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The fictional soils of a 'sustainable' Anthropocene: A new materialist story of the soils of the Queen Elizabeth Olympic Park

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Abstract
The Queen Elizabeth Olympic Park in London has been celebrated as an exemplar of sustainable landscape architecture and regeneration. Yet tracing the new materialist histories of its enmeshed soils reveals how complex sustainable landscape architecture is. On the one hand, the park has expertly recycled and locally sourced its materials. On the other, the socio-ecosystems of its soil assemblages have been pulverized, treated and mixed to create a new profile of synthetic geological strata. Their history and life have been erased. The subterranean sections through this park are caricatures of a 'sustainable Anthropocene'. Here, the anthropogenic geology supporting the vision of idealized future ecosystems is used for the global marketing of a nation and property developments. This project indicates a destructive systemic blindness in sustainable approaches and the need for truly regenerative design processes, based on working with a place, including the various (other-than) human inhabitants, instead of solely mining its materials to create a perfect vision anew.

soil / landscape architecture / sustainability / new materialism / Olympic Park

Introduction
In recent decades, researchers such as landscape historian Jane Hutton[1] and sociologist Caroline Knowles[2] have followed the journeys of specific materials from their source landscapes to their end destinations to reveal the ecological, societal and human impact behind the creation of celebrated landscapes and ubiquitous artefacts. Their research unearthed stories of destruction and cruelty during the industrial period and beyond. This practice is often shrouded by the treatment of the extracted products as commodities and by the manipulated form they take post-processing.

In comparison, the focus on 'sustainability' and human rights in twenty-first-century landscape practices seem ethical, but are they as respectful of human and other-than-human life as they appear?

This study aims to stimulate a more profound understanding of the mechanisms and implications of 'sustainable' material specification in landscape architecture by tracing the stories of how the soils were processed in the landscape of the Queen Elizabeth Olympic Park, in order to reveal the ecological, social and political implications of the disproportionate material transactions between seemingly temporally and geographically detached sites.

The Queen Elizabeth Olympic Park (Fig. 1) in Stratford, London is a seminal landscape architectural project in the Lea Valley in East London, created to host the 2012 Olympic Games. They were praised by the independent Commission for a Sustainable London 2012 as the 'most sustainable Games ever'.[3] The parklands and buildings for the Olympic Games could not have


JASON HAWKES

Figure 1 Aerial image of the Queen Elizabeth Olympic Park.

been realized without exceptions to building rules and practices. The suspension of routine planning procedures, the circumvention of statutory regulations and the formation of agencies with special powers were just some of the exceptional measures introduced to ensure the Games were delivered on time. This research will expose to what extent the provenance of the specified materials in the park and the integrity of its soils were sacrificed to satisfy uncompromisingly high stakes and weighty time pressures.

Soil in sustainable landscape practices

The key enquiries of this paper are: How were the chosen landscape materials, in particular the soils, specified? Where did they come from? If local, did they need to be transformed? What are the social and ecological implications of their extraction? Most importantly, what does this say about sustainable landscape practices, understood as a range of increasingly mainstream approaches that aim to mitigate the negative impact of human development on climate change and biodiversity? These ways of doing differ from those of regenerative design, which strive to also improve the situation.[4]

The protagonist of this material story is soil. Despite its seemingly inert disposition, soil is described by biophysicist Iain Young and theoretical biologist John Crawford as 'the most complicated biomaterial on the planet' and contains 'more organisms in a single handful than the total number of humans that have ever lived'.[5] Adopting a new materialist and modern animist lens, we will conceive of soils not as the inert substrates waiting to be shaped by humans, as usually described in specifications, but as intricate and dynamic assemblages that are very much alive.[6] We regard soils as evolving and dynamic groupings of elements that include the other-than-human and human lives that relate to and care for it. The boundaries of these earthy assemblages extend above the ground through intangible, and generally missed (by humans), relations of exchange and care. These tentacular earthy beings are not passive; they have agency and co-create themselves.[7]

Furthermore, the paper draws on the essay *A Sedimentation of the Mind: Earth Projects*, where conceptual artist Robert Smithson alludes to the concept of 'levels of sedimentation' or the seams of geological matter that constitute the Earth's crust.[8] Smithson's concept also applies to the complex ideological and material treatment of soil in the Queen Elizabeth Olympic Park, where dynamic materials, unseen by humans, were unearthed and layered at great speed to form three levels of sedimentation: the subsoil, the fill and the topsoil. In the paper, the three levels are considered as individual parts, followed by a comprehensive and dynamic understanding of material relations both inside and outside the park's formalized curtilage. In the final part, the soil of the park is spatially and temporally interpreted in its entirety. It reveals the deadly consequences to systemic life concealed behind human handling of soil as inert matter and offers a reflection on an alternative approach to similar conditions.

The subsoil: soil and the pedosphere

Soil's ubiquity often leaves it negatively dismissed as 'dirt' and is frequently read reductively as a singular 'ground' that can be governed, owned or controlled. Contrary to both designations, soil is in fact a highly complex and biotically active assembly of minerals, water, organic matter, gases and microorganisms that together, according to environmental journalist Jim Robbins, make it the 'foundation on which the house of terrestrial biodiversity is built'.[9] Perhaps because of soil's inherent opacity, hindering human ability to empathize with it, it seems that it is literally and metaphorically beneath us. This opacity can be understood as both the biological complexity of soil and the microscopic scale at which its constituent processes occur.

In 2015, the Food and Agriculture Organization of the United Nations (FAO) revealed that a third of the world's soils are degraded by erosion, salinization, compaction, acidification or chemical pollution.[10] This is the consequence of continual anthropogenic disregard for soils. The dependence of human and nonhuman populations upon their intricate and irreplaceable relation with soil, especially at a microbial scale, have historically garnered little attention. Yet soil biota and the services they provide are central to ensuring global ecological futures.[11]

The thin layer of matter formed by the gradual weathering of rocks and organic matter that blankets much of the Earth's surface soil constitutes the pedosphere, which is defined by environmental scientists Angus Cook, Karin Ljung and Ronald Watkins as 'the outer most layer of earth that is composed of soil and subject to soil transformation processes'.[12] The pedosphere is a physically and biotically active mélange of innumerable soils that anthropologist Tim Ingold described as 'a zone of interpenetration'.[13] We will interpret this zone appropriately, in accordance with common terminology in soil science, as a horizon. The pedosphere as a horizon is a transitional layer parallel to the soil surface between two differing soil types. Understanding this zone as a blurred intersection in constant flux, recognizes it as a stretched vibrant melange of atmospheric, ecospheric and lithospheric functions.

It is becoming increasingly important that we endeavour to encourage more convivial and empathetic connections with the lively realm beneath our feet and, as Ingold suggests: 'Cease regarding [it] as an inert substratum.'[14] To grasp the significance of soil as an essential support for life it should be regarded as a vibrant and lively assemblage. Appreciation beyond its status as a resource will help to forefront threats to existing terrestrial ecosystems and contribute to secure ecological futures.

The subsoil of Queen Elizabeth Olympic Park in the Lea Valley

In geological terms, London's soils are young, yet they still represent 11,000 years of continual ecological processes. Although the Earth is almost 4,600 million years old, only the last 100 million years of events are represented in London's surface geology. This geological evolution is best appreciated when considering the Earth's history as a single day. At this scale the earliest rocks in London were formed at around 11:30 pm, and the London Clay that lies beneath most of the capital at around 11:45 pm. The Quaternary ice ages would have occurred at less than a minute before midnight and the first human-like inhabitants arrived at less than one second to midnight.[15] The naturally arising processes of London's soils were subject to intervention for the purpose of human survival. Crop fields, pastures and managed forests alongside urban development and infrastructure perpetually altered the soils. Over time soils and humans co-evolved, to become what zoologist and philosopher Donna Haraway would describe as 'companion species'.[16]

The Anglo-Saxons are popularly credited with having first drained the Lea Valley marshlands for use as hay meadows between the seventh and eleventh centuries.[17] The economy was focused solely on food production and trade, of which cattle were a vital component. Cattle were moved seasonally between the newly created hay meadows and the surrounding woodlands. In the Lea Valley this would have been between the Leyton, Walthamstow and Stratford Marshes and Epping Forest. These marshes are the closest representative of the condition that would have been visible at the Olympic Park prior to its nineteenth-century industrialization. The Walthamstow Marsh, just north of the Olympic Park, is one of the last surviving examples of a grazing marshland in London.

In the nineteenth century, the significance of soil as subordinate to humans became dominant over that of a co-created source for human subsistence. The character of the marshes shifted drastically as large portions of marshland were purchased and built on by railway, water and gas companies. Growth in the area was further accelerated by the construction of the Royal Docks and the introduction of the Metropolitan Building Act (1844), which barred the operation of pollutive and noxious industries within the metropolitan area. The River Lea marked the Act's eastern boundary, which resulted in many of the restricted activities being relocated to its banks. Consequently, the area became one of the country's largest manufacturing centres for pharmaceuticals, chemicals and processed goods (Fig. 2). These industries were responsible for the smattering of powerlines, underused railway sidings, abandoned buildings and polluted waterways as well as the profound levels of contamination and their detrimental effects on the native soils in the area.[18] The accumulated contaminants included petroleum hydrocarbons, polycyclic aromatic hydrocarbons, chlorinated hydrocarbons, heavy metals, ammonia and asbestos, physical contaminants such as glass and nails, and biological contaminants such a Japanese knotweed, Himalayan balsam and giant hogweed.[19] Also present were traces of radioactivity from naturally occurring materials and radioactive luminescent paint used for the dials of aircraft built at the site during the Second World War.

As industry flourished, soils were implicitly recategorized from a source of vitality to ground. The processes that transpired throughout this development modified the Lea Valley soils, leaving them damaged, their natural processes obstructed and their microscopic inhabitants poisoned. Ultimately, this resulted in the landscape becoming perpetually haunted by past uses.

Following the decline of the above industries in the twentieth century, an outcome exacerbated by the closure of the Royal Docks in the 1960s, the area only experienced fleeting attempts of modernization, not inspiring any drastic change, until the construction of the Olympic Park.

However, as human pressure was removed during the industrial decline of the 1970s, an altered but functioning subterranean ecosystem re-emerged from the fragmented and damaged post-industrial remains. While the ruderal, regenerating soil supported a great floral and faunal diversity, the

MUSEUM OF LONDON, MIKE SEABOURNE

Figure 2 View looking across the City Mill River towards Banner's Chemical Storage and Distribution Depot prior to the Queen Elizabeth Olympic Park being created, 2007.

authorities and the inhabiting community conceived the site as decaying, because it no longer provided economic benefits.[20] The soils in Lea Valley were ecologically flourishing from the industrial ruins and left to recover, unintentionally freed from subjugation. Their constituent processes emerged and their vibrancy gradually returned. This regenerating soil was the condition at Stratford prior to the Olympic redevelopment.

The fill: the Olympic Park and the legacy

At 230 hectares, the Queen Elizabeth Olympic Park is one of the largest new parks in Europe. The design combines the vocabulary of British parklands and post-industrial brownfield sites, while it forefronts sustainability and resilience. In 2004, the aspirations of the project were summarized by the then Mayor of London, Ken Livingston, in a letter to the then President of the International Olympic Committee, Jacques Rogge: 'This will kickstart regeneration in east London, while bringing all parts of the city together to celebrate the unifying force of Olympism.'[21] The key aspects of the park design brief, delivered by landscape architects John Hopkins and Peter Neal, were to create a robust infrastructure for the organization and building of the venues, to renew the water and land structures, and to socially and spatially connect the park site to its surroundings.[22] The strategic aims were core to recovering the sparse ruins of industrialization that had spawned after more than 150 years of ill-treatment.

The design of the park also considered the longer-term benefits and effects of planning, funding, building and staging the Olympics for the park and the surrounding area, to generate economic, sporting, social and regenerative opportunities and outcomes. This forward-looking process became known by the Olympic Delivery Authority and London Organising Committee of the Olympic and Paralympic Games as the 'Olympic Legacy' (Fig. 3).[23] The idea of the park as a future legacy became so ingrained in the early planning process that, from its conception, any plans produced for the park would have a companion plan showing that exact plan 'in Legacy'. The condition visible today should be regarded as the park configured 'in Legacy'.

Olympic Park Soil Strategy: sustainable soil science

In 2009, Tim O'Hare was appointed by the Olympic Development Association as the project's independent soil scientist throughout both the detailed design and construction phases.[24] He worked alongside the planning and design team's landscape architects, ecologists, engineers, environmental consultants and contractors and his office was responsible for the 'Olympic Park Soil Strategy'.[25] Soils were considered very early on in the design, an approach that Tim White, senior associate at Tim O'Hare Associates, described as 'refreshing, as soils generally seem to be the last thought'.[26] This early conceived approach allowed the strategy to consider the different social and biological functions that soils provide and to support the design of the landscape, habitat creation, interaction with the environment and water containment.[27]

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GOOGLE EARTH, MAXAR TECHNOLOGIES

GOOGLE EARTH

Figure 3 Satellite images showing the development of the Queen Elizabeth Olympic Park in 1999, 2012 and 2020.

In total, nine separate soil types were specified to help meet the park's design requirements.[28] These requirements included that the soils drained well, were free of contaminants, met stringent remediation standards, and fulfilled the horticultural and ecological needs of the landscape strategy. Additionally, the soils were an important contributor to the carbon targets in the Sustainable Development Strategy of the Olympic Development Association, as soils and vegetation sequester substantial amounts of carbon.[29]

To further the sustainability goals of the project, a large portion of the existing agriculturally and industrially disturbed soils were to be repurposed and reused. The existing soil matter was tested, graded, sorted, washed and treated without leaving the site. This material was then covered by what O'Hare designated the 'Human Health Layer', an 800 to 1,000-mm accumulation of imported soils that act as a 'clean' barrier between human contributions and the largely remediated fill beneath it (Fig. 4).[30] To further the concealment of soils, the rubble of the pre-existing buildings was crushed and manipulated to form pedestals from which the out-of-scale stadia could dominate the subservient landscape. During the park's configuration as host for the Olympics, a much larger portion of the park was hard surfaced than proposed in its legacy, which meant that once those hard surfaces were removed post-Games, the majority of landscape soils had to be imported. In total, 84,000 m^3 of newly deposited earth covered the park[31] on top of the 2,000,000 m^3 of pre-existing soil that was excavated and of which approximately 80 percent was reused.[32]

CAPITA LOVEJOY

Figure 4 Tree pits being dug in the 'cleansed' fill prior to the marker layer and imported soil being installed. The full profile is visible to the right of the image.

ENVIRONMENT AGENCY, UK

Figure 5 Olympic Park 'soil hospital' in operation, 2008.

Redeveloping the contaminated site

Prior to redevelopment, the site's soil was known to be severely contaminated, but the complete extent of the contamination was unknown. At the earliest opportunity a soil resource survey was completed to identify the potential for existing soils to be reused in the landscape scheme.[33] A series of around 3,500 boreholes, some up to 60 m deep, and trial pits were dug at 25 m intervals across the park. The excavated material was tested and analysed in an on-site laboratory for reuse or treatment. The results of the survey were poor and showed that there was no reusable topsoil.[34] In the end, none of the site's soil was reused above the human health layer, even after cleansing, as it was deemed to contain too many residual contaminants.

The initial survey and testing determined the choice of decontamination techniques. To minimize transport, in situ methods were preferred, such as bioremediation and chemical stabilization, but vast amounts of soil were still excavated in order to maximize the effectiveness of the decontamination efforts. Soil washing by the infamous 'soil hospitals' (Fig. 5) is the most well-known decontamination tool used by the Olympic Development Association.[35] In a stepped flushing process, soil particles that carry the contamination are washed from the major soil volume.[36] Approximately 750,000 m³ of material was cleansed using the onsite soil washing facility. Chemical and physical stabilization were employed to recover around 300,000 m³ of soil in situ. Finally, 30,000 m^3 of material went through a process of bioremediation, using microorganisms such as bacteria or fungi to chemically transform toxic into non-toxic particles.[37] Soils with lighter contamination were subjected to a rotavation system that allowed volatile substances to aerate. More heavily contaminated substances were removed entirely and placed in controlled environments where calculated changes to air quality, temperature and microorganism activity were used to break down the contaminants. All three techniques contributed to an unprecedented quantity of reconstituted material being retained on site, even if it was entombed within and disguised by the new landforms.

The core argument for the radical and destructive processing of the Park's earthy matter was the hazard to human health. Ironically, even after completion of the notoriously extensive decontamination programme, today the fill remains polluted and is covered by the spoil of distant soil extraction activities. This raises the question as to whether the decontamination exercise of the entire site was truly necessary.

The topsoil: a new soil ecosystem

There were a number of factors that influenced the requirements of the chosen soils at the park. Tim O'Hare lists 'large, semi mature, and specimen trees, groundcover shrubs, ferns, tall ruderal and herb planting, wet woodlands, amenity grass spectator lawns and species rich annual and perennial grassland meadows', that had to be catered for, as well as new ecological habitats and water attenuation and filtration systems.[38] Considering the integral part that soils had to play in the scheme, their requirements were combined with those of the main specification documents. There was a separate document with detailed information about the physical and chemical properties and parameters of each soil. In addition, there was also strict information on the overall soil depth or soil profile, which was influenced by two key factors: the legislative requirements of the human health layer and the estimated rooting depth of the proposed plants.[39] According to O'Hare, the design process acknowledged that topsoil does not perform well below depths of 300 to 400 mm from the surface as anaerobic conditions that are detrimental to plant root functions tend to develop.[40]

In order to meet the vast quantities and particularity of the proposed soil types and the project's stringent timescale, it was decided that manufactured topsoil would be used instead of natural topsoil. O'Hare emphasized that instead of creating natural topsoil, substrates were composed that would perform the function of topsoil.[41] This acknowledges that manufactured topsoil is not a like-for-like replacement and raises the question to what extent manufactured soils can replace the intricate biotic functions of natural soils.

The biotic functions of manufactured sustainable soil

The introduction of manufactured topsoil further contributes to the emphasis on sustainability that was tangible throughout the entire project. A key benefit of manufactured soils is that 'natural' soils need not be removed from their original location and anthropogenically tainted material is used instead. The chosen sources for the manufactured soils were soil washings and quarry overburden. Following a rigorous process of testing and ratification, British Sugar Topsoil, Freeland Horticulture and London Rock Supplies were the chosen suppliers.

British Sugar Topsoil supplied approximately 1,700 m^3 of soil that fulfilled the specification of the moisture retentive soil. Soil washings consist of the soil matter recovered from sugar beets during their harvest and processing. During the harvest, as much soil is removed from the beets as possible and returned to the field. The beets are delivered to one of four British Sugar Topsoil facilities. Upon arrival they are floated from a holding area through the factory in water channels, any stone and weightier deposits are removed via gravity during this floating. A giant washing machine then removes the remaining soil, producing a watery solution that contains approximately 7 per cent solids.[42] This solution is then pumped into settlement lagoons to separate. The surface water is removed from the lagoons and recycled back to the beginning of the soil-washing process. The settled sand, silt and clay is lifted using excavators (Fig. 6) and spread flat to naturally dry. Upon removal from the lagoons the mixture is 50 per cent dry matter (Fig. 7). While drying the material is regularly mixed and cultivated to aerate the soil and avoid compaction. Following a two-year drying process (Fig. 8), the soil is collected, blended and stockpiled until ready to be distributed (Fig. 9).

The soil supplied for the Olympic Park was British Sugar Topsoil's standard sandy loam, known as 'Landscape 20', and a modified clay loam titled 'Landscape 20 with less sand'.[43] They were sourced within an 80-km radius of the Wissington and Bury St Edmund factories and transported 110 to 130 km to the Olympic Park in lorries, twenty tonnes at a time.

Freeland Horticulture and London Rock Supplies provided the remaining 82,300 m^3 of soil, 45,750 m^3 and 36,550 m^3 respectively. London Rock Supplies provided the general-purpose landscape subsoil, while Freeland Horticulture was responsible for the blending and supply of the multipurpose topsoil, low-nutrient topsoil, high-permeability turf soil, river-edge and wet-woodland topsoil, structural-tree soil and tree sand. Both suppliers used quarry overburden to provide the mineral component of each topsoil, located as a seam below the natural topsoil and subsoil layers but above the clean sand and gravel deposits.[44] Due to its lack of recoverable stone, or sand, overburden is deemed as low value, however, it is ideal for use in soil manufacture. Following its removal from a series of quarries near London, the overburden was transported to Freeland Horticulture's blending sites in Kent and Essex where they were mixed according to specification. The soils were tested for physical, chemical and biological properties and contaminants before being transported to the Olympic Park by train. Traditionally, soils would have been transported by lorry, however, the Olympic Development Association committed to minimizing lorry movement. Trains were used instead, each load carrying roughly 1,500 m^3, a far larger quantity than a lorry could move. It was a very efficient, and cost-effective, way of moving the large amounts of soil required.[45]

The Olympic Park is an example of best practice in terms of the sustainable specification of new soil mixes made from recycled material. Arguably, this is an improvement on historical specification practices that obtained material by stripping far-flung source landscapes. Nonetheless, the chosen solutions are still manufactured from the waste of other, national, industrial processes, which are themselves damaging. These soils are mainly anthropogenic, they are made from the waste of other extractive human-led industries. They are an amalgamation of disparate parts, mixed to create a suite of fit-for-purpose substrates that do their utmost to mimic the biological and ecological functions of naturally arising soils.

MUSEUM OF LONDON, MIKE SEABOURNE

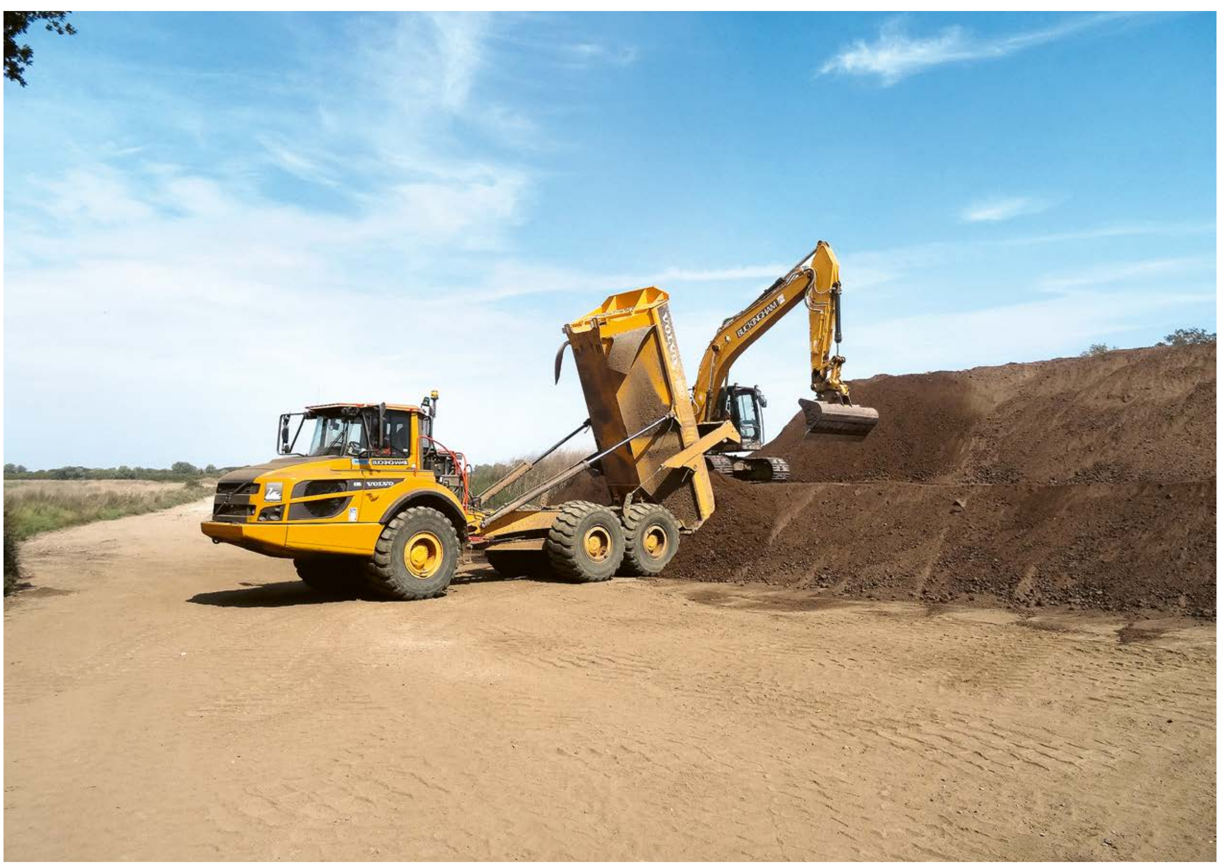
Figure 6 Settlement lagoons being emptied at British Sugar Topsoil's Wissington site, 2020.

MUSEUM OF LONDON, MIKE SEABOURNE

Figure 7 The 50:50 solution ready for drying after removal from the settlement lagoons, 2020.

BRITISH SUGAR TOPSOIL

Figure 8 Soil drying process, 2020.



BRITISH SUGAR TOPSOIL

Figure 9 Stockpiling of dried soils, 2020.

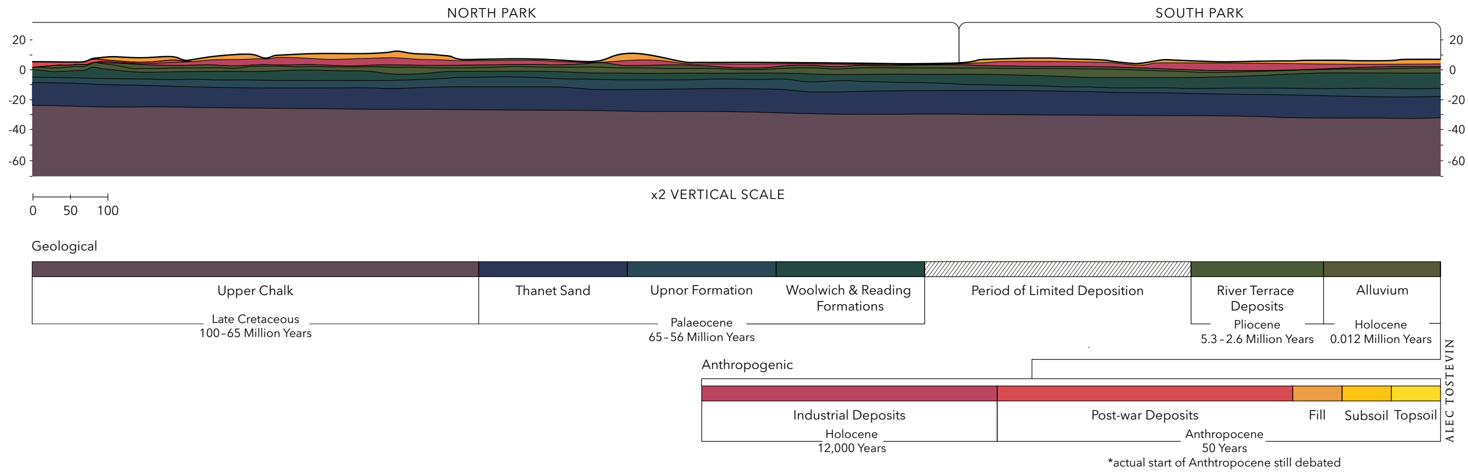


Figure 10 Geological cross section through the Queen Elizabeth Olympic Park, 2022.

The assemblage: destructive anthropogenic profiles for future ecosystems

After looking at the specification and sourcing of each of the three soil layers individually, this final part describes how they have been, spatially, shaped to create a complete profile and how the existing living earthy assemblages, constitutive of the original soils, were destroyed to create this futuristic ground. The spatial and temporal analysis will demonstrate the lifeless and narrow conception of soil in the specification practice.

The profile: designed strata for future ecosystems

The strata of the three soils analysed earlier (subsoil, fill, and topsoil), are organized in the park as distinct synthetic layers specified by humans with predominantly uniform qualities and sharp boundaries. The physical scale of earth movements is colossal; the decontaminated soil excavated for the fill alone covered 1.4 million m^3.[46] This designed layer of earth has a thickness equivalent to that created by previous geological epochs (Fig. 10).

This synthetic profile is a highly simplified version of a naturally occurring soil profile, in which the individual strata are less regular and the horizons in between are blurred and gradated. The blurring and gradation are the result of dynamic exchanges between differing soil compositions. In the Olympic Park each layer is a uniform result of a separate mechanical process. The uniformity comes from the methods of artificial and accelerated entropy used to produce them—matter is crushed, cleaned and mixed. The profile with delineated boundaries result from a fixed design made from the layering of different earthy mixes by human and machine, leaving a definite and obvious distinction between the placed strata instead of an emergent process that combines upward and downward movements of erosion and sedimentation, capillarity, growth and decay.[47]

Each stratum is created for a specific purpose, the fill constitutes the topographies that are beneficial to a range of ecosystems, as well as support for the buildings. Each topsoil is defined to host a specific future vegetal and animal community. The profile thus replaces the pulverized cultural and ecological history of the site with an artificial geological and pedological past, a designed geology, recreated to host an idealized vision of an ecological future. Even the wasteland conditions previously found on the site have been re-created at a far smaller scale to rehost the species that were eradicated during construction.[48]

The result is a broad range of conditions, an exhibition of ecologies with varying degrees of moisture and stages of ecological succession. They cover 'a site wide total of 56.84 hectares [of new] "habitats" created to mitigate losses', according to the London Legacy Development Corporation.[49] The breadth of conditions is an improvement on the previously fairly uniform topography with little transition between dry and flat ground and canalized river. Yet when comparing before and after conditions on satellite photographs, the area of living soil seems to have been substantially reduced (Fig. 3). On the one hand, the designed diversity of ground conditions could welcome a broader range of species, both below and above ground, but on the other the sweeping destruction of the site's pre-existing ecosystems resulted in an almost complete extinction of its pre-existing inhabitants, 'mitigated' via the creation of new habitats and the 'translocation' of species.[50] It is not in the scope of this article to demonstrate a net loss in biodiversity, but it is remarkable that the—excellent—current Biodiversity Action Plan for the park does not state that net gain was achieved, although it was set as an aim.[51] It will take decades, if not centuries, for the complexities of these created ecosystems to (re)develop below and above ground.

The profile of the park appears to be a caricature of a 'sustainable Anthropocene'; its geology was designed through abstracted geological and pedological layers, entirely shaped by man to host idealized future ecosystems, as opposed to natural horizons resulting from emergent processes. It is reminiscent of the 'ideal' lifeless pieces collaged together by Frankenstein to realize a 'perfect' human specimen. Here, each piece is made anew from no longer recognizable materials, topographically, geologically, pedologically, culturally and ecologically, that are either found in situ or elsewhere.

The politics of destruction and creation of earthy assemblages

With Jacques Rogge, many present the Queen Elizabeth Olympic Park as an exemplar of regeneration.[52] This may be accurate financially, but the above analysis shows that its soil assemblages have not been regenerated. New ecosystems have been created from the waste arising from the destruction of the socio-ecosystems that were constitutive of this terroir and were slowly regenerating their soils.

In contrast to the designed earthy substrates specified for the park, existing soil assemblages are more than a growing medium. They are dynamic systems whose boundaries are not clearly delineated and that extend above the ground. The assemblages are created by plants, animals, fungal networks and the care of human communities. All these living beings are literally and metaphorically rooted in this soil and co-create it.[53] Soils are cultural and ecological, they are 'companion species', that co-evolve with humans.[54] Prior to the redevelopment, the site of the Olympic Park contained living soils: that of the thriving allotments where the stadium was built, that of the self-regenerating soil in the industrial ruins. These have been dismantled because they were not considered valuable, but were conceived as scrub or wasteland that hindered the profitability and marketing of the vision that has replaced them.[55]

The marketable novelty of a 'bold vision' and soil presented as hazardous waste to be fully treated are engaged in a self-reinforcing political feedback loop. In one direction, the creation of this forward-looking scheme meant that the ground had to be substantially disturbed and entirely purified. If the design had substantially incorporated the existing, most of the soil and its human and ecological communities would have remained in place, while continuing to slowly regenerate. It would have been capped with benign topsoil where necessary—as was done eventually anyway because the remediation was not entirely successful. In the other direction, the health and safety discourse on the pollution of the soil was instrumental in the justification for a tabula rasa approach and the removal or dismantlement of the below- and above-ground communities in order to clean the soil safely. To discuss it as earth, a dangerous inert matter, polluted by industry and passively waiting to be cleaned by humans through technology, conceals the meaning of soils as assemblages that include the imbricated lives they host.

When seen as assemblages, the original soils of the Queen Elizabeth Olympic Park have been annihilated into waste matter and the past used as justification for destroying the present to make the future entirely anew. The framing of soils as dangerous lifeless matter reordered through human genius and incapable of developing via their own agency was used politically. It layered an ethical justification on what is essentially a violent act towards soil life and the human and other-than-human lives it nourished and that cared for it: the less powerful, the unseen, the weeds and pests, those we wish to hide.

Inert and ahistorical grounds

In the design specification and realization the soils are perceived as inert. As discussed earlier, the entire team responsible for the commission, design and construction of the project regarded the fill and topsoils as functional, either a supporting base or a growing medium. Soils were not understood–neither explicitly nor implicitly—as a constitutive process of emergence between biotic and abiotic communities. They were delivered anthropogenically, the capacity of soils to create themselves, what political theorist and philosopher Jane Bennet would call 'material vibrancy', was ignored and replaced by human (bio)technology.[56]

Each of the component soils is recycled. They are all transformed beyond recognition, their history concealed and biodiversity stunted. The arcadian design created from the industrial ruins erases the past as if it never occurred. The historical remnants are crushed and mixed and then hidden beneath a succession of synthetic layers. A naturalistic vision of ahistorical purity has been created for urban real estate marketing and that of the nation at a global scale.[57] Instead of 'regenerating' the existing terroir, it denies both cultural and ecological histories and replaces them with a utopian ecological future.[58]

This 'sustainable' Anthropocene may be less harmful than human interventions at an earlier stage of the era, because the travel of matter is limited, 'waste' is reused and destruction of pristine landscapes is avoided.[59] Nonetheless, it involves a huge quantity of alterations on site and the destruction of pre-existing soils. It does not radically change the modernist paradigm, mainly aimed at the future, positivist in its treatment of matter as inert, and anthropogenic in its procurement processes. This way of operating does not nurture existing socio-ecosystems to regenerate. It destroys them to create others. It is ecologically creational.

Regenerative possibilities

There are examples of successful regenerative landscape design in industrial ruins of a scale similar to that of the Olympic Park. At the Île de Nantes (started in the 1990s and ongoing), a 350-hectare district in the French city of Nantes, the landscape has not just been regenerated economically. Acknowledging the different conditions and character of the Queen Elizabeth Olympic Park and the Île de Nantes, a general comparison shows that in Nantes an alternative approach was applied to transform abandoned industrial land where ecological succession was taking place. Instead of defining a bold vision up front that would have led to replacing the existing soils entirely, the project, led by urban designer and landscape architect Alexandre Chemetoff, developed iteratively. Starting from historical and sociological studies that lead to a diagrammatic strategy, throughout its realization the design was repeatedly reassessed and developed through regular meetings with a dynamically changing group of stakeholders. The project focused on in-situ interventions, rather than the sitewide master plan approach adopted at the Olympic Park. Several principles were kept in mind: 'Use what exists, use the history of the site to imagine its transformation, consider the site as a resource, and favour a limited level of intervention with the primary aim of saving energy.'[60] These principles are diametrically opposed to those employed in the project in London. Whereas in the Île de Nantes the full range of sustainable approaches are used, reducing embodied carbon and energy, now known as the 'circular economy'—maintain, reuse, refurbish and recycle—in the Queen Elizabeth Olympic Park the least effective and most destructive of these approaches was primarily used: recycling.[61]

The Île de Nantes project is a slower and more gradual response to similar pre-existing post-industrial conditions. The measured start has led to a mosaic that combines existing regenerating soils—nurtured by a light touch of human intervention—and portions of 'sustainable' soil.

Figure 11 The Queen Elizabeth Olympic Park has become increasingly 'wild', 2020.

The time pressures asserted upon the Olympic Park in London, associated to the obsession with the new of the global economy and culture in the early 2000s, were key limiting factors for its regenerative credentials. Speed further encouraged a wholesale approach and destruction, as designing and constructing with what is already present is a slower process.

Over time, the Queen Elizabeth Olympic Park has become less perfect and less controlled, human influence still permeates but to a much lesser extent. The spaces created are becoming increasingly 'wild', and the visible flora and fauna seem to be thriving (Fig. 11). This intimates that in the long term, the imported substrates' biotic functions, ecosystems and inhabitants may develop earthy assemblages and prosper. If they are allowed to do so.

Conclusion

Soils have proven to be fundamental characters in the establishment of the Queen Elizabeth Olympic Park's bold and vibrant narrative. This new materialist story reveals the complex relational materiality of the park beyond the tangible underground matter that can be manufactured and indicates a blind–systemic–spot in contemporary and allegedly 'sustainable' culture. The narrative of these soils has proven complex. On the one hand, the dynamic assemblages of the existing topsoils have been destroyed. The emergent processes of the terroir that were regenerating the ruins left by industrialization have been interrupted. The complex web of relations and exchanges of these assemblages of humans and other beings has been shattered, their matter considered inert, their life unseen, processed into substance moulded via human will to create an idealized new vision of caricatural 'natural' topographical forms, with the unwanted elements, including human ones, displaced elsewhere or concealed underneath. Most of this material came from the site and some from the waste of industrial processes altering other English landscapes. All have been processed mechanically, washed and crushed, some have also been treated with microorganisms, but their lives are used like machines for a single specific purpose, instead of respecting their ecosystemic complexities. They are conceived for a perfect future detached from human and ecosystemic histories, growing from a novel geology and pedology and embodying a fictitious past. Contrarily to the most destructive phases of the Anthropocene, where the landscapes of extraction are spatially distinct to that created because they are elsewhere, the soils of the Olympic Park indicate that the landscapes of extraction of a 'sustainable' Anthropocene are primarily temporally separated and intangible—the web of life present on site prior to the work is destroyed.

On the other hand, although it cannot be assumed that all materials in the park were obtained with the same rigour and care, the procurement of the soils for the park demonstrate a dramatic improvement in sourcing. Contrary to most cases throughout the twentieth and twenty-first centuries, where supply chains steadily became longer, more complex and increasingly global, the soils are sourced decidedly locally. The sustainable practices adopted by the suppliers leave little soil matter wasted and in the case of British Sugar Topsoil any resulting exhaustion of resources is partly ameliorated. The Olympic Park is an example of best practice in terms of the sustainable specification of new soil mixes made from recycled material. Arguably, this is an improvement on historical specification practices that obtained material by stripping far-flung source landscapes. Nonetheless, the chosen solutions are still manufactured from the waste of other, national industrial processes that are themselves damaging. These soils are mainly anthropogenic, being made from the waste of extractive human-led industries. They are an amalgamation of disparate parts, mixed to create a suite of fit-for-purpose substrates and to mimic the biological and ecological functions of naturally arising soils.

The key arguments for pulverizing the existing living soils and creating new ones from their waste were the speed necessary for the delivery of the Olympic Games and the real estate economy, as well as a desire for an idealistic novelty to market both property and nation, while concealing a more diverse and contested history. A truly regenerative approach would have used less energy and retained the diverse interrelated socio-ecosystem, but it probably would have taken decades, and the result would have embodied a history that impatient decision makers were inclined to erase. This may have been the best, or only, solution in this exceptional case, considering the pressures of such a global event, the London real estate and the level of pollution, but we should be careful of presenting it as a model for regenerative landscape practice. All things considered, this project is not an example of a regenerated socio-ecosystem, it is the expert creation of new ecologies from the waste of those that have been almost entirely destroyed. It merely remedies its own destruction.

At the Olympic Park, the landscape architects, soil consultants and ecologists have demonstrated exceptional expertise in soil creation from waste. In future regenerative projects, this approach will be useful where creating anew is unavoidable, but it should be a small proportion rather than the gargantuan scale found here. Defining processes of care to existing soils that leaves their assemblages in situ and alive and activates their renewal may correct the life-threatening blindness to earthy life found in sustainable specifications. This material story is a warning of a tendency in the 'sustainable' Anthropocene for broadscale destruction of human history and ecological systems to create idealized and marketable futures, hidden behind stories of lifeless material redemption.

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