International Conference on Green Walls

Meeting the Challenge of a Sustainable Urban Future: the Contribution of Green Walls

Image: J. Farrell

04.09.2014 The Green Wall Centre, Staffordshire University

Madeira Drive Green Wall - Two Centuries in the Life of a Green Wall on Brighton Seafront

Promotional Brochure for Brighton, c1911

Vintage Travel Poster, 1920s. Artwork by TF

Madeira Drive Green Wall: **Contents**

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Team

- Ben Kimpton, Senior Ecologist, The Ecology Consultancy http://www.ecologyconsultancy.co.uk/
- James Farrell, Co-founder and Chair of Brighton & Hove Building Green http://building-green.org.uk/
- Martin Eade, Coastal Protection Engineer Brighton & Hove City Council

Support

- Graeme Rolfe – Parks Department, B&HCC (maintenance)
- Gary Grant – Green Roof Consultancy (planter specification)
- RW Greens – Contractor (arboriculture)
- CJ Thorns – Contractor (hard-landscaping)

Madeira Drive Green Wall: **Introduction**

- Green wall located on Brighton seafront
- Owned by Brighton and Hove City Council
- 1.2km long, but is non-continuous

- Supported by Madeira Drive Wall and is up to 20m high

Image: J. Farrell

Madeira Drive Green Wall: **Introduction**

- Planted with Japanese spindle (*Euonymus japonicus*)

Images: B. Kimpton

Madeira Drive Green Wall: **Introduction**

- Provides a range of plant growing conditions/micro-climates due to different structures
- Supports around 100 plant species
- Candidate Local Wildlife Site

Images: J. Farrell / B. Kimpton

Madeira Drive Green Wall: **Introduction**

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Brighton & Hove City Council

The Ecology Consultancy

A contender for one of oldest, longest and best protected green walls in the UK?

Images: J. Farrell

Madeira Drive Green Wall: **Designation**

- The wall was identified as a candidate Local Wildlife Site in 2013 – *Madeira Drive Green Wall Site of Nature Conservation Importance*
- This non-statutory designation is in light of its ecological, historical and social value within the City.
- Its social value is due in part to the high profile, easily viewed location, with high footfall from tourists and local residents alike.
- 8.6m people in south-east (+8% 2001-2011).
  B&H most populous LPA in south-east 270,000 (+9.4% 2001-2011).

Madeira Drive Green Wall: **Designation**

The wall continues to provide both visual amenity and recreational value and its use has changed little since its Victorian heyday.

To raise awareness information signs about the wall are being designed, encouraging people to ‘promenade’ and enjoy its benefits.

Madeira Drive Green Wall: **Designation**

- The wall plays a role in the wider ecological landscape providing vertical green habitat along the predominantly hard-landscaped seafront and by acting as a stepping stone for wildlife.

- It runs parallel with the Volks Railway Vegetated Shingle SNCI, which is across the road, and is adjacent to Black Rock SNCI and Brighton to Newhaven Cliffs SSSI at its eastern end (the potential source for hoary stock).

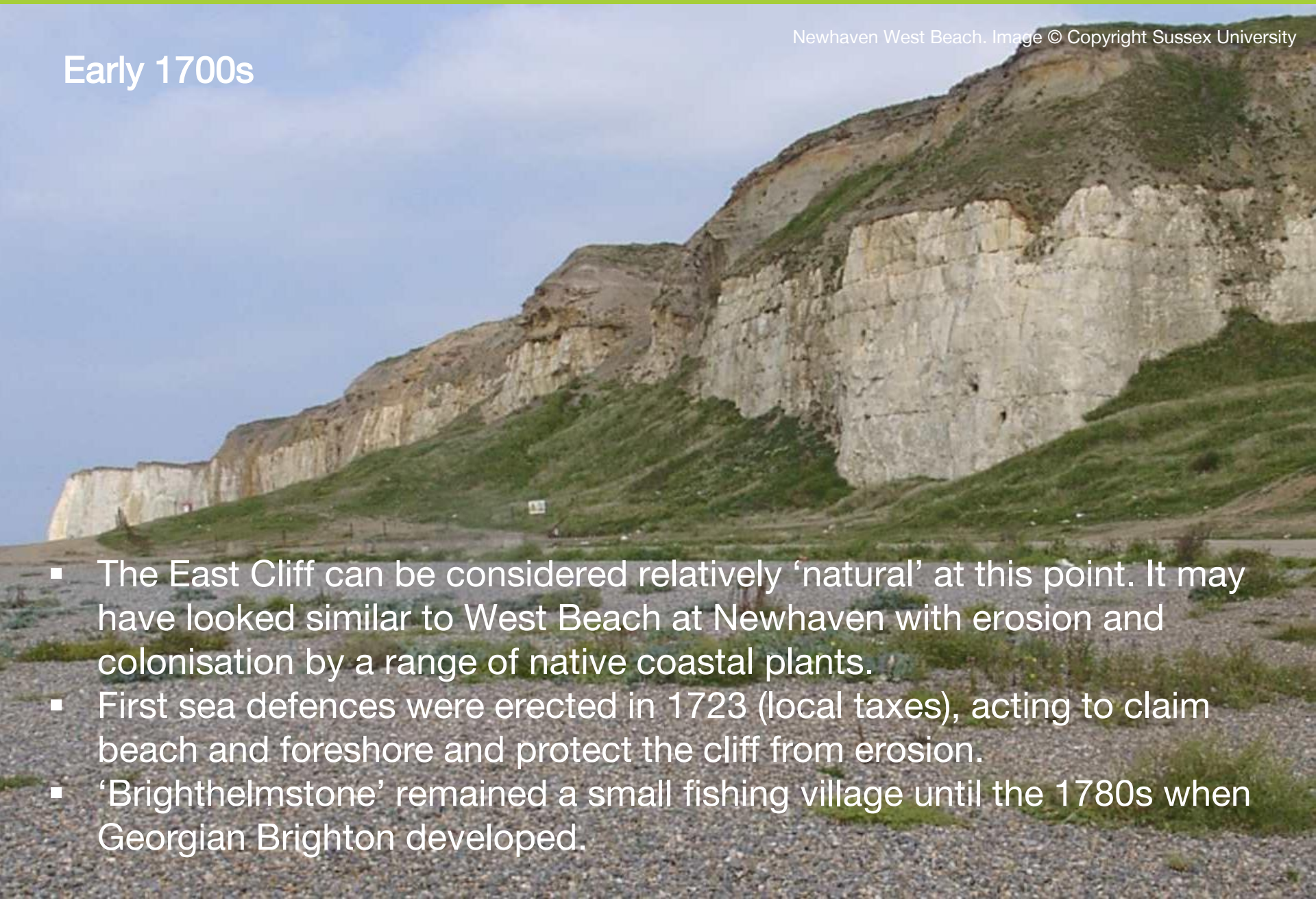
- As part of The City's portfolio of wildlife sites, it also contributes to the Brighton and Lewes Downs UNESCO World Biosphere Site – designated in 2014.

Madeira Drive Green Wall: History

- *Euonymus japonicus* is a shrub (or small tree) documented as growing up to 8m in height.
- Native to Japan, introduced into cultivation in 1804.
- It was an ideal plant to select, hardy, evergreen, tolerant of coastal conditions, drought tolerant when established, attractive fruit.
- When was it planted?

Image: Wikimedia commons

Image: B. Kimpton / J.Farrell



Newhaven West Beach. Image © Copyright Sussex University

Early 1700s

- The East Cliff can be considered relatively ‘natural’ at this point. It may have looked similar to West Beach at Newhaven with erosion and colonisation by a range of native coastal plants.
- First sea defences were erected in 1723 (local taxes), acting to claim beach and foreshore and protect the cliff from erosion.
- ‘Brighthelmstone’ remained a small fishing village until the 1780s when Georgian Brighton developed.

Madeira Drive Green Wall: **History**

Image: John Constable - The Yorck Project, 10.000 Meisterwerke der Malerei. Public domain.

Early 1800s

Plants, almost certainly established naturally, are visible on the East Cliff as shown in this Constable painting of the Royal Suspension Chain Pier dated 1824-27. Kemptown development begins in 1823 and works began on facing the East Cliff in 1827.

Early 1800s

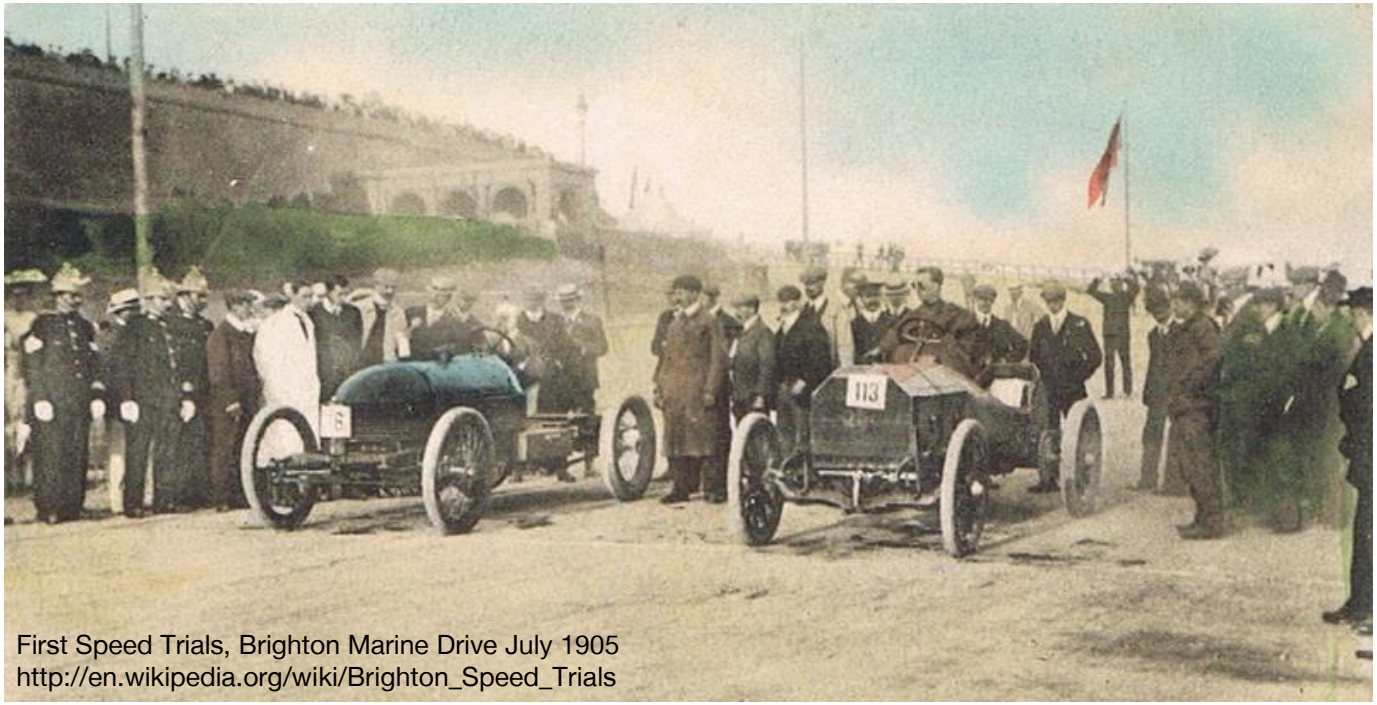
- The major construction project to stabilise the soft cliff line of the East Cliff was completed in 1838.
- The Madeira Drive wall was 2 miles long and cost £100,000 (£11m).
- The wall was reported to be 15 feet thick at the bottom and 2 feet thick at the top.
- Built from all-in ballast probably taken from the beach and mixed with lime and cement.
- It is later accompanied by the construction of a sea wall and Madeira Road (later Drive) starting 1870. Since that time a large shingle beach has built up in front of the old seawall.

William Earp (1876)

Image: William Arthur Earp, The Old Chain Pier. Royal Pavilion & Brighton Museums Collections.

Further developments along Madeira Drive consolidated this area of Brighton as a place to be;

- Aquarium at the foot of the East Cliff (1872)
- UK's first public electric railway, The Volks (1883)
- Lift and tea rooms (now the Concorde 2 live music venue)
- Elevated iron walkway with gardens and promenade (1890)
- Major events such as the Brighton Speed Trials.



First Speed Trials, Brighton Marine Drive July 1905
http://en.wikipedia.org/wiki/Brighton_Speed_Trials

Madeira Drive Green Wall: History

The walkway, now a Grade 1 listed structure, was conceived in a way which enabled the spindle to grow behind it and up the retaining wall.

Image: J. Farrell

A nice later picture dated between 1883 and 1896 showing the planting well established on the wall

Image: Brighton Aquarium postcard

Madeira Drive Green Wall: **History**

- J.R.B. Evison's 1969 book 'Gardening By the Sea' records 'Japanese Privet' well established on the cliff face in 1882. Evison was Director of Parks at Brighton from 1951.

- Evison notes 'I have only seen it [flowering] on the cliff face at Brighton where plants set out in 1882 are some 60ft high…'.

- This gives a vigorous but believable growth rate of c45cm per year.

J.R.B. Evison (1969). *Gardening By the Sea*. Macmillan

Madeira Drive Green Wall: **Plants**

- Since 1870 a wide range of native and non-native plants have established, giving the wall its cosmopolitan feel.

- Of particular note is the presence of hoary stock (*Matthiola incana*) in a few exposed and dry locations. This is a Brighton and Hove Biodiversity Action Plan species and nationally scarce plant.

- A few plants of sea fern grass (*Catapodium marinum*) are also present – nationally scarce plant

- A large fruiting fig tree (*Ficus carica*) at ground level is also of interest.

Nationally scarce plants are those recorded in 16-100 of the hectads (10km squares) covering Great Britain.

Madeira Drive Green Wall: **Plants**

- Botanical surveys started in 2012

Scientific Name	Common Name	Abundance	Qualifiers
Acer pseudoplatanus	Sycamore	R	y
Achillea millefolium	Yarrow	R	
Agrostis stolonifera	Creeping bent	R	
Anisantha sterilis	Barren brome	R	b, dm
Anthriscus caucalis	Bur chervil	O	b
Anthriscus sylvestris	Cow parsley	R	b
Arctium minus	Lesser burdock	R	b
Asplenium adiantum-nigrum	Black spleenwort	LF	w
Avena sativa	Common oat	R	b
Bellis perennis	Daisy	R	b
Berberis darwinii	Darwin's barberry	R	b, p
Brassica rapa	Turnip	R	s
Buddleja davidii	Butterfly bush	R	dm
Campanula porscharskyana	Trailing bellflower	R	dm
Capsella bursa-pastoris	Shepherd's purse	O	
Carex pendula	Pendulous sedge	R	b
Catapodium marinum	Sea fern grass	R	
Catapodium rigidum	Hard fern grass	O	
Centranthus ruber	Red valerian	F	dm
Cerastium fontanum	Common mouse-ear	O	b
Chenopodium album	Fat-hen	R	b
Cirsium arvense	Creeping thistle	R	b
Cirsium vulgare	Spear thistle	O	dm
Clematis vitalba	Traveller's joy	R/LF	dm
Convolvulus arvensis	Field bindweed	R	b, dm
Conyza canadensis	Canadian fleabane	R	?
Coronopus squamatus	Greater swinecress	R	b
Crocosmia x crocosmiiflora	Monbretia	R	b, p
Cymbalaria muralis	Ivy-leaved toadflax	F	dm
Cyrtomium falcatum	House Holly Fern	R	w
Dactylis glomerata	Cock's-foot	R	o
Digitalis purpurea	Foxglove	R	
Diplotaxis muralis	Annual wall rocket	R	
Epilobium ciliatum	American willowherb	R	b
Epilobium hirsutum	Great willowherb	R	b
Erigeron glaucus	Seaside daisy	LF	dm
Erigeron karvinskianus	Mexican fleabane	R	
Erysimum cheiri	Wallflower	LA	dm
Euonymus japonicus	Japanese spindle	D	p, dm
Ficus carica	Fig	R	b, p?
Galium aparine	Cleavers	O	dm
Geranium molle	Dove's-foot crane's-bill	R	dm
Geum urbanum	Wood avens	R	b
Gladiolus communis ssp. *byzantinus*	Eastern gladiolus	R	p, dm
Hedera helix	Englsh ivy	LA	dm
Hemerocallis fulva	Orange day-lily	R	b, p, dm
Hordeum murinum	Wall barley	O	b
Hyacinthoides hispanica	Spanish bluebell	R	b, p?
Hypochaeris radicata	Cat's ear	R	dm
Lactuca serriola	Prickly lettuce	R	s, dm
Linaria purpurea	Purple toadflax	R	dm
Lolium perenne	Perennial ryegrass	R	
Malva sylvestris	Common mallow	R	b
Malva x clementii	Garden tree mallow	R	
Matthiola incana	Hoary stock	O	NR/g
Narcissus pseudonarcissus	Daffodil	R	b, p
Parietaria judiaca	Pellitory-of-the-wall	A	dm
Pentagottis sempervirens	Blue alkanet	R	b
Phyllitis scolopendrium	Hart's-tongue fern	LF	w
Picris echioides	Bristly ox-tongue	O	b, dm
Picris hieracioides	Hawkweed ox-tongue	R	dm
Plantago coronopus	Stag's-horn plantain	O	b
Plantago lanceolata	Ribwort plantain	R/LF	dm
Plantago major	Greater plantain	R	b
Poa annua	Annual meadow grass	F	
Polypodium vulgare	Common polypody	LF	w
Rubus fruticosus	Blackberry	R	dm
Rumex crispus	Curled dock	R	
Rumex obtusifolius	Broad-leaved dock	O/LF	b
Sagina apetela	Annual pearlwort	R	
Sagina procumbens	Procumbent pearlwort	R	
Sambucus nigra	Elder	R	b, s
Sedum acre	Biting stonecrop	LA	
Sedum album	English stonecrop	O	
Senecio cineraria	Silver ragwort	F	dm
Senecio viscosus	Stick ragwort	R	
Senecio vulgaris	Groundsel	F	
Sisybrium officinale	Hedge mustard	R	s
Sisybrium orientale	Oriental rocket	O	b
Smyrmium olusatrum	Alexanders	O	b, dm
Solanum dulcamara	Bittersweet	R	dm
Sonchus asper	Prickly sow-thistle	R	b
Sonchus oleraceus	Smooth sow-thistle	R	s, dm
Spergularia marina	Lesser sea spurrey	O	
Stellaria media	Common chickweed	O	b
Taraxacum officinale agg.	Dandelion	R	b
Triticum aestivum	Bread wheat	R	b
Ulex sp.	Gorse	R	dm, p?
Urtica dioica	Common nettle	R	b
Veronica x franciscana	Hedge veronica	LF	

Madeira Drive Green Wall: **Plants**

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Madeira Drive Green Wall: **Plants**

Image: B. Kimpton

Madeira Drive Green Wall: **Plants**

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The Ecology Consultancy

Why has such a diverse flora developed?

- Spindle is perhaps a ‘nursery plant’ that ‘readily regenerates’
- Eroding material gets trapped behind spindle
- Accumulated leaf litter (organic matter) added over time
- Cracks further increased the niche for plants
- Plants grow directly into the softer wall substrate
- Added micro-climates from structures
- Shift of priorities in green space management – reduced pruning of spindle and gardening of raised planter.

Overall this decrease in maintenance has been good for biodiversity.

Madeira Drive Green Wall: **Plants**

Image: B. Kimpton

Madeira Drive Green Wall: **Plants**

Images: B. Kimpton

Madeira Drive Green Wall: **Challenges**

Biodiversity has benefited over time but large and mature plants in an area of high footfall introduces other challenges.

Image: B. Kimpton

Madeira Drive Green Wall: **Challenges**

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Madeira Drive Green Wall: **Challenges**

- Considering its age the wall is in good condition and is structurally sound. However the face is deteriorating and has been eroded by up to 500mm in places.
- Associated listed architectural structures require costly repair.
- The walkway is also deteriorating, currently closed to the public.
- Spindle and other plants require management to maintain and regenerate their condition

- Improve the overall contribution this candidate Local Wildlife Site makes to the seafront and the UNESCO World Biosphere Site
- To improve public safety and reinstate the face of the wall
- Maintain integrity of candidate Local Wildlife Site going forward in line with planning policy

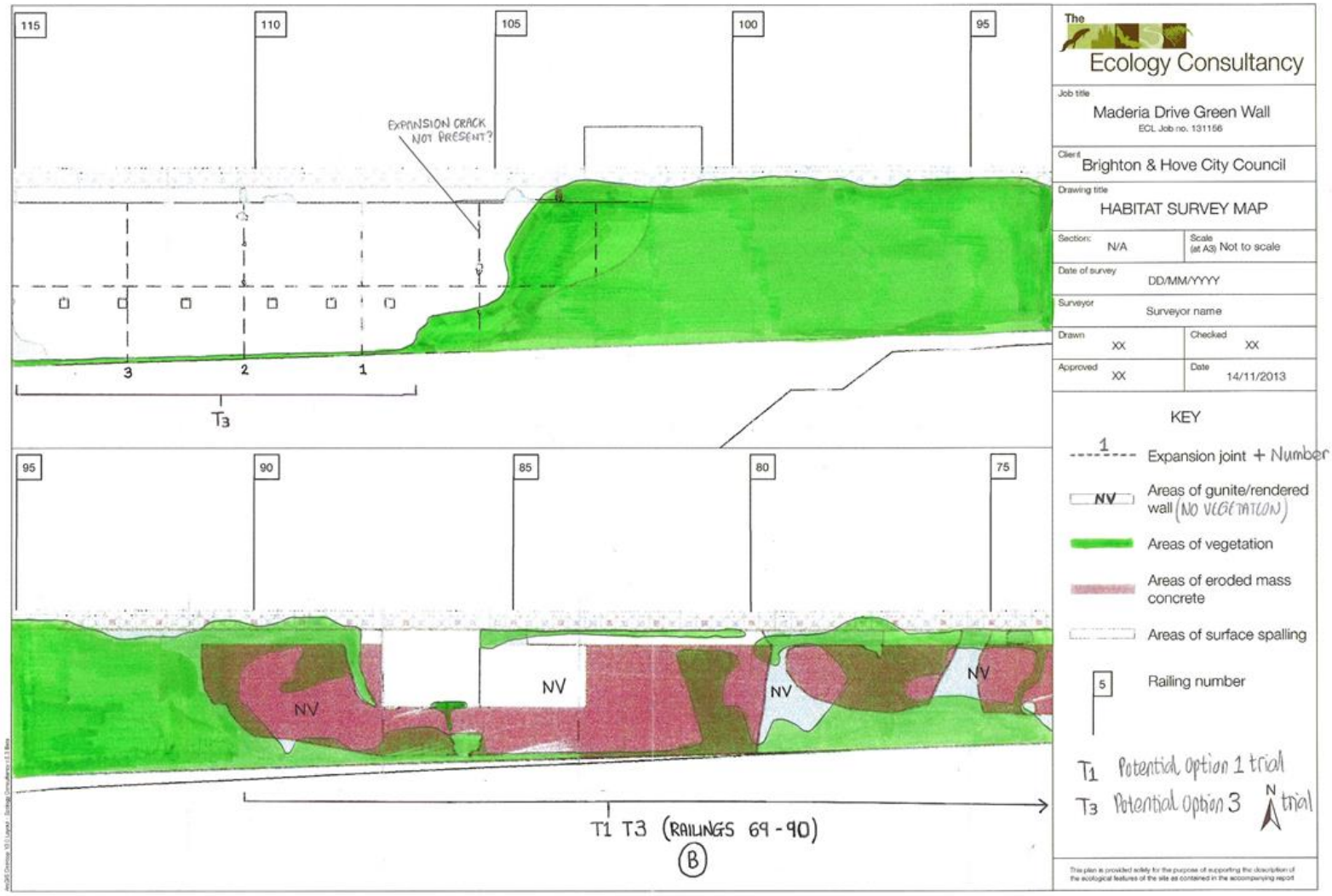
Key works are in progress along Duke's Mound:

- Enlargement of the bed at the foot of the wall to catch falling rubble and to move pedestrians further away from it.
- Drilling of soil nails into the wall on a 1.5m grid, fixing reinforced mesh to the ends of the soil nails and casting of concrete

Duke's Mound was selected for trial as it provided:

- A shorter 400m section
- Receives less footfall
- Easier access for works
- 30m length of shorter spindle
- Allows more easily for mistakes to be made and learnt from

- Work underpinned by 2013 mapping exercise



Madeira Drive Green Wall: **Maintenance**

30m length of shorter spindle selected for coppice trial

Image: B. Kimpton

Madeira Drive Green Wall: **Maintenance**

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Madeira Drive Green Wall: **Maintenance**

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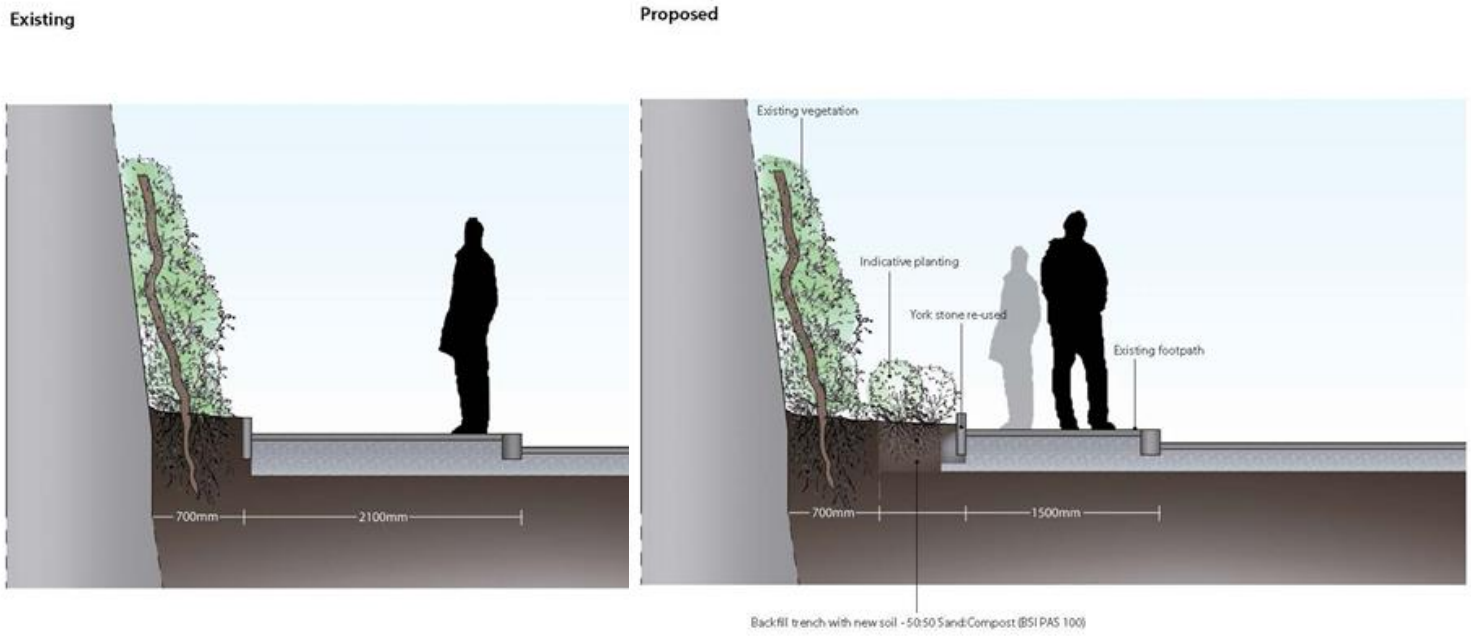

Madeira Drive Green Wall: **Maintenance**

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Madeira Drive Green Wall: **Maintenance**

Image: B. Kimpton

2014

- Removal of vegetation from expansion cracks
- Removal of butterfly bush (*Buddleja davidii*) and elder (*Sambucus nigra*)
- General cutting back of the front face to 1m of the wall
- Creation of a gentle batter so that vegetation reduces in distance from wall as it increases in height.
- Four areas of the wall were identified for clearance of 4 larger areas of vegetation where the face was in poor condition
- Coppicing of spindle
- Cutting back all vegetation to 300mm from the top
- All work timed to avoid the bird nesting period

Madeira Drive Green Wall: **Maintenance**

Image: B. Kimpton

Madeira Drive Green Wall: **Maintenance**

Image: J. Farrell

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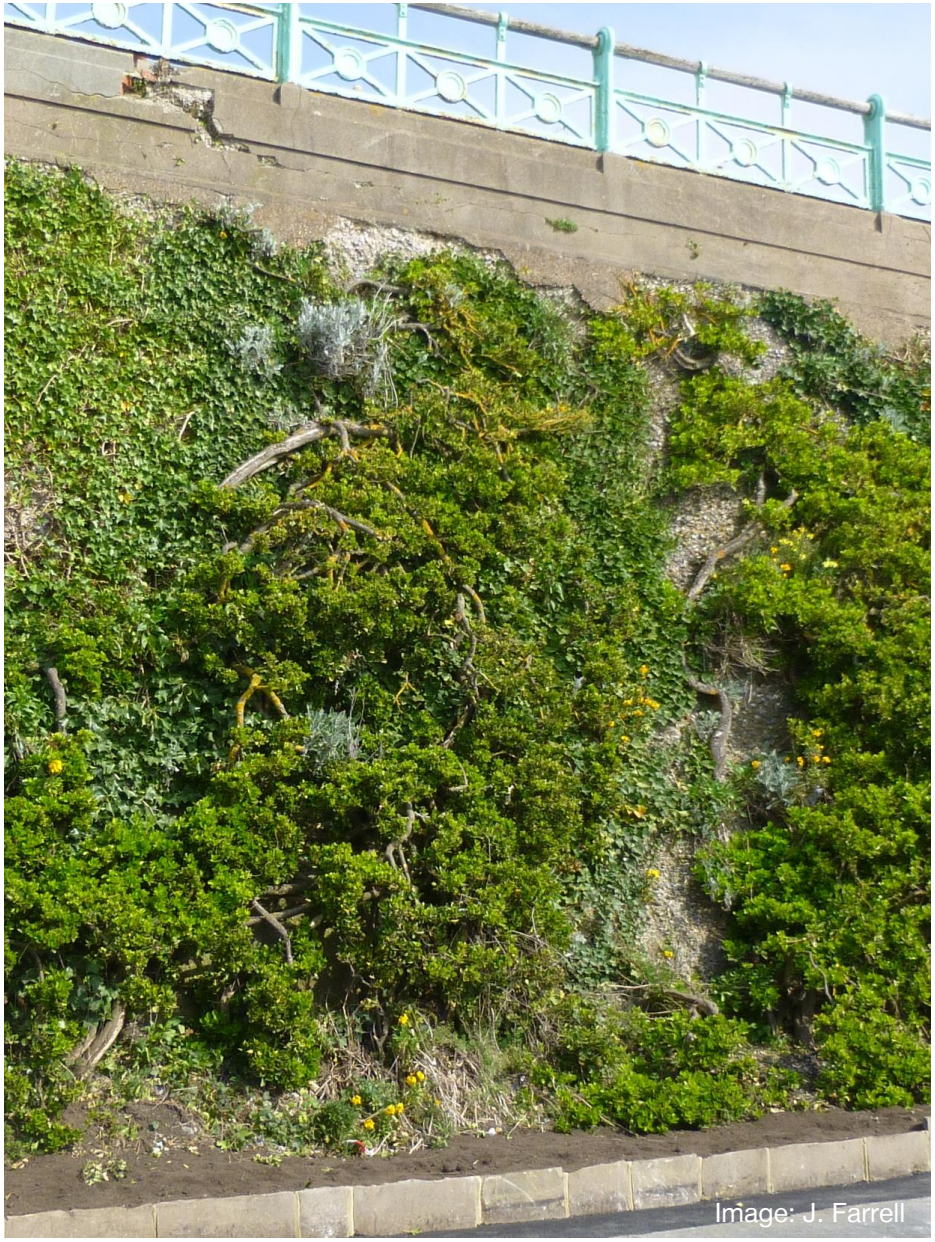

Image: J. Farrell

Madeira Drive Green Wall: **Future Work**

Work in 2014/15 will include:

- Stabilising and rendering 4 areas of wall
- Fixing new support wires
- Monitoring the success of coppicing
- Taking cuttings and propagating spindle
- Planting new spindle
- Devising work programme for remaining 800m
- Further research on Kemptown Estate for planting plan/date

Images: B. Kimpton / J. Farrell

Madeira Drive Green Wall: **Future Work**

Designing a cost-effective, long-term maintenance programme.

The use of volunteers is being explored whilst considering the safety and technical challenges in working on a 20m high wall!

Options for enhancing the wall in future years include:

- Selecting perennial species for ground level planters
- Designing bespoke concrete planters to be fixed at height onto the rendered wall and selecting plants
- Citizen science bird and insect survey

One of the challenges will be to maintain the variety of micro-climates that have slowly developed along the spectrum between dry, open, sun-baked locations and permanently wet, shady locations.

This may mean purposely diverting water onto the face of the wall, by disconnecting down pipes and/or altering the rendered finish to create a rougher surface that plants can adhere to.

Madeira Drive Green Wall: **Conclusions**

- Evolved over c145yrs from a monoculture to a diverse mixture of c100 plant species. Spindle helps to sustain plant diversity.
- It is 1.2km long and up to 20m tall
- Candidate Local Wildlife Site, within UNESCO World Biosphere Site.
- Possible one of the oldest, longest and best protected UK walls?
- Forms an impressive and historic backdrop to the seafront, both growing behind and on a listed structure. It is hoped that by harnessing its social history, future funding will be unlocked.
- Dual function as a retaining wall supporting the A259 Marine Parade and as a supporting structure for vegetation
- A joint approach, resulted in a successful partnership between council engineers, ecological experts and the local community.

GWs can provide vertical connecting habitat between the streetscape and roofscape (green roofs).

Can new walls also be strategically positioned to provide linear (horizontal) connecting habitat between existing greenspaces / designated nature conservation sites?

GWs require irrigation to sustain their green façade?

Can GW planting plans follow nature's lead more? - potentially include species tolerant of dry conditions (xerophytic) or even tolerant of salt conditions (halophytic) plants?

Have many delegates have designed GWs mimicking UK coastal habitats?