



is named), a lapwing (or peewit), a swan (or sandglass) and a fox, all thought to date from 17th century. In a 2002 paper on the Comiston Springs, architectural historian Richard Emerson suggests that a fifth lead animal, an owl, is missing from this peculiar assemblage. Emerson suggests that this odd collection of – swan apart – land and air dwelling creatures was the product of Brusci's – and perhaps society's - notions of the grotto as a place of natural mystery and wonder: a liminal zone between the terrestrial and the subterranean; the real and the imagined.

The Comiston springs water house and seven stone wellheads now sit partially derelict, overgrown and unmarked at the edge of Edinburgh's southerly creep. Increasing demands for water from the growing city led to new springs being sourced at Swanston in the early 1700s and subsequently through the construction of reservoirs in the Pentland Hills following the formation of the Edinburgh Water Company in 1819. The lead animals are now gone, housed in a glass case in the Museum of Edinburgh on the Canongate, not far from a series of original wellheads supplied by the Comiston springs. Nettles and brambles tangle around metal barriers surrounding the water house droop at half-mast: half-heartedly keeping an absent audience at bay. Sharp edged mason's marks cut at angles into the dressed stone echo runic symbols.

Comiston's neglect is acute: the Buildings at Risk register for Scotland list the buildings as 'at risk', yet there are no plans to restore or celebrate the site. Perhaps, even if renovated and the lead animals restored, it could be argued that the site wouldn't necessarily be an attraction for visitors. However, St Margaret's Well and St Bernard's Well - arguably less intriguing and historically rich springs in the centre of town - are popular enough with visitors and Edinburgh's narratives of heritage. More specifically, this isn't an argument that people would visit the springs if given the chance, instead that a historically important set of buildings rich with stories are being left to ruin, whilst the centre of Edinburgh continues to sell itself as a city of heritage. Debates over the conservation of these buildings has parallels with those over biodiversity conservation: how do we prioritise what to conserve and restore, and why? The history of water in Edinburgh is largely forgotten here, yet for now, the sound of the springs still rings unseen around the disused water house and wellheads.

Not far from the Comiston springs water house is Oxgangs lochan. The lochan was created in 2003 on the site of a demolished 1960s tower block, the hollowed foundations for planned naturalness finding a niche in the city. Designed to help alleviate flooding from the nearby Braid Burn, the lochan now fizzles with life: dragonflies, coots, and wagtails all flitting amongst the irises. We lowered a pair of hydrophones into the Canadian pondweed which throngs the eastern edge of the lochan, recording a series of clicks and pops, the result of minute air bubbles released by the photosynthesising plants. This percussive oxygenating beat was punctuated by occasional oscillating buzzes: the striations of water insects constantly flitting from stem to stem. This site challenges how we think about nature in the city: new life overlaying ruin.

The seen and unseen: powers of scale and the unknown

Tapping water from 'natural' sources has not been without controversy in Edinburgh's history. In 1870 a debate began over whether St Mary's Loch in the Pentland Hills to the south of the Edinburgh should be used to supply water the city. The proposal – put forward by the newly formed Edinburgh Water Trust - initially met with little opposition, until a series of anonymous letters signed 'A Physician' began appearing in The Scotsman newspaper. Soon discovered to be the work of Dr Charles Wilson, a retired physician from Kelso - and shareholder in the recently disbanded Edinburgh Water Company - the letters objected to

the use of St. Mary's water due of the presence of microscopic daphnia or 'water fleas' in the loch. Wilson suggested that 'repugnance to the use of lake water [for drinking] is as old as it is universal'. Proponents of the scheme at the Edinburgh Water Trust received the advice of two doctors, who stated not only that the loch water was safe for consumption, but also that daphnia was only present in the 'best and most wholesome waters'.

Despite objections from Wilson and a series of city dignitaries – additionally criticising the expense and complexity of the St. Mary's plan - the Bill in favour of the scheme was passed in the House of Commons in May 1871. According to Judge James Colston, writing in 1890, 'since the celebrated Disruption of the Church of Scotland in 1843, party feeling in Edinburgh had never run so high, nor was it so embittered, as in this great water struggle'. Edinburgh newspapers took the side of the scheme's opponents, and line drawings of the infamous daphnia filled their pages and were plastered across the city on posters and placards: a huge jump in scale to representations of the microscopic daphnia into something alien and unnerving.

The image of the daphnia - this visual propaganda telling of unnatural, unsafe water - gained wide public support for the opposition campaign. An influential group of letter writers - including mill owners along Pentland streams – joined the opposition, successfully playing on public fears regarding water quality and sanitary health. Observing the power of questionable scientific advice in mobilising public opposition for the scheme, the physicist James Clark Maxwell - an Edinburgh native - wrote a poem 'The F.R.S.E.' in 1871 for his friend and colleague Peter Guthrie Tait, lightly sending up the controversy: 'The Edinburgh Pharisee / Receives both water, fish and Flea / The water Flea he filters out / Then, unsuspecting, eats the trout.'

The controversy highlights a number of important interactions between science (specifically water science) and society at the time. There were still huge elements of uncertainty about understanding the composition of water. Perhaps tellingly, Maxwell spent some of his final years before his death in 1879 editing Henry Cavendish's pioneering research on the composition of water at Cambridge University. The microscopic unknown still exists regarding water, but advances in filtration and sanitation processes means that most people are relatively sanguine about the water they consume: an implicit trust in making the uncertain 'natural' into a palatable, safe hybrid liquid.

Scale is important here. Regardless of trust in modern filtration processes, the vision of a giant 'water flea' blown up to placard size may still have a significant impact on people and their faith in the safety of drinking water. There's a beauty in the unknown and the unseen (a theme we've been attempting to tease out through microscope photographs of water samples, an echo of this controversy), but also, perhaps, unease in confronting the odd-looking life that inhabits water on a micro-scale. And it was this unknown, when made gigantic and aligned with questionable scientific advice (partly attributable to a discipline still untangling the characteristics of the natural world) that caused such an outcry in Edinburgh society. Water as 'natural', biodiverse and full of life was presented as being a public health hazard. And when thinking about water and the 'natural', this is a tension that perhaps still exists: water from springs must undergo a series of mechanical transformations, filtration and sterilisation to become 'pure' mineral water. On a wider scale, we see how scientific advice can prove extremely influential in swaying public debate, a theme that continues to today.

The water controversy came before the House of Lords on 27 June 1871 and the St. Mary's Loch proposal was dismissed on the grounds of expense and complexity, underpinned by a general

unease about the composition of the water. This brief episode in the history of Edinburgh is not widely known, yet reveals a large amount about the interrelationship of science and society at the time: centred on ideas of water's 'naturalness' and purity.

Edinburgh's current water supply flows from two large reservoirs 30 miles south of the city, Talla and Megget. Built almost a century apart, the two bodies of water lie in drowned valleys in the Scottish Borders, separated by a steep ridge. Talla, built by the Edinburgh and District Water Trust, was opened in 1905. The reservoir's architecture is grand: Victorian engineering, neat, sweeping brickwork and a stately, domed pumphouse jutting into the clear waters. Megget was opened in 1983, flooding the valley south of Talla, aesthetically wilder than its older sibling, with the air of a grand earthwork: jagged scree along the shore, a seeming untamedness absent in Talla's formal lines. Until recently, water from Talla and Megget flowed under force of gravity – just as the original Comiston springs supply did – over 30 miles to Edinburgh's Alnwickhill Water Treatment Works, a set of dressed stone and classically inspired listed buildings overlaying a vast underground reservoir and series of filtration beds of sand and shell. Alnwickhill is now disused, and the underground reservoirs empty, off-limits echo chambers resonating with a century of confluence, replaced in 2012 by a new 'environmentally friendly' water treatment works at Glencorse.

Imagined Landscapes: Water and Edinburgh

Numerous visions for water in the city have been proposed over recent centuries: imagined landscapes for the future, often intertwined with an imagined past. In 1949, Patrick Abercrombie and Derek Plumstead published 'A Civic Survey and Plan for the City and Royal Burgh of Edinburgh'. A forward looking architectural survey, the plan plots a number of dramatic changes to the fabric of the city, most notably a six lane motorway running through Princes Street Gardens. Abercrombie and Plumstead's proposed (and unbuilt) motorway echoed a historical lineage of real and imagined lines of water, transport and change in this valley.

In the 19th century, Robert Stevenson, architect of the Bell Rock lighthouse (and grandfather of Robert Louis) proposed a series of canals connecting the Water of Leith at the Dean Village to the site of the recently drained Nor' Loch. Under Stevenson's vision, a new picturesque, landscaped loch would be created in the Nor' Loch valley, with canals leading east through Canonmills and Leith over a series of locks to the sea. The Nor' Loch was created around 1450 by flooding the valley where Princes Street Gardens currently sit. Fed by nearby springs (the Wellhouse Tower stands partially ruined in the gardens), the loch became a meeting point for industry and the city's waste. By the 1700s, the Nor' Loch had been encroached upon by a growing city, and grown polluted and stagnant. Drainage began in 1759, an act of urban domestication on the feral margins of the growing New Town. Now, the only traces of water in the valley are in the ornamental fountains, and in the 'Nor' Loch' pub built in Waverley Station: a new set of sullied water flows.

A century earlier, George Drummond, the Lord Provost of Edinburgh and chief instigator of the development of the New Town, put forward plans for an ornamental canal to replace the polluted Nor' Loch. Excavations for the canal were made, and a street subsequently demolished by Waverley Station was briefly named 'Canal Street'. However, the construction of the railways in the 1840 changed the role of water in the city. The brief heyday of the existing canals as routes of transport and industry in Edinburgh was over and in the 1920s the grand canal basins at Fountainbridge were drained, filled in and built over. The Port Hopetoun basin, the eastern terminus of the Union Canal was drained in 1922, and the Art Deco Lothian

House building built on the site in 1935. The building now hosts a small, dark subterranean swimming pool in its basement: a chlorinated aquifer remade in the space of the past.

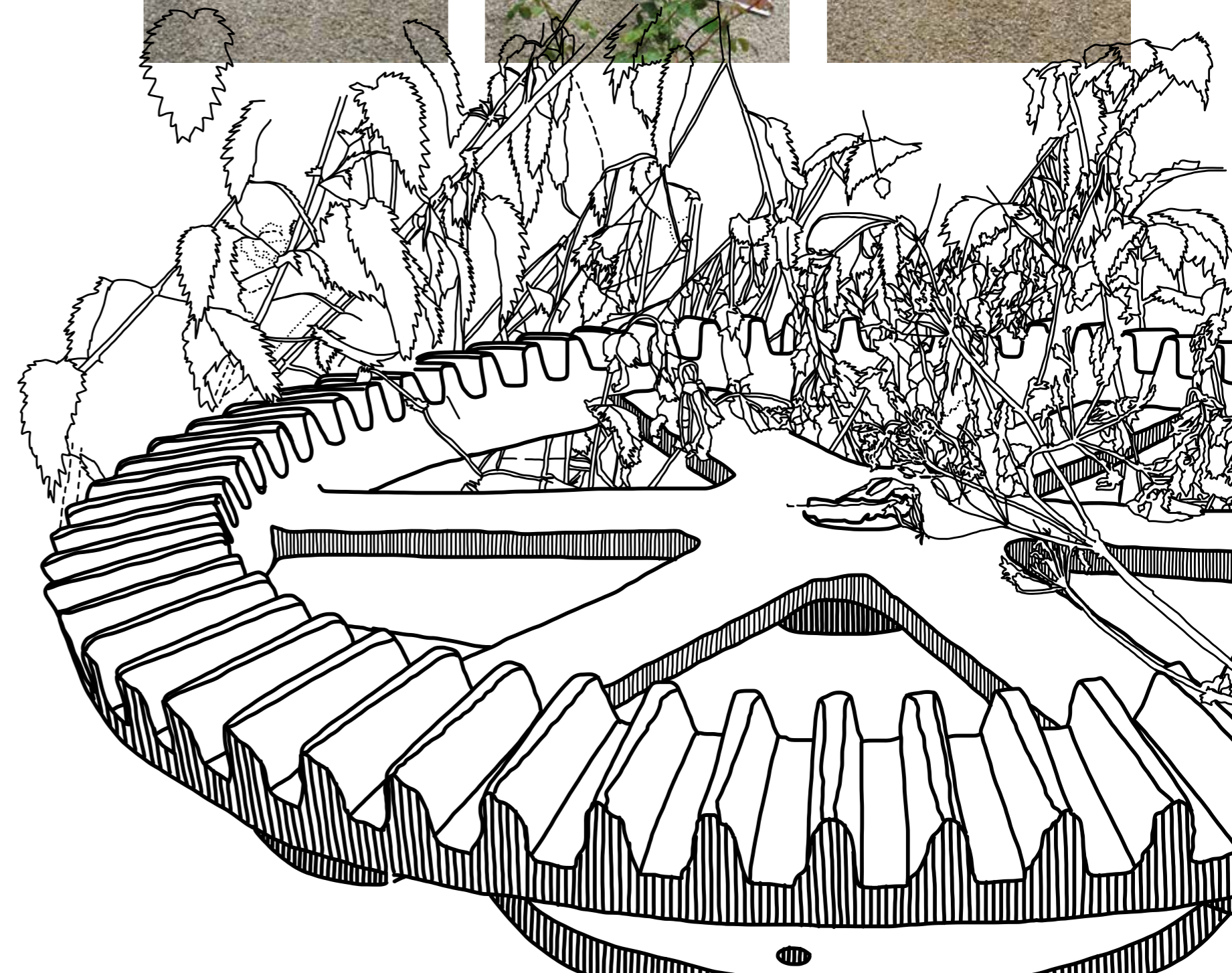
Construction of the Scotland Street tunnel linking Waverley Station to Canonmills began in 1847, terminating at the site of the recently drained Canonmills Loch, where George IV Park now stands. The loch was created by the retreat of the last ice age around 10,000 years ago, which supported settlements based around mills and breweries from the 12th century onwards. Following its drainage through the early 19th century, water in Canonmills was given a brief resurgence in 1865 when a large artificial pond was created on the site for the Royal Patent Gymnasium, the brainchild of John Cox, a philanthropist who sought to promote outdoor recreation and exercise for the city's population. This pond housed a huge circular contraption of wood and metal, 471 feet in diameter, known as the 'Patent Rotary Boat' or 'Giant Sea Serpent', which allowed up to 600 people to board and row together in a circle on the pond, creating a giant centrifugal motion in the water at the speed of a small steamship.

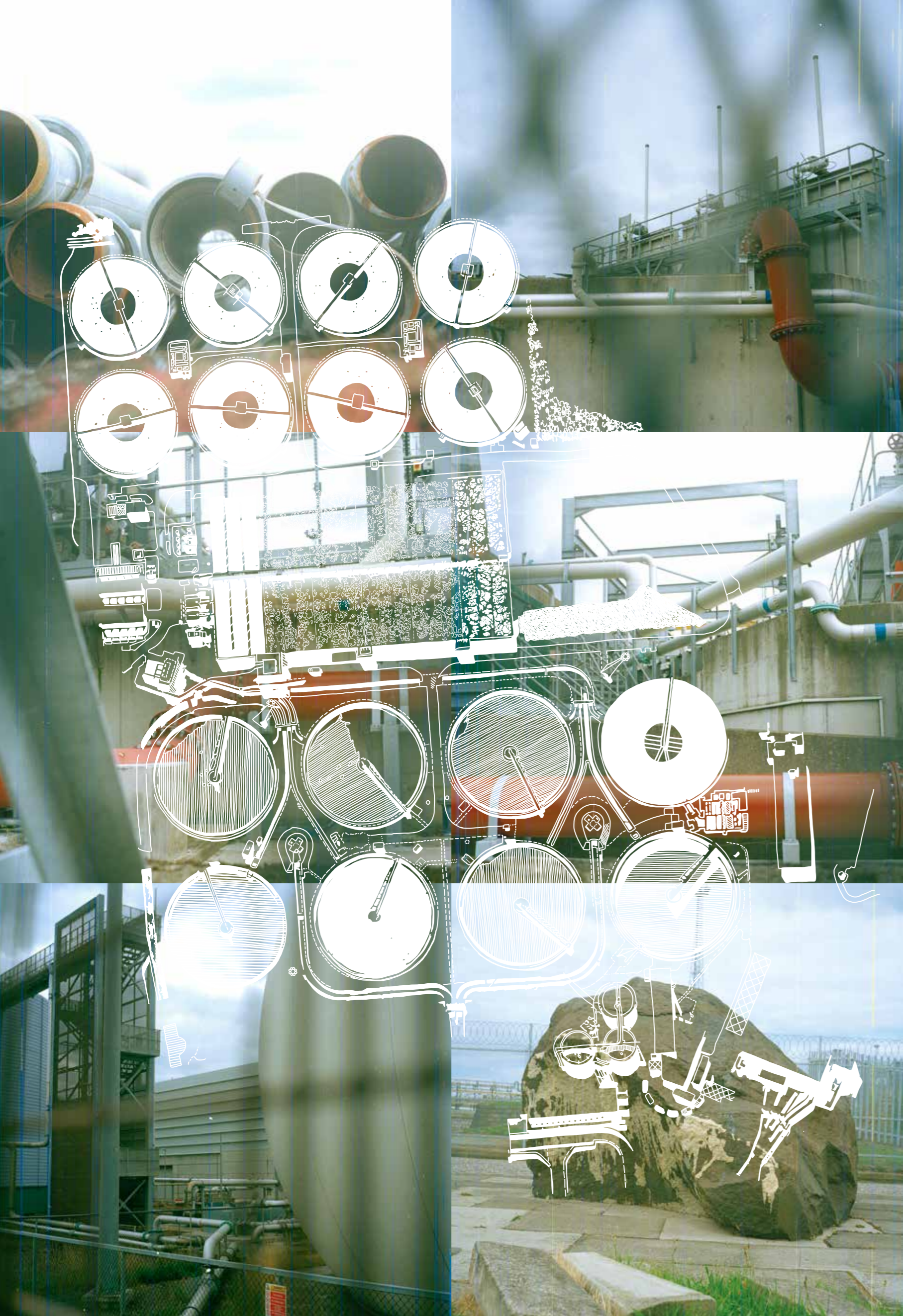
These histories of water in planned and imagined landscapes are fascinating. For George Drummond, the existing body of water in the Nor' Loch – all solute pollutants and built up sulphuric silts – was out of human control, the receptacle for the city's waste and a proving ground for disease and squalor. As a result, the replacement body of water was to be ordered, bounded and, crucially, planned for human needs. This theme continued through the late 19th and early 20th centuries, as sites where water had previously found a space in the city were reappropriated for new lochs for public health and recreation.

This theme was common to many British cities at the time, as the polluting impact of the Industrial Revolution fostered movements to preserve open and green spaces for public wellbeing. To an extent you could see this important turn in the nascent environmental movement in Britain, which, in part, resulted in significant legislation such as the Open Spaces Act of 1906, as a precursor to current zeitgeist topics of ecosystem services and sustainable city planning, viewing green space as a key facet to public wellbeing.

In Edinburgh, this movement was given political power by the formation of the 1878 Public Parks (Scotland) Act, which allowed the town council to purchase marginal (in this case, read marshy or overgrown waterways) land to be developed for public recreation purposes. In a global climate yet to be significantly altered by greenhouse gas emissions, and not long after the Little Ice Age – a sustained period of cold climates in Europe between 1550 and 1850 – this change in planning attitudes to water often took the guise of the creation of skating or curling ponds. A set of new bodies of water were created through Edinburgh from the early 19th century onwards – often on ground where water had previously sat before – Blackford Pond, Inverleith Pond (designed for model boating, and kept largely devoid of plants as a result - an interesting management quirk when you consider the new 'wildlife' corner in the pond), Dunstapie and St. Margaret's Loch, created at the behest of Prince Albert in the increasingly de-wilded Holyrood Park.

To return to Abercrombie and Plumstead, it's fascinating to note that one of their proposals that found traction in later town plans was the greening of the Water of Leith valley. In the 1940s, the river still supported numerous mills, and this industry - combined with run-off from a growing city - meant the river was heavily polluted. It's interesting to note that in a vision of Edinburgh's future urban environment which can be seen as insensitive (running a motorway through the centre of the city, for example), Abercrombie and Plumstead's plan





can also be seen as forward-thinking in finding space for nature in the city. However, this 'space for nature' was to be implemented with aesthetic caveats. Abercrombie and Plumstead suggest that thinning of vegetation should be undertaken at the Dean Village, to 'permit more sunlight and greater appreciation of the beauty of the river and its banks'. In other words, the self-seeded plants and trees of the Dean Valley should be kept in check so that the - seemingly 'natural' - beauty of the river and its surroundings (the picturesque mill buildings and grand bridge) could be better appreciated.

Braiding tangled lines: Seafeld and the Shellycoat

The last stop for much of the water that passes through Edinburgh is the Seafeld Sewage Works. This part of the seafront adjacent to Leith Docks hasn't developed in the same manner as the neighbouring Shore and Portobello. Instead, it sprawls across a chain-link landscape of anonymous warehouses, rust-red razor wire and abandoned railway carriages freckled with ox-eye daisies: self-willed knots of weeds and wildflowers amongst the fading lines of metal tracks and cracking cobbled paths.

The site feels very much like a terminus: a muted palette of slate-greys and faded greens spilling over into the sea, the endpoint to the gravitational pull of the city's natural (and perhaps unnatural) watershed. A common theme to our research has been the lack of access to such fascinating sites - with authorities citing security risks - and the Seafeld site is no exception. But in many ways, this makes the site even more intriguing: off-limits, seemingly unnatural and alien.

Prior to the construction of the Seafeld works - which now processes most of Edinburgh's sewage - a waste disposal tanker - the MV Gardyloo - became an unlikely tourist attraction. The public paid to be taken into the Firth of Forth from Leith, where they would witness thousands of tonnes of the city's waste being dumped into the sea, perhaps taking in some lunch whilst they admired the spectacle. Prior to its decommissioning in 1998, the MV Gardyloo - 'gardyloo!' was shouted by early Edinburgh tenement dwellers tipping their waste into the street - made over 2600 trips into the Firth, dumping over 8.5 million tonnes of sewage.

In the car park of neighbouring office buildings stands the Pennybap stone, a huge glacial erratic boulder. Dropped at the lowest tidal ebb off Seafeld by continental-scale ice sheets after the last ice age, this barnacle encrusted boulder gained local notoriety as the home of a Shellycoat - a bogeyman said to haunt rivers and lochs (in this case perhaps washed out to sea) particularly common to Scottish and German folklore. Said to wear a coat of rattling shells (I can't help but imagine an elusive, mollusc-wearing cousin to South Queensferry's Burryman), the Seafeld Shellycoat fascinated local children, who would run round the stone singing:

*"Shelly-coat! Shelly-coat! gang awa' hame,
I cry na' yer mercy, I fear na' yer name"*

With the expansion of Leith Docks the Pennybap completed another leg on its slow migration, this time shifted by human hand into the car park of a set of Brutalist office buildings. Fringed by coils of razor wire and the dishwater-grey expanse of the sewage works, the Pennybap now sits unceremoniously alone and flecked with concrete, a world away from the plaques and information boards of Edinburgh's heritage-driven centre. The site is a muddle of the industrial, the folkloric and the ruined, all creeping through edgeland concrete: a confluence of things out of sight and out of mind of the city. Water that has passed through rivers, pipelines, bodies and filtration tanks, a solute set of traces of the city.

Meanderings and confluences: our reflections on art-science collaborations

We approached this work as a true collaboration: to co-produce the final work based on fieldwork and research undertaken together, both responding to new sites, sights, sounds and information. Our research process echoed a geography fieldtrip in many ways. We set out to gain an understanding of a set of sites, where the data we collected was field recordings and fallible 120 film photographs; the water samples taken were used to explore the beauty of microscopic creatures rather than their biological characteristics; and the maps we drew stretched time and space.

For such art-science collaborations to work, artists can't be viewed only as the communicators of academic research. In an academic culture increasingly attuned to the need for outreach and engagement with the public, this is an important, but potentially conflicting theme. Artists cannot simply be the people who repackage research through their work to make it more engaging to the public. For art-science collaborations to be most potent, the collaborative element should be instilled from the beginning, so collaborators with different ways of knowing and seeing can offer their own critical and creative perspectives to a topic. Granted, when dealing with existing or extremely technical research projects, this may not always be possible, but it is important to appreciate the role of the artist as more than a conduit through which to communicate research. But of course, this suggestion of involving artists from the beginning of a project doesn't mean that the nature of the collaboration should be prescriptive and bound. Instead, in this project, it's been the process of exchange and finding new and different perspectives on discoveries that has provided the most rewarding aspect of our work.

What are the outcomes of such a collaborative research process? From my point of view, I began to see sites and strands of information in new ways. The city became a visual tangle of nodes on an aquatic network - both dried up and in full flow, current and historical - and took on numerous new meanings, many of which have been teased out in this piece. An new awareness of the aesthetics of the landscape yielded new perspectives in figuring out 'what is natural' at different sites - the contrasts of the neat, weathered stone of Talla reservoir and the grand, rugged earthworks of Megget reservoir; the contrast of the picturesque Dean Bridge and the A720 bypass bridge over the Water of Leith: concrete greys mottling into mossy brown.

The process of untangling the 'natural' and the 'wild' from the environment is conceptually tricky, yet these designations of 'naturalness' and 'wilderness' underpin a great deal of environmental decision making. And as intangible and subjective as aesthetic valuations of the environment may be to some, they do influence how many people perceive, value and use the natural world. From my perspective, it's the uncertain tangle of environmental, social and economic histories that underpin each site that largely define its character and narrative. Naturalness is a spectrum, life thriving in the margins. But what we are left to consider is the aesthetics of the present, the views that overlay and obscure these histories, and the basis for many judgement decisions about the 'naturalness' or 'wildness' of our land. Tommy's keen eye has helped me find new ways of seeing the relationships between the past and present, the natural and unnatural in the visual and sonic landscapes that remain.

www.edinburghwateroflife.org

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