Northern Virginia, specifically that of Tysons (previously Tyson's Corner). The beltway provided a much-needed connection to Washington and Maryland on the other side of the Potomac. By the early 1960s much of the commercial and residential development outside of the district was happening in Maryland. The beltway redirected this growth towards Northern Virginia. This new connectivity, coupled with the presence of the Pentagon and the CIA headquarters in NOVA, made the region an attractive place for technology contractors, who in the wake of the Cold War were in high demand. The completion of Dulles International Airport in 1962 and the extension of the Dulles Access Road which connected to the Capital Beltway in Tysons ensured the local and international connectivity of the region.

Tysons was strategically positioned to take advantage of this new connectivity. Resident resistance to commercial development to the east of the beltway meant that most of the new development would have to extend out to the west of the beltway. The undeveloped nature of the land in Tysons and its ownership by a small number of farming families made urban development less complicated and faster than the neighbouring McLean, Falls Church or Vienna, which were at that time subdivided and dominated by low-density suburban housing. The development of Reston to the immediate west of Tysons provided an additional green buffer that enabled a density of development in Tysons that was unlike other suburban areas. Soon, the office parks and the shopping centres that were so central to Joel Garreau's conception of the 'edge city' would begin to populate this strategically located, yet unplanned, part of Northern Virginia.[37] [Fig. 4] The construction of the Tysons Corner Center in 1968 at the intersection of the Capital Beltway and Route 123 spurred a rapid rise in real estate values, prompting the construction of hotels, office buildings and residential complexes. The super-regional mall and the neighbouring Tysons Galleria, which respectively attract twenty-five million and twenty million visitors annually, would eventually anchor a surge in development in the region. These commercial centres were important in attracting the many technology contractors (and their families) working with the federal government that would define the region's urban identity for the next thirty years.[38]

Infrastructure of the information age

The growth of the internet from military foundations is well documented and a nuanced history of its development lies outside of the bounds of this study. However, it is perhaps worthwhile to examine how this part of Northern Virginia, stretching from Tysons to the west of the Dulles airport along the converted path of the W&OD railroad, became so critical to the growth of the internet, and subsequently to data platforms. By the early 1990s, with defence spending in a downturn, vacancy in the office buildings of Tysons was on the rise. These vacancies were soon to be filled by a new economic force, one built on networking and communication. The internet grew out of ARPANET, a communication network set up by the Advanced Research Projects Agency of the US Department of Defense to enable access and resource sharing to and between remote computers. The rise of the personal computer in the 1990s highlighted the commercial potential of such a network and some of the earliest commercial access providers to the network that would become the internet, like MCI, UUNet, and PSINet were based in Northern Virginia.[39]

To make the internet into a network of networks as it was first imagined, the growing number of service providers needed facilities that enabled exchange between their different networks. MAE-East was among one of the world's first internet exchange points, with facilities in Vienna, Reston and Ashburn. Its original 1992 location was in Tysons at 8100 Boone Blvd, one block south of the Tysons Corner Center.[40] This location still operates as a data centre, albeit a small one by today's standards. The presence of these early peering and exchange facilities in the region as well as the rapid growth of local internet service providers such as America Online (AOL) gave way to



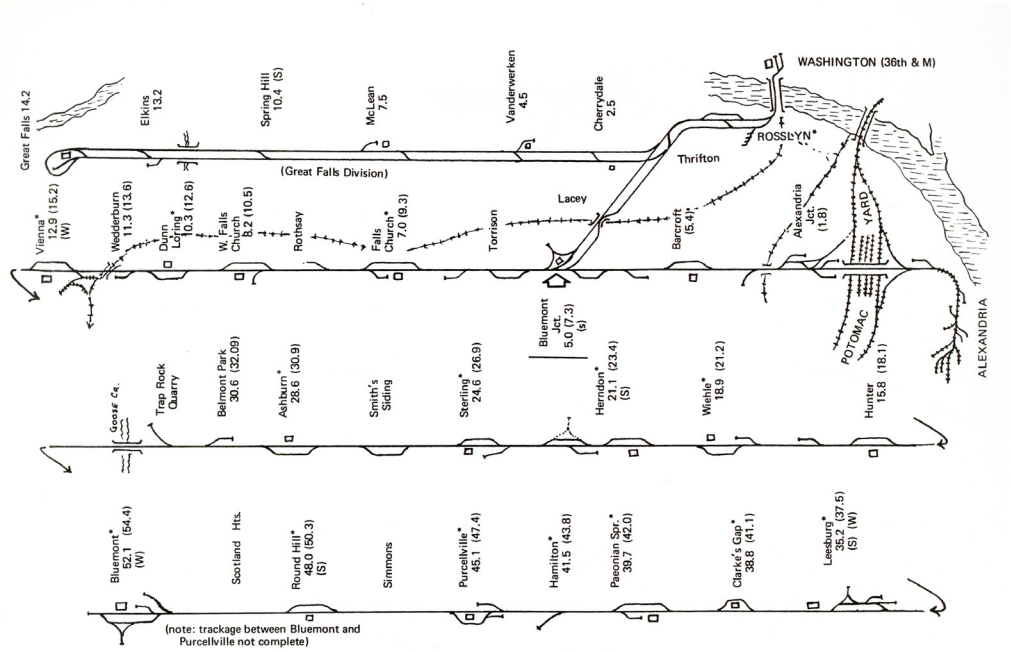


Fig. 1: The historical progression of development in NOVA in relationship to the W&OD trail, 1920s– 2010s. Drawing: author, assembled from historic topography maps from USGS's map archive.

Fig. 2: Trackage diagram of the W&OD, 1916. The flattening of the path of the railway in the diagram reshapes the surrounding territory based on the linear logic of the tracks. Source: Herbert H. Harwood, *Rails to the Blue Ridge* (Fairfax Station, VA: Northern Virginia Regional Park Authority, 2000).

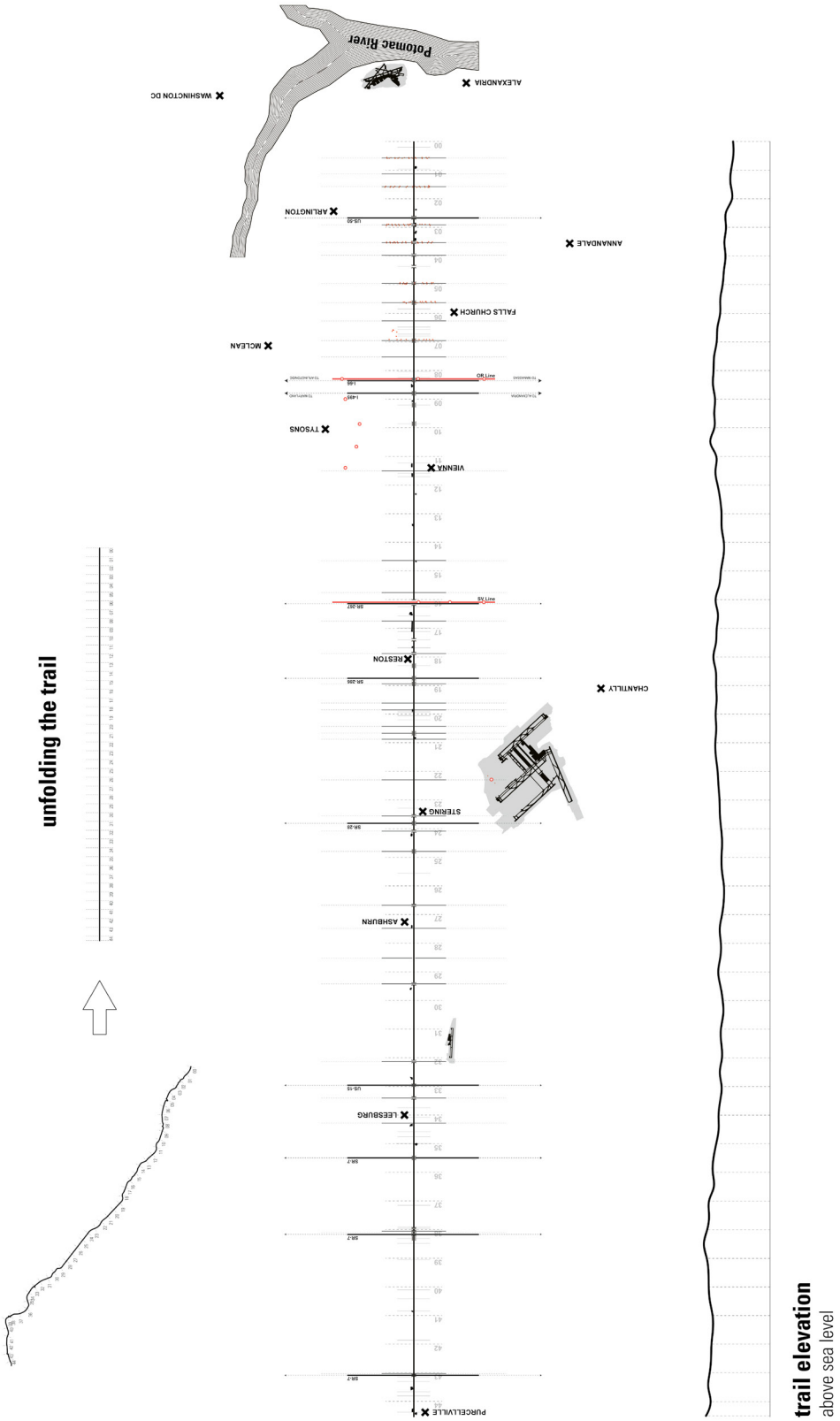


Fig. 3: The unfolded path of W&OD showing elevation, towns, airports, and all roads and highway crossings. Drawing: author.

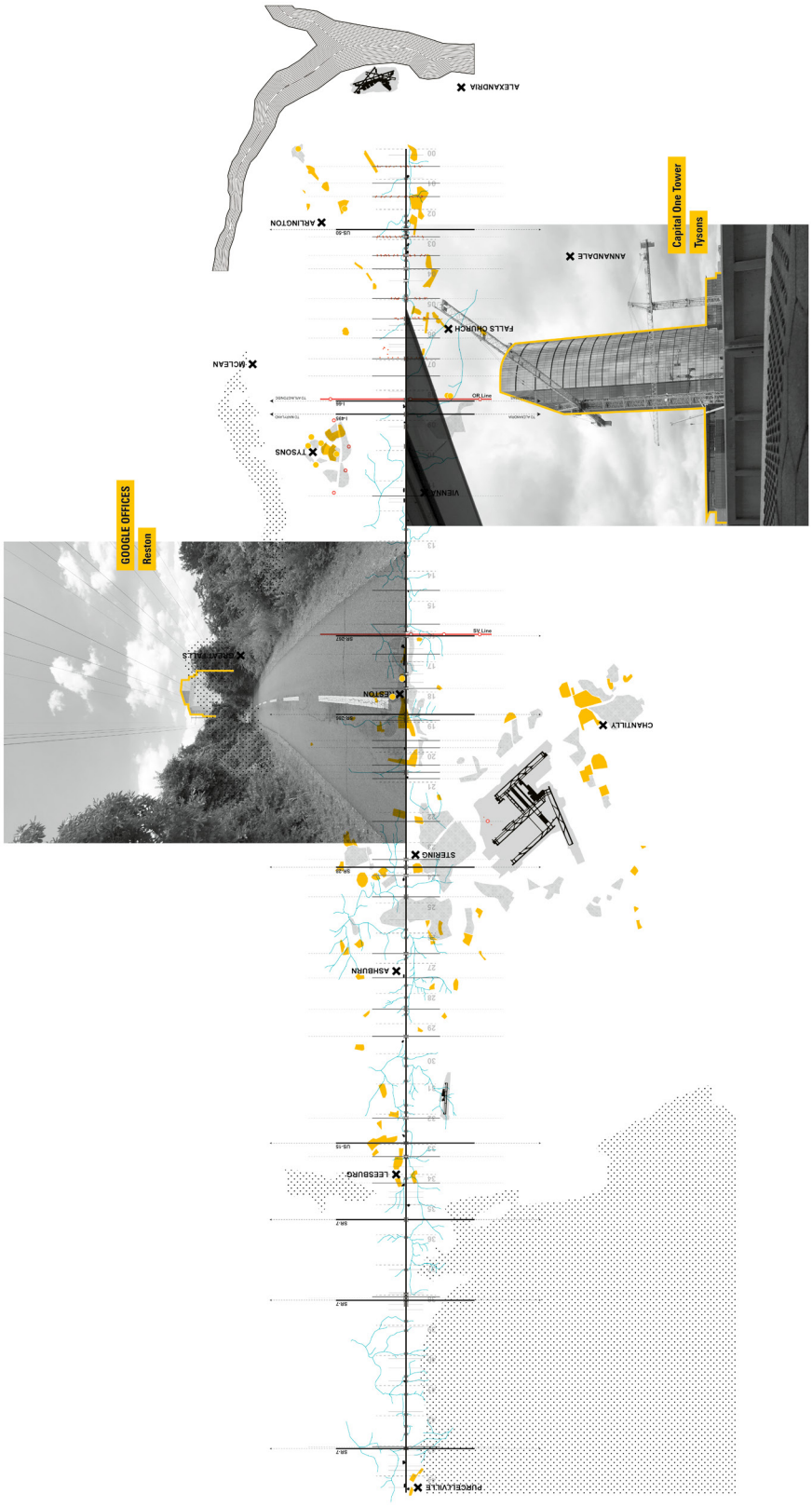


Fig. 4: Office parks and commercial spaces along the W&OD trail. Office parks and Fortune 500 companies are shown in yellow and commercial spaces including malls and shopping centres are cross-hatched in grey. Drawing: author.

a dense network of fibre optics which was laid in anticipation of the growing network demand that would accompany the rise of the internet. Northern Virginia is now home to 'the most dense fiber network anywhere in the world'.[41]

A thickening geography

It is partly due to this infrastructural capacity that the area has remained attractive to technology firms even in the aftermath of the dot-com crash of the early 2000s. However, as it did at the end of the Cold War, the region has shape-shifted. The growth of platforms is transforming the nature of computing from personal computing on individual devices to distributed computing in the cloud, and the dominant form of data networks from decentralised networks on public backbones to centralised data ecosystems on increasingly private networks.[42] This has led to the growing importance of data centres as instruments of expansion within the extended geographies of platforms. Within this expansionist logic, reliability is an important factor. Building up redundancies in the network through the creation of multiple data regions and zones is an essential part of making a data platform reliable. The regions and zones of the cloud are materialised through data centres that are in turn grounded in the specificities of geography. Over the past two decades, relying on relatively inexpensive land in the western parts of the corridor, low-cost electricity, ready access to water for cooling, a growing skilled and educated population, favourable tax incentives, and reliable and redundant infrastructural connectivity, Northern Virginia has positioned itself as the largest data centre market in the world.[43] [Fig. 5]

The positioning of Northern Virginia's technology corridor between federal agencies – a massive client base for data platforms – and the critical data infrastructures embedded in its urban fabric has been crucial in establishing its urban identity and continues to inform its future. Major technology platforms like Google and Amazon have established a significant presence in the region, both in terms of office real estate and back-of-house infrastructure critical to their operations. Amazon, whose Amazon Web Services (AWS) division counts as clients not only other technology firms but also the federal government's defence, civilian and intelligence sectors, has invested $35 billion in data centres located in Northern Virginia since 2011.[44] The company has also recently chosen a site in Arlington for its second global headquarters.[45] Called 'National Landing', the development will involve billions of public and private funding to create a new Amazon campus that will house 25 000 new employees.[46] And there is currently no sign that the buildout of the infrastructural landscapes that support the expansion of platforms will be slowing down in the region. This signals the continued importance of geography, infrastructural capacity and spatial proximities in how data platforms operate. At the same time, it is important to consider that while these factors are increasingly important to the continual urbanisation of the region, they have largely followed paths established by an interwoven web of speculation, infrastructural development and technological advancements since the middle of the nineteenth century.

The more concentrated forms of development in Tysons or Reston that have defined the urbanisation of NOVA for the past fifty years are currently under pressure by the emerging form of urbanisation driven by technology platforms. The Covid-19 pandemic has accelerated the process, driving a data centre construction boom in a region that already represents the largest data centre market in the world.[47] The contemporary urbanisation of Northern Virginia may now be closer to the 'edgeless cities' of Robert E. Lang than the 'edge cities' of Joel Garreau, as the density that was bounded within Tysons spills out and expands.[48] But whether there is an edge or not, there certainly is a spine. The converted tracks of the W&OD have unintentionally become the spine of development in NOVA. The tree-lined trail provides a cross-sectional cut across the different eras of development that have defined the urbanisation of the region over its relatively short history. [Fig. 6]

Grounding platforms and excavating palimpsests

Analytically, the forty-five miles (70 km) of the trail can be broken down to a set of distinct zones that owe their formation to the forces that have contributed to the urbanisation of the region over time. [Fig. 7] The first five miles (8 km) of the trail (Zone 1) are conditioned by the historical presence of the colonial port city of Alexandria and the density and intensity of Arlington, whose development after the arrival of the Pentagon has given direction to the entire region. Here, we find a mix of urban conditions and the highest population density in the region: from high-density office and residential towers to single-family housing that has grown in relationship to the Pentagon. The next seven miles (11 km), between mile markers 5 and 12, (Zone 2) are the commercial heart of Northern Virginia, with Tysons acting as the commercial and office centre surrounded by low-density suburban housing extending out to McLean, Vienna and Falls Church. The next nine miles (14.4 km) to the west of Vienna (Zone 3) are the living room of the region, with large tracts of low-density housing and a large number of public parks and other recreational spaces like golf courses. There is also a significant density of office buildings in Reston, along the W&OD, which has been growing over the past years as large tech companies like Google establish local offices here. The ten miles (16 km)

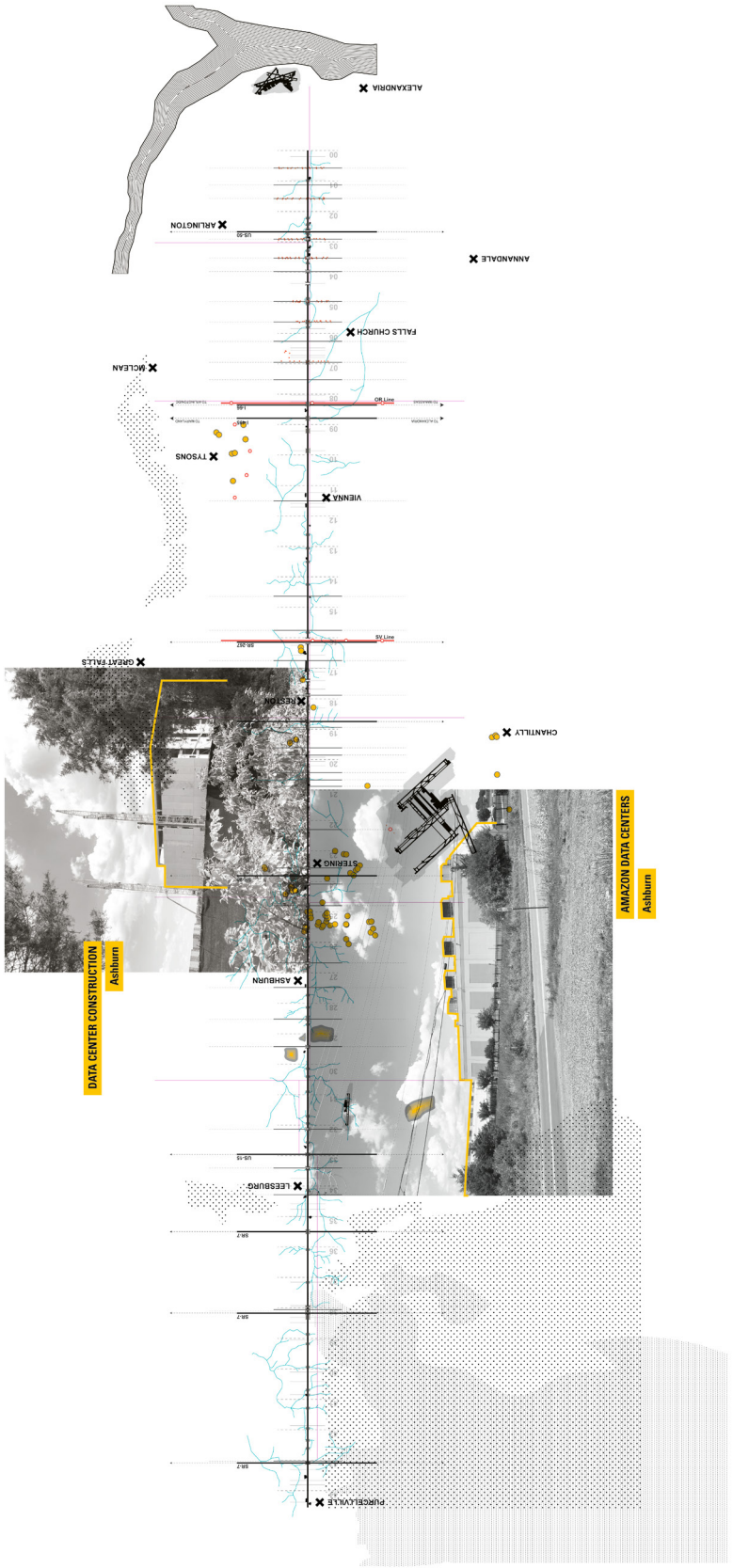


Fig. 5: The operational landscapes of data along the W&OD trail, showing data centres (yellow circles), power-lines (pink lines), quarries (grey-yellow gradient) and agricultural land (fine grey dots). Drawing: author.

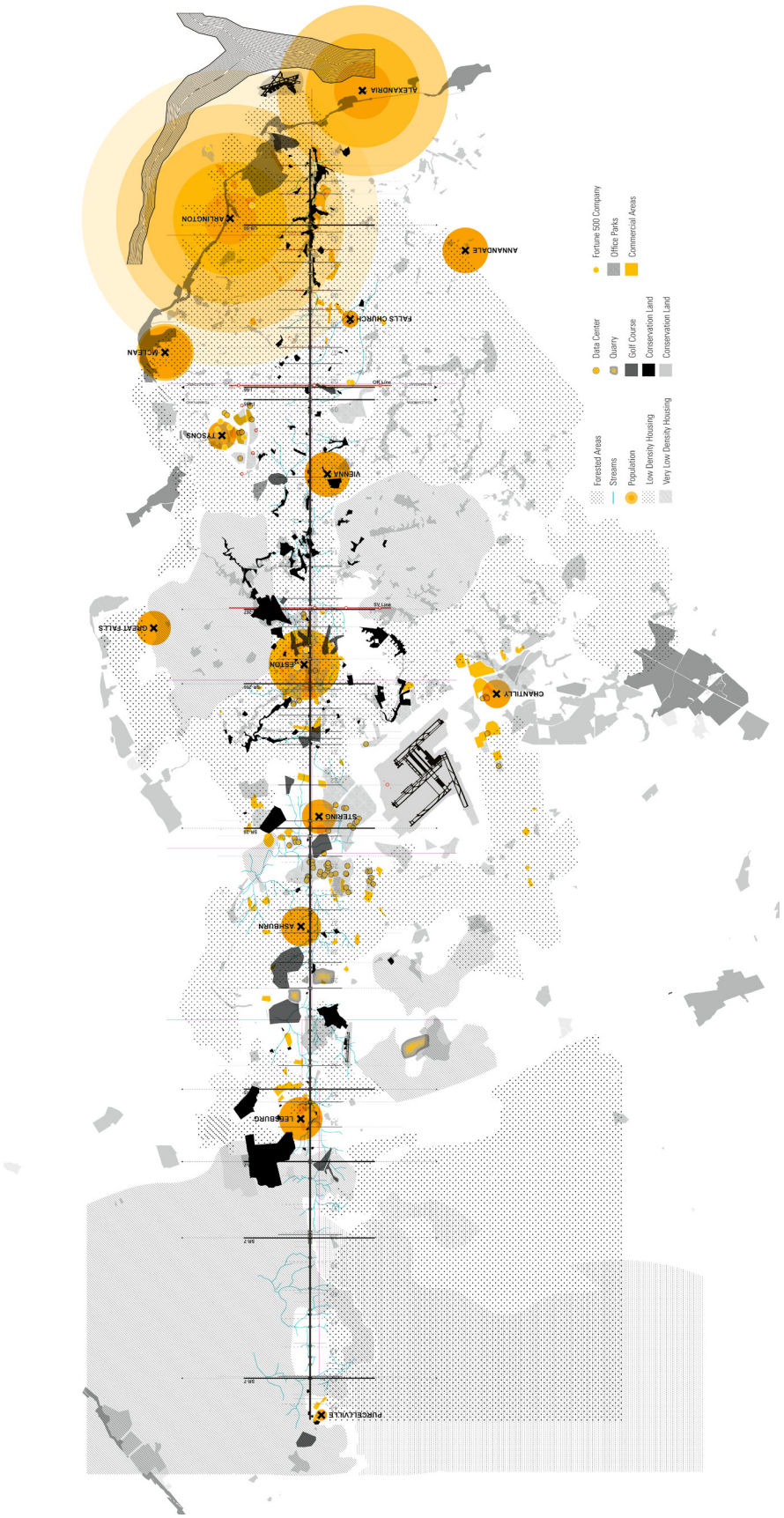


Fig. 6: Urban intensities and proximities in Northern Virginia. The drawing shows how natural geography, population densities, park lands, protected areas, residential zones, data centres and commercial spaces create a thickened urban palimpsest along the path of the W&OD. Drawing: author.

Figure 7: The urban zones of NOVA. Drawing: author.

between mile markers 21 and 31 (Zone 4) can be characterised as the operational landscape of the region. There is the usual suburban housing, but the massive clustering of data centres, coupled with the presence of the airport and surrounding logistical facilities and quarries, make this stretch the infrastructural and logistical engine of the entire tech corridor. The next five miles (8 km, Zone 5) are characterised by the centrality of Leesburg, a historic city that has transformed into a suburban bedroom community for commuters to Washington. The final nine miles (14.4 km) of the trail (Zone 6) pass through a largely agricultural landscape with some low-density housing. The stretch between Leesburg and Purcellville is the least developed portion of the trail, but given the pace and intensity of development happing to its immediate east, this zone will likely witness a radical transformation over the next decade.

Understanding the histories, systems, actors and forces that inform NOVA's urbanisation ultimately helps ground the contemporary operations and trajectories of technology platforms. Through this historical grounding the urban landscape of the region emerges as an infrastructural palimpsest that is continually built upon, tweaked and expanded. And while the contemporary condition is often dismissed as an extension of suburbanisation or sprawl, the presence of technology corporations, defence and intelligence agencies, and the density of critical infrastructural networks in the region hint at a condition that is more akin to the infrastructuralisation of urbanism outlined in Keller Easterling's conception of 'extrastatecraft'.[49] In this vein, the entire urbanisation of NOVA operates as a spatiotemporal infrastructure whose specific twists and turns directly contribute to the continual construction of one of the largest and most important operational landscapes of data in the world. Hence, when speaking about platforms, these spatial narratives and the urban dynamics that play out within them provide a fuller picture of how platforms are constructed, of their spatial dependencies, the timescales of their emergence, and the intricacy of their operation, through all of which data gains its value.

To fully capture the complexity of contemporary relationships between technology, data and urbanisation we need to move beyond the city and into the landscapes that accommodate the production and circulation of data as the lifeblood of the capitalist formation of the platform. These landscapes, which have been constructed over time, need to be historically grounded to more precisely articulate the forces, actors, systems and agencies that continue to contribute to their build-up. This deep mapping of the sociotechnical landscapes of platforms allows the narratives of their construction to move beyond the metaphoric articulations and arbitrary boundaries that typically plague discussions of technology and urbanisation. The aim, however, is not to suggest that all geographies of data production and circulation share these same characteristics. Rather, the point is to highlight the variegated conditions that emerge as we engage with these uneven geographies and the specificities of history and materiality that are embedded within them. Research on these operational landscapes can produce a much more elaborate understating of the diversity of spatial conditions, histories and material geographies that contribute to the construction and maintenance of platforms and provide a counterpoint to the myths that they spread and the 'revolutionary' urban visions they propagate.

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Biography

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