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DESIGN PACKAGE C122 – BORED TUNNELS

Biodiversity Accounting Report Central Section

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Contents

1	Introduction	6
1.1	Crossrail’s Commitments.....	6
1.2	The Development of Biodiversity Offsetting	7
1.3	Biodiversity Offsetting.....	8
2	Methodology.....	9
2.1	Measuring Biodiversity Units.....	10
2.2	Limitations and Qualifications	11
3	Results.....	12
3.1	Mile End Shaft	12
3.2	Eleanor Street Shaft.....	13
3.3	Old Oak Common.....	14
3.4	Paddington Integrated Project (PIP)	15
3.5	Plumstead Portal and Sidings.....	16
3.6	Pudding Mill Lane and Ham & Wick.....	17
3.7	Westbourne Park and Royal Oak Portal	18
3.8	Whitechapel Station.....	19
3.9	Limmo Peninsula Shaft.....	20
3.10	Liverpool Street Station.....	21
3.11	Ilford Yard.....	21
3.12	Connaught Tunnel	22
3.13	Woolwich Station	22
3.14	Custom House and Victoria Dock.....	23
3.15	North Woolwich Portal.....	24
3.16	Stepney Green Shaft.....	24
3.17	Urban Realm.....	26
4	Conclusions	27
4.1	Losses and Gains	27
4.2	Wallasea Island	27
5	Appendices.....	30
5.1	Measuring Biodiversity Units.....	30
5.2	Multipliers for Offsetting Risks	32
5.3	Planting design and site photographs	34

1 Introduction

Ove Arup & Partners Ltd (Arup) was commissioned by Crossrail Limited to undertake a biodiversity accounting study. The purpose of this study is to assess and quantify the amount of biodiversity to be lost and gained as a result of development at seventeen of the Crossrail sites across London (Central Section). Landscaping plans to be implemented after development and those already implemented allow an assessment of biodiversity gain to be made on each site, and collectively across the Central section. The Defra toolkit¹ for calculating 'biodiversity units' will be used to calculate the losses and gains.

1.1 Crossrail's Commitments

Under the Environment Minimum Requirements, the following general principles will be applied where applicable:

- *After construction, habitats or ecological features that have been affected by construction activities will be reinstated or allowed to recolonise so that (as far as reasonably practicable), they recover to their pre-construction conditions;*
- *Where appropriate, landscape planting (other than ornamental and specimen tree planting) will be undertaken using native species typical of the area.*
- *Subject to any relevant approvals or agreements required for any restoration or mitigation schemes under Schedule 5 or 7 or 17 to the Act, land which is temporarily acquired or required in connection with the project will normally be restored to not less than former nature conservation value.*

In addition, the Nominated Undertaker for the Crossrail project is considered a 'public authority' as defined in the Natural Environment and Rural Communities Act 2006². The Nominated Undertaker will therefore have regard, so far as consistent with the proper exercise of its functions, to the conservation (restoration or enhancement) of biodiversity, integrating this commitment within its management processes.

¹ Defra (2012) Biodiversity Offsetting Pilots – Technical Paper: the metric for the biodiversity offsetting pilot in England. Defra and Natural England online report available at: <https://www.gov.uk/government/publications/technical-paper-the-metric-for-the-biodiversity-offsetting-pilot-in-england>

² UK Government (2006) Natural Environment and Rural Communities Act 2006. UK Government legislation online available at: <https://www.legislation.gov.uk/ukpga/2006/16/contents>

1.2 The Development of Biodiversity Offsetting

In 2010, it was concluded in the Lawton report *'Making Space for Nature: A review of England's Wildlife Sites and Ecological Network'* that only the more important areas of habitat, i.e. those that are designated or have a European protected species present, are adequately protected. This report recognised that non-statutory sites *'having only minimal protection through recognition in national planning policy, and are highly vulnerable to damage and loss [...] in general their management is under-funded'*.

As a result, the Coalition Government agreed to *"introduce measures to protect wildlife and promote green spaces and wildlife corridors in order to halt the loss of habitats and restore biodiversity"*³. Following extensive consultation with interested stakeholders, in March 2012, Defra and Natural England published a toolkit for using a system of 'biodiversity units' to measure and compare biodiversity gains and losses on a development site and any offset requirement necessary to compensate for predicted biodiversity loss.

The National Planning Policy Framework (2012)⁴ highlights the role of the planning system in relation to biodiversity:

'The planning system should contribute to and enhance the natural and local environment by:

- *protecting and enhancing valued landscapes, geological conservation interests and soils;*
- *recognising the wider benefits of ecosystems and services;*
- *minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water, or noise pollution of land instability; and*

³ UK Government (2010) The Coalition: our programme for UK government. Quote from Lord Henley's speech at the RSPB Futurescapes launch, available online at:

<https://www.gov.uk/government/speeches/lord-henley-s-speech-at-the-rspb-futurescapes-launch>

⁴ UK Government (2012) National Planning Policy Framework. UK Government online report available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*'

Policy 7.19.C of the London Plan (2011)⁵ sets out the approach towards biodiversity conservation and planning decisions:

'Development proposals should:

- a) wherever possible, make a positive contribution to the protection, enhancement, creation and management of biodiversity;*
- b) prioritise assisting in achieving targets in biodiversity action plans (BAPs) [...] and/or improve access to nature in areas deficient in accessible wildlife sites;*
- c) not adversely affect the integrity of European sites, and be resisted where they have significant adverse impact on European or nationally designated sites or on the population or conservation status of a protected species, or a priority species or habitat identified in a UK, London or appropriate regional BAP or borough BAP.'*

By quantifying the habitat lost to the development footprint, a value is being put on the services provided by those habitats and thus a robust indication of the level of compensation needed to offset development activities is given.

1.3 Biodiversity Offsetting

Defra states that "*Biodiversity offsets are nature conservation activities designed to deliver biodiversity benefits in compensation for losses from development activity*"⁶. Unlike previous forms of ecological compensation, there is a formal requirement for a quantitative calculation to demonstrate the loss and gain in biodiversity during the course of a development.

Losses (from the development footprint) and gains (from habitats created or enhanced as part of the development) are each measured in the same way, using a rigorous system of quantification. Firstly it can be seen if there is likely to be an overall loss in biodiversity on the site (and hence whether biodiversity offsetting is required), and secondly, where offsetting is required, the number of biodiversity units which need to

⁵ London Assembly (2011) London Plan 2011. Online report available at: <https://www.london.gov.uk/what-we-do/planning/london-plan/past-versions-and-alterations-london-plan/london-plan-2011>

⁶ Defra (2012) Evaluation of the Biodiversity Offsetting pilot phase – WC1051. Online quote available at: <http://www.defra.gov.uk/environment/natural/biodiversity/uk/offsetting/>

be offset (to ensure no net loss or a net gain in biodiversity as a result of the development).

Defra has detailed the principles for offsetting, including that it should:

- *'not change existing levels of protection for biodiversity;*
- *deliver real benefits for biodiversity;*
- *be managed at the local level as far as possible;*
- *be as simple and straightforward as possible, for developers, local authorities and others;*
- *be transparent, giving clarity on how the offset calculations are derived and allowing people to see how offset resources are being used; and*
- *be good value for money.'*⁷

2 Methodology

The following methodology was undertaken on each of the seventeen sites in order to quantify the amount of biodiversity lost or gained at each site. An overall net loss or gain of biodiversity was then calculated by summing the results of all sites.

1. Mile End Shaft
2. Eleanor Street Shaft
3. Old Oak Common
4. Paddington Integrated Project (PIP)
5. Plumstead Portal and Sidings
6. Pudding Mill Lane and Ham & Wick
7. Westbourne Park and Royal Oak Portal
8. Whitechapel Station

⁷ Biodiversity Offsetting Pilots. Technical Paper: the metric for the biodiversity offsetting pilot in England (2012)

9. Limmo Peninsula Shaft
10. Liverpool Street Station
11. Ilford Yard
12. Connaught Tunnel
13. Woolwich Station
14. Custom House and Victoria Dock
15. North Woolwich Portal
16. Stepney Green Shaft
17. Urban Realm

The process of biodiversity accounting involves two distinct evaluation stages:

- Stage 1: Valuing the existing habitat of the development site; and
- Stage 2: Valuing the net impact of the development proposal from losses of existing habitat, gains of new habitat and enhancements of existing (retained) habitats.

Each of these stages involves the same basic calculation method, albeit with additional multipliers for the second stage to reflect risk factors in habitat restoration/creation such as the difficulty in recreating certain habitats and the likelihood of creating a similar value habitat.

2.1 Measuring Biodiversity Units

Biodiversity units are the currency of Defra's biodiversity offsetting methodology.

The calculation of the biodiversity units of a habitat type is based on three characteristics:

1. habitat distinctiveness;
2. habitat condition; and
3. size in hectares.

These characteristics are dealt with in more detail in Appendix 5.1.

Development sites are mapped and divided into habitat parcels with the number of biodiversity units calculated on a parcel-by-parcel basis for each habitat type.

Where habitats are proposed to be created or enhanced, the following additional risk factors are introduced into the calculation method:

- Delivery - the difficulty of creating or restoring the target habitat on the offsetting site;

- Spatial - whether the offsetting site is within or adjacent to an area identified in the Offsetting Strategy (or equivalent);
- Temporal - the expected timescale for the habitat to reach its target condition.

These risk factors are dealt with in more detail in Appendix 5.2.

For each habitat type on-site, the first three factors (distinctiveness, condition and size) are multiplied to create a **Biodiversity Score**. These are summed to calculate the current value of existing habitat on-site.

For proposed new habitats or enhancements, the biodiversity score of each habitat is then divided by the three risk factors in turn to create a **Biodiversity Value** for each habitat type. These values are then summed to calculate the total biodiversity value of the site following development and on-site ecological mitigation.

Should on-site mitigation not be sufficient in replacing all biodiversity units lost to the development footprint, off-site offsetting will be required in order for the development to result in no net loss in biodiversity. The number of biodiversity units which need offsetting is calculated by subtracting the number of biodiversity units gained through on-site mitigation from the number of biodiversity units lost to the development footprint.

2.2 Limitations and Qualifications

Some habitats, principally non-BAP habitats, do not have detailed condition assessments within the Farm Environment Plan (FEP) manual. Where this is the case, professional judgement, based upon the detail within the original Phase 1 Habitat Surveys of the sites, has been used to make an informed decision on the condition of the habitat.

The results for each site detailed within this document are based on the original Phase 1 Habitat Surveys, undertaken in 2005 by Carter Ecological Ltd. As such, all limitations detailed within the original Phase 1 report should be acknowledged.

The areas of habitat which will be lost as a result of development have been provided by Crossrail. If it has not been indicated by Crossrail that biodiversity is lost as part of the development, it has been assumed that no biodiversity will be lost. A number of assumptions based on professional judgement have been made regarding landscaping proposals where the degree of detail given is not adequate enough to attribute a condition score. In these cases, assumptions made have been detailed in text associated with the relevant site.

Where landscaping proposals are to be undertaken within the site itself, no spatial risk has been incorporated into the calculations as this will be directly mitigating the habitat lost.

3 Results

Section 3.1 presents the biodiversity accounting results for each of the sites using landscaping proposals provided by Crossrail. These proposals have been reviewed to identify additional opportunities, where relevant.

3.1 Mile End Shaft ⁸

Table 1 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **1.38 biodiversity units**.

Table 1 Mile End Shaft biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score
Amenity grassland	2	2	0.2470	0.9880
Introduced shrub	2	2	0.0150	0.0600
Scattered trees	4	2	0.0410	0.3280
Total				1.3760

Table 2 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail⁹. The value of the site will be **1.78 biodiversity units** following development.

Table 2 Mile End Shaft biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Wildflower green roof	4	2	0.1675	1.3400	1	1.2	1.1167
Scrub	4	2	0.0211	0.1688	1	1.4	0.1206
Amenity grassland	2	1	0.1675	0.3350	1	1.2	0.2792
Scattered broadleaved trees	6	2	0.0280	0.3360	1	1.4	0.2400
Introduced shrub	2	2	0.0081	0.0324	1	1.2	0.0270
Total				2.2122			1.7834

⁸ Information taken from The Ecology Consultancy report 'C360 Sites: Mile End Park / No Net Loss Assessment'

⁹ Drawing reference: 3294_CostainSKANSKA_Mile End Park_No Net Loss_V1 0

As a result, there is a positive increase in the biodiversity value of the site by **0.41 biodiversity units** across the course of development.

3.2 Eleanor Street Shaft

Table 3 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **0.51 biodiversity units**.

Table 3 Eleanor Street Shaft biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score
Introduced shrub	2	2	0.0350	0.1400
Ephemeral/short perennial	2	2	0.0020	0.0080
Scattered trees	2	2	0.0900	0.3600
Total				0.5080

Table 4 details the site's biodiversity value following development, based on landscaping proposals supplied by the Ecology Consultancy¹⁰. The value of the site will be **2.08 biodiversity units** following development.

Table 4 Eleanor Street Shaft biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Sedum green roof	2	2	0.1250	0.5000	1	1.2	0.4167
Wildflower	4	2	0.0710	0.5680	1	1.2	0.4733
Dry grassland	4	2	0.1382	1.1056	1	1.2	0.9213
Scrub	4	2	0.0045	0.0360	1	1.4	0.0257
Scattered broadleaved trees	6	2	0.0280	0.3360	1	1.4	0.2400
Introduced Shrub	2	2	0.0020	0.0080	1	1.2	0.0067
Total				2.5536			2.0837

As a result, there is a positive increase in the biodiversity value of the site by **1.58 biodiversity units** across the course of development.

¹⁰ Information taken from The Ecology Consultancy report 'C360 Sites: Eleanor Street / No Net Loss Assessment'

3.3 Old Oak Common

Table 5 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **38.21 biodiversity units**.

Table 5 Old Oak Common biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity baseline
Dense scrub	4	2	0.7712	6.1696
Ephemeral	4	2	2.0920	16.7360
Introduced shrub	2	1	0.0430	0.0860
Scattered scrub	4	2	0.3434	2.7472
Bare ground	2	1	1.4980	2.9960
Unimproved neutral grassland	4	2	1.1850	9.4800
Total				38.2148

Table 6 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail¹¹. The value of the site will be **21.59 biodiversity units** following development.

Table 6 Old Oak Common biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Woodland and scrub enhancement	6	3	0.0340	0.6120	1.5	1.4	0.2914
Wildflower	4	2	0.6660	5.3280	1	1.2	4.4400
Species rich grassland	4	2	1.2017	9.6136	1	1.2	8.0113
Shrub planting	4	2	0.2989	2.3912	1	1.2	1.9927
Scattered trees	6	2	0.0019	0.0228	1	1.2	0.0190
Ballast areas	2	2	2.0497	8.1988	1	1.2	6.8323
Total				25.554			21.2953

¹¹ Drawing reference: C160-MMD-T-DDA-CR074-SD004-1-40035; Q234-ATK-D-DDL-CR074_SD004_1-92032; and CRL1-XRL-Z1-DDA-CRG05-00030 P02

As a result, there is a decrease in the biodiversity value of the site by **16.99 biodiversity units**.

Previous surveys have identified the presence of a population of slow worm (*Anguis fragilis*) on site¹², features such as hibernacula and basking banks are incorporated into the landscaping plans to support these species.

3.4 Paddington Integrated Project (PIP)

No biodiversity will be lost as a result of the PIP. However, biodiversity enhancements in the form of a sedum green roof and planting of scattered trees are to be incorporated as part of the development¹³.

Table 7 PIP biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Green roof (sedum)	4	3	0.0780	0.9360	1	1.2	0.7800
Scattered trees	6	2	0.0050	0.0600	1	1.2	0.0500
Total				0.9960			0.8300

As a result of this development, this site will increase in biodiversity value by **0.83 biodiversity units**.

¹² Report reference: Q234-BMB-T1-RGN-CR074-50002

¹³ Drawing references: 539-PLN-35101-WCC and 539-PLN-05100-WCC

3.5 Plumstead Portal and Sidings

Table 8 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **22.80 biodiversity units**.

Table 8 Plumstead Portal and sidings biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Bare ground	2	1	1.5920	3.1840
Broadleaved woodland	6	2	1.0535	12.6420
Bracken	2	1	0.0395	0.0790
Dense scrub	4	2	0.4987	3.9896
Scattered broadleaved trees	6	2	0.0024	0.0288
Scattered scrub	4	2	0.0259	0.2072
Scattered tall herb	4	2	0.0013	0.0104
Tall ruderal	4	2	0.0788	0.6304
Unimproved neutral grassland	4	2	0.2541	2.0328
Total				22.8042

Table 9 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail¹⁴. The value of the site will be **5.80 biodiversity units** following development.

Table 9 Plumstead Portal and sidings biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Wildflower meadow	4	2	0.5652	4.5214	1	1.2	3.7679
Hedge	6	2	0.0585	0.7015	1	1.2	0.5846
Ballast	2	2	0.3157	1.2626	1	1.2	1.0522
Ornamental grass	4	2	0.0103	0.0825	1	1.2	0.0687
Shrub	4	2	0.0492	0.3938	1	1.2	0.3281
Total				6.9618			5.8015

As a result, there is a decrease in the biodiversity value of the site by **17.00 biodiversity units** across the course of development.

¹⁴ Report reference: C610-ATC-T1-COL-CRG03-50002 and drawing reference: C122-OVE-S-DDA-CR148_1-87160

3.6 Pudding Mill Lane and Ham & Wick

Table 10 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **5.31 biodiversity units**.

Table 10 Pudding Mill Lane and Ham & Wick biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Unimproved neutral grassland	4	2	0.2120	1.6960
Scattered conifer	6	3	0.0010	0.0180
Scattered scrub	4	2	0.2570	2.0560
Dense scrub	4	2	0.0790	0.6320
Scattered broadleaved trees	6	3	0.0190	0.3420
Tall ruderal	4	2	0.0710	0.5680
Total				5.3120

Table 11 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail¹⁵. The value of the site will be **1.28 biodiversity units** following development.

Table 11 Pudding Mill Lane and Ham & Wick biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Green wall	4	2	0.0040	0.0320	1	1.2	0.0267
Grass seeding	4	2	0.0170	0.1360	1	1.2	0.1133
Shrub	4	2	0.0794	0.6352	1	1.2	0.5293
Herb	4	2	0.0013	0.0104	1	1.2	0.0087
Broadleaved Woodland	6	2	0.0700	0.8400	1.5	1.2	0.4667
Scattered tress	6	2	0.0140	0.1680	1	1.2	0.1400
Total				1.8216			1.2847

As a result, there is a decrease in the biodiversity value of the site by **4.03 biodiversity units** across the course of development.

¹⁵ Drawing references: C152-SWN-L-DDA-CR094_PT002_Z-96170 and C152-SWN-L-DDA-CR094_PT002_Z-96171

3.7 Westbourne Park and Royal Oak Portal

Table 12 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **28.96 biodiversity units**.

Table 12 Westbourne Park and Royal Oak Portal biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Amenity grassland	2	1	0.0600	0.1200
Bare ground	2	1	2.9550	5.9100
Broadleaved woodland	6	3	0.0430	0.7740
Dense scrub	4	2	0.0390	0.3120
Ephemeral	4	2	1.2450	9.9600
Scattered broadleaved trees	6	2	0.0040	0.0480
Scattered scrub	4	2	0.3860	3.0880
Tall ruderal	4	2	0.0720	0.5760
Unimproved neutral grassland	4	2	1.0210	8.1680
Total				28.9560

Table 13 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail¹⁶. The value of the site will be **4.03 biodiversity units** following development.

Table 13 Westbourne Park and Royal Oak Portal biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Ballast areas	2	2	0.1150	0.4600	1	1.2	0.3833
Shrub planting	4	2	0.0300	0.2400	1	1.2	0.2000
Grassland	4	2	0.3700	2.9600	1	1.2	2.4667
Wildflower meadow	4	2	0.1000	0.8000	1.5	1.2	0.4444
Scattered trees	6	2	0.0630	0.7560	1	1.4	0.5400
Total				5.2160			4.0344

¹⁶ Drawing references: C150-CSY-L-DDA-CR076_PT001-00001 and C178-CSY-L-DDA-CR076_MS005-01750

As a result, there is a decrease in the biodiversity value of the site by **24.92 biodiversity units** across the course of development.

3.8 Whitechapel Station

No biodiversity will be lost as a result of development at Whitechapel Station. However, biodiversity enhancements in the form of green roofs are to be incorporated as part of the development¹⁷ (Table 14). The green roofs being installed are a mix of sedum and biodiverse areas, with the biodiverse green roofs targeting black redstart (*Phoenicurus ochruros*). This is a bird species of particular importance in London as it favours living in the heart of urban areas in close association with sparsely vegetated brownfield sites. It is on the amber list of Birds of Conservation Concern (BoCC) and is listed as a priority species on the London Biodiversity Action Plan (BAP)¹⁸.

Table 14 Whitechapel Station biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Green roof (sedum)	4	3	0.0770	0.9240	1	1.2	0.7700
Green roof (biodiverse)	6	3	0.1060	1.9080	1	1.2	1.5900
Total				2.8320			2.3600

As a result of this development, this site will increase in biodiversity value by **2.36 biodiversity units**.

¹⁷ Drawing references: C140-BBM-A-DDA-D061_WS106_C-LAN01, -LAN02, -LAN03, -LAN04 and – LAN05

¹⁸ <http://www.lbp.org.uk/londonpriority.html>

3.9 Limmo Peninsula Shaft

Table details the biodiversity value of areas of the site which will be lost as a result of development. This equals **32.20 biodiversity units**.

Table 15 Limmo Peninsula Shaft biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity baseline
Bare ground	2	1	1.9864	3.9728
Unimproved neutral grassland	4	2	1.0782	8.6256
Dense scrub	4	2	0.5856	4.6848
Broadleaved plantation	6	3	0.4120	7.4160
Ephemeral	4	2	0.2996	2.3968
Introduced shrub	2	1	0.2738	0.5476
Scattered tall herb	4	2	0.2740	2.1920
Scattered scrub	4	2	0.2951	2.3608
Total				32.1964

Table 16 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail¹⁹. The value of the site will be **3.29 biodiversity units** following development.

Table 16 Limmo Peninsula Shaft biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Wildflower	4	2	0.4773	3.8184	1	1.2	3.1820
Ballast areas	2	2	0.0322	0.1288	1	1.2	0.1073
Total				3.9472			3.2893

As a result, there is a decrease in the biodiversity value of the site by **28.91 biodiversity units** across the course of development.

¹⁹ Drawing reference: C360-SKC-A-DDA-CR144_SH011_A-03501

3.10 Liverpool Street Station

Table 17 details the biodiversity value of areas of the site which will be lost as a result of development. In total, **2.53 biodiversity units** will be lost at this site.

Table 17 Liverpool Street Station biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Amenity grassland	2	1	0.2890	0.5780
Introduced shrub	2	1	0.0105	0.0210
Hedge	6	2	0.1610	1.9320
Total				2.5310

Restoration plans are currently being progressed for this site with an urban realm scheme being delivered in the future by the City of London.

3.11 Ilford Yard

No biodiversity will be lost as a result of development at Ilford Yard. However, biodiversity enhancements in the form of tree and shrub planting have been incorporated as part of the development²⁰ (Table 18).

Table 18 Ilford Yard biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Shrub planting	4	2	0.0427	0.3416	1	1.2	0.2847
Scattered trees	6	2	0.0060	0.0720	1	1.4	0.0514
Total				0.4136			0.3361

As a result of this development, this site will increase in biodiversity value by **0.34 biodiversity units**.

²⁰ Drawing reference: C161-MMD-T-DDA-CR112-SD007-1-40102

3.12 Connaught Tunnel

Table 19 details the biodiversity value of areas of the site which will be lost as a result of development. In total **4.05 biodiversity units** will be lost at this site.

Table 19 Connaught Tunnel biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Amenity grassland	2	1	0.2958	0.5916
Bare ground	2	1	0.5795	1.1590
Hedge	6	2	0.0450	0.5400
Broadleaved woodland	6	2	0.0130	0.1560
Dense scrub	4	2	0.0149	0.1192
Ephemeral	4	2	0.0019	0.0152
Introduced shrub	4	2	0.0825	0.6600
Unimproved neutral grassland	4	2	0.0671	0.5368
Scattered scrub	4	2	0.0202	0.1616
Scattered broadleaved trees	6	3	0.006	0.1080
Total				4.0474

3.13 Woolwich Station

No biodiversity will be lost as a result of development at Woolwich station. A brown roof²¹ is to be installed. It is recommended that this feature is further enhanced through the inclusion of invertebrate features such as log piles and insect hotels. Table 21 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail²².

Table 21 Woolwich Station biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Scattered trees	6	2	0.0030	0.0360	1	1.4	0.0257
Grassland	4	2	0.0482	0.4680	1	1.2	0.3215
Brown Roof	4	2	0.1274	1.0192	1	1.2	0.8493
Total				1.4410			1.1965

²¹ Presentation 'Woolwich Station Roof Plant Alteration'

²² Drawing reference: C530-BBR-L-DDA-CR147_WS163_Z-20001

As a result of this development, this site will increase in biodiversity value by **1.20 biodiversity units**.

3.14 Custom House and Victoria Dock

Table 22 details the biodiversity value of areas of the site which will be lost as a result of development at Custom House. In total, **8.83 biodiversity units** will be lost at this site.

Table 22 Custom House and Victoria Dock biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Unimproved neutral grassland	4	2	0.0350	0.2800
Dense scrub	4	2	0.6560	5.2480
Scattered broadleaved trees	6	3	0.0030	0.0540
Ephemeral	4	2	0.2194	1.7552
Scattered scrub	4	2	0.1870	1.4960
Total				8.8332

Table 23 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail²³. The value of the site will be **1.79 biodiversity units** following development.

Table 23 Custom House and Victoria Dock biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Species rich grassland	4	2	0.2684	2.1472	1	1.2	1.7893
Total				2.1472			1.7893

As a result, this site will decrease in biodiversity value by **7.04 biodiversity units**.

²³ Drawing references: C340-VIN-L-DDA-CR144_PT003_1-10001, C340-VIN-L-DDA-CR144_PT003_1-10002, C340-VIN-L-DDA-CR144_PT003_1-10003

3.15 North Woolwich Portal

Table 24 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **19.82 biodiversity units**.

Table 24 North Woolwich Portal biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Unimproved neutral grassland	4	2	0.8115	6.4920
Bare ground	2	1	0.5556	1.1112
Dense scrub	4	2	0.0326	0.2608
Amenity grassland	2	1	0.0289	0.0578
Marshy grassland	4	2	0.0025	0.0200
Ephemeral	4	2	0.6880	5.5040
Scattered tall herb	4	2	0.2770	2.2160
Scattered scrub	4	2	0.5200	4.1600
Total				19.8218

Table 25 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail²⁴. The value of the site will be **0.41 biodiversity units** following development.

Table 25 North Woolwich Portal biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Broadleaved trees	6	2	0.0012	0.0144	1.0	1.4	0.0103
Grassland	4	2	0.0005	0.0042	1.0	1.2	0.0035
Scrub	4	2	0.07000	0.5600	1.0	1.4	0.4000
Total				0.5786			0.4138

As a result, this site will decrease in biodiversity value by **19.41 biodiversity units**.

3.16 Stepney Green Shaft

Table 26 details the biodiversity value of areas of the site which will be lost as a result of development. This equals **0.38 biodiversity units**.

²⁴ Drawing reference: C530-BBR-L-DDA-CR146_PT004_Z-20001 & Proposed Site Plan 1.66-00-20 (CREATE London)

Table 26 Stepney Green Shaft biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Scattered tall herb	4	2	0.0288	0.2304
Amenity grassland	2	1	0.0500	0.1000
Scattered broadleaved trees	6	3	0.0025	0.0450
Total				0.3754

Table 27 details the site's biodiversity value following development, based on landscaping proposals supplied by Crossrail²⁵. The value of the site will be **1.66 biodiversity units** following development.

Table 27 Stepney Green biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Scattered broadleaved trees	6	2	0.0024	0.0288	1.5	1.4	0.0137
Wildflower meadow	4	2	0.0892	0.7138	1	1.2	0.5949
Shrub planting	4	2	0.0280	0.2242	1	1.2	0.1869
Permeable grassed pavement	2	2	0.0240	0.0960	1	1.2	0.0800
Grassland	4	2	0.1178	0.9422	1	1.2	0.7852
Total				2.0051			1.6606

As a result, this site will increase in biodiversity value by **1.29 biodiversity units**.

²⁵ Drawing reference: CRO_SG_C360_Garden Street Design_Draft GA for Schedule 7 CD-003

3.17 Urban Realm

As part of urban realm works, Crossrail Ltd will be planting 85 trees within the urban realm in the central section of the Crossrail route.

Table 28 Urban realm biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Scattered trees	6	2	0.0085	0.1020	1	1.4	0.0729
Total				0.1020			0.0729

As a result of the urban realm works, an overall increase in biodiversity value of **0.07 biodiversity units** is expected across the Central Section.

4 Conclusions

4.1 Losses and Gains

Table 29 details the overall losses and gains in biodiversity across the seventeen sites in the Central Section. Although several sites do display gains in biodiversity value, several sites also exhibit more significant losses. As such, the overall balance in biodiversity value resulting from development is a net loss of **116.75 biodiversity units**.

The most significant of these losses occurs at Limmo Peninsula Shaft and Westbourne Park, as a result of the loss of neutral grassland and woodland habitats in particular. The most significant gain occurs at Whitechapel station as a result of green roof creation.

Table 29 Summary table of biodiversity lost and gained across the development sites

Sites	Biodiversity Units
Mile End Shaft	0.41
Eleanor Street Shaft	1.58
Old Oak Common	-16.92
Paddington Integrated Project (PIP)	0.83
Plumstead Portal	-17.00
Pudding Mill Lane and Ham & Wick	-4.03
Westbourne Park and Royal Oak Portal	-24.92
Whitechapel Station	2.36
Limmo Peninsula Shaft	-28.91
Liverpool Street Station	-2.53
Ilford Yard	0.34
Connaught Tunnel	-4.05
Woolwich Station	1.20
Custom House and Victoria Dock	-7.04
North Woolwich Portal	-19.41
Stepney Green	1.29
Urban Realm	0.07
Total	-116.73

4.2 Wallasea Island

The Royal Society for the Protection of Birds (RSPB) is undertaking a flagship coastal habitat creation project on Wallasea Island, located at the junction of the Crouch and Roach Estuaries in Essex. Wallasea Island was originally five low-lying islands used primarily as a grazing marsh for sheep and cattle. In the 1950's and 1970's, the area

was drained and levelled for intensive agricultural use. A grid formation drainage system was created so the island was criss-crossed by 13 drainage ditches.

The aim of this project is to return the island to a diverse array of intertidal habitats which will provide resource for birds, fish, water voles and invertebrates. The creation of intertidal mudflats, saltmarsh and transitional habitats will contribute to the UK BAP targets as well as mitigate for the national loss of these important habitats, which is estimated to be at a rate of 600ha per year, mainly due to rising sea levels and climate change. This restoration will also include supra-littoral habitats into which water will move as sea levels rise, thus ensuring that the site will be sustainable in the long term.

This project has involved the importation of fill materials to facilitate the creation of suitable landforms within the Wallasea site. A principal source for this fill is the beneficial reuse of recovered tunnelled material from the Crossrail project. Crossrail consider the relocation and reuse of such materials to be the most appropriate and sustainable solution.

This project has necessarily resulted in the loss of arable fields and some smaller areas of neutral grassland habitats. The area of Wallasea associated with Crossrail (181 ha) has been valued at **362 biodiversity units** (Table 30) prior to it being restored to a range of more ecologically beneficial habitats.

Table 30 Wallasea biodiversity lost

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Baseline
Wallasea	2	1	181	362
Total				362

Given the biodiversity benefits and status of this project as outlined above, as well as the considerable involvement of the RSPB in the creation and ongoing management of the site (involving the production of a management plan with input from statutory bodies), it is believed that the habitats created over the 181 ha with which Crossrail is involved²⁶ will possess the highest distinctiveness and condition scores within the biodiversity offsetting calculations. However, the delivery risks involved in trying to create such important habitats are also 'high'. In total, and following these assumptions, it is calculated that this habitat creation project at Wallasea could be valued at **775.714 biodiversity units** (Table 31).

²⁶ Drawing reference: C176-FAB-C-DWG-CRT00_ES001-50003

Table 31 Wallasea biodiversity gained

Habitat	Distinctiveness	Condition	Area ha	Biodiversity Score	Delivery	Temporal	Biodiversity Offset Score
Wallasea	6	3	181	3258.000	3	1.4	775.714
Total				3258.000			775.714

The Wallasea Island project thus has the potential to generate a substantial biodiversity net gain (**413.7 biodiversity units**) as a standalone project, to which Crossrail has made an important contribution.

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5 Appendices

5.1 Measuring Biodiversity Units

5.1.1 Habitat Distinctiveness

Habitats are ranked into three types based on distinctiveness and assigned a numerical value; high (6), medium (4), and low (2). Parameters for this include species richness, diversity, and rarity at local, regional, national and international levels (Table 32).

Table 32. Parameters for distinctiveness categories

Habitat distinctiveness	Broad habitat type covered	Type of offset	Habitat value
High	Priority habitat, as defined in Section 41 of the NERC Act	Same band type, and ideally like for like	6
Medium	Semi natural	Within band type or trade up	4
Low	E.g. Intensive agricultural – but may still form an important part of the ecological network in an area	Trade up	2

5.1.2 Habitat Condition

There is no standard habitat condition assessment tool. Defra have recommended that the Higher Level Stewardship (HLS) Farm Environment Plan (FEP) manual is used to assess habitat condition.

Presently, habitat condition is ranked as good (3), moderate (2), or poor (1) and assigned the appropriate numerical value. In the FEP, each habitat type possesses specific condition requirements for it to meet one of these rankings based upon characteristics such as the presence of undesired species, the frequency of indicator species and the percentage cover of bare ground. If the habitat meets all the condition requirements, it is classed as good, if it fails one criterion it is classed as moderate, and if it fails two or more criteria it is classed as poor quality.

Low distinctiveness habitats are, as standard, assigned a poor condition unless a particularly valuable or diverse example of that habitat is present.

5.1.3 Biodiversity Score

Condition and distinctiveness are combined to give the number of biodiversity units per hectare (Table 33).

Table 33. Calculation of the biodiversity units per hectare of a habitat type.

Distinctiveness		Low	Medium	High
Condition		2	4	6
Good	3	6	12	18
Moderate	2	4	8	12
Poor	1	2	4	6

The Biodiversity Score of each habitat type is therefore this value multiplied by the total number of habitat hectares being lost to the development footprint. These are then summed to calculate an overall Biodiversity Offset Value for all habitat being lost as a result of the development.

5.2 Multipliers for Offsetting Risks

Risks inherent in successful offsetting delivery, including the difficulty of restoring/creating habitat, the spatial location of the offset and the time taken for recreated/restored habitats to reach their peak condition, are corrected by multipliers. Effectively, this increases the number of hectares required to deliver a target number of biodiversity units.

Delivery risks refer to the difficulty in recreating or restoring a habitat (Table 34).

Table 34. Multipliers used to account for risks in habitat restoration/creation.

Delivery Risk	
Very High	10
High	3
Medium	1.5
Low	1

Spatial risks are judged against the priorities identified in a Local Offsetting Strategy or equivalent. Most councils do not have a specific Local Offsetting Strategy. Instead, pilot areas are using a combination of relevant documents such as Local Biodiversity Action Plans (LBAPs), Living Landscapes and Open Space Strategies to guide the selection of offsetting sites. Such documents highlight local areas of conservation concern/potential biodiversity improvement which are local priorities. Through directing offsetting to such sites, a strategic approach to conserving biodiversity can be used, directing efforts efficiently and effectively to “*enhance England’s ecological network*”.

Table 35 Multipliers used to account for spatial risks.

Spatial Risk	
Offset is in a location identified in the offsetting strategy	No multiplier required
Offset is buffering, linking, restoring or expanding a habitat outside an area identified in the offsetting strategy	2
Offset is not making a contribution to the offsetting strategy	3

Temporal risks are judged on the number of years the habitat will take to reach its target condition (Table 36).

Table 36. Multipliers accounting for temporal risk in offsetting.

Temporal Risk	
Years to target condition	Multiplier
5	1.2
10	1.4
15	1.7
20	2.0
25	2.4
30	2.8
32	3

5.3 Planting design and site photographs

5.3.1 Mile End Shaft



Fig 1. Mile End Shaft headhouse wildflower roof

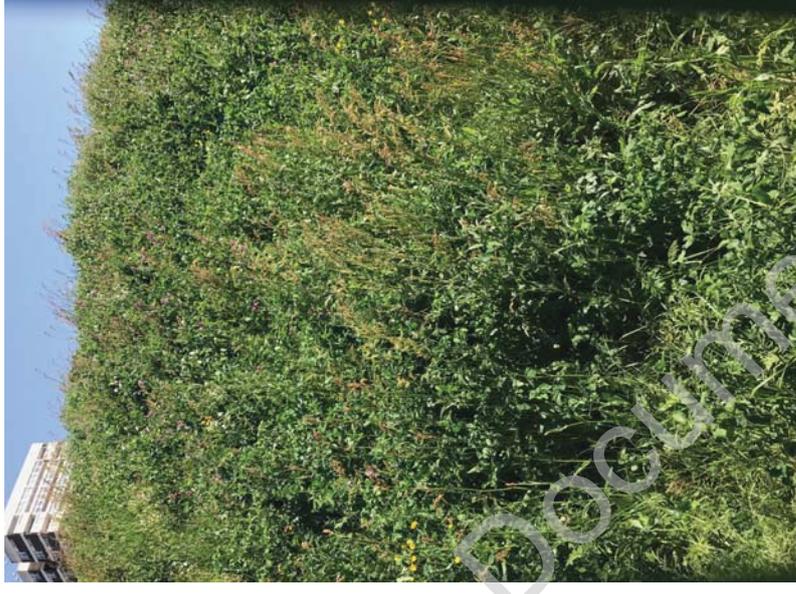


Fig 2. Mile End wildflower roof

5.3.2 Eleanor Street Shaft



Fig 3. Eleanor street shaft sedum roof

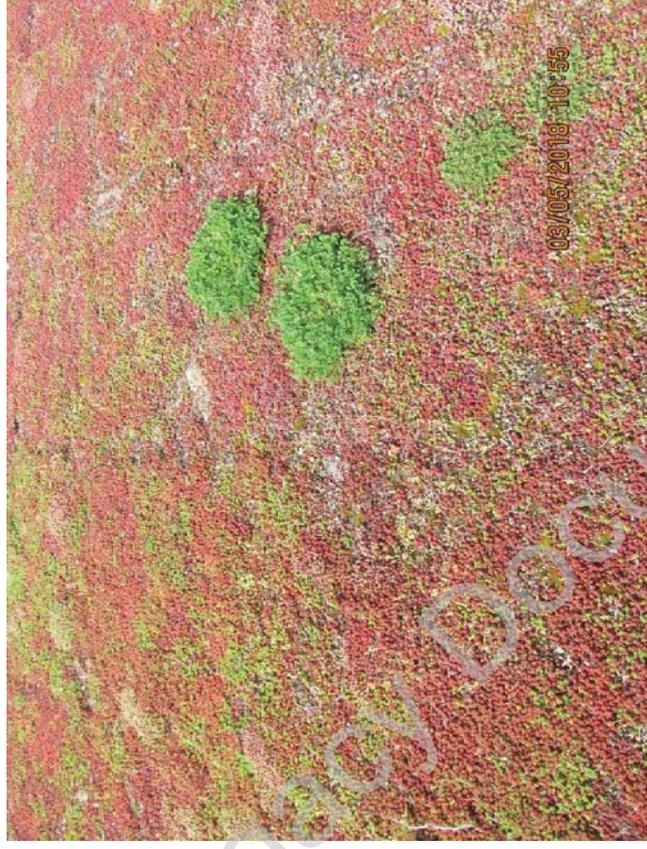


Fig 4. Eleanor street shaft sedum roof

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5.3.3 Old Oak Common

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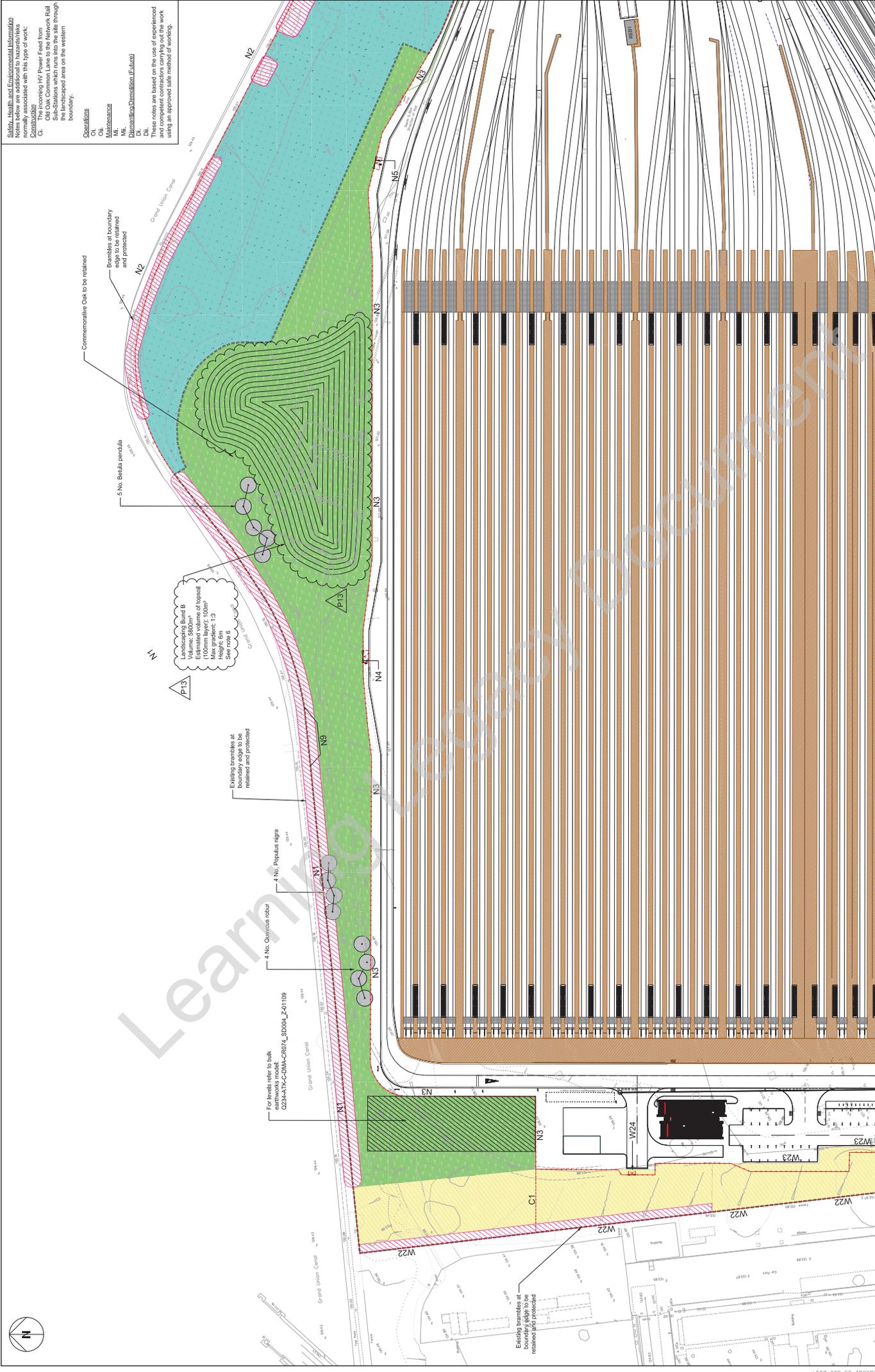
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Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:
 Consideration should be given to:
 - The existing HV Power Feed from Old Oak Common Lane to the Network Rail Sub-Stations which runs into the site through the developed area on the western boundary.
 - Commemorative Oak to be retained.
 - Brimble at boundary edge to be retained and protected.
 - 5 No. Betula pendula.
 - Existing brimble at boundary edge to be retained and protected.
 - 4 No. Populus nigra.
 - 4 No. Quercus robur.
 - For levels refer to bulk Q234-ATK-COMA-CR07A_SD004_Z-01109.
 - Grand Uprick Canal.

- Quantities**
- Oh.
 - Maintenance
 - M.
 - Demolition/Dismantling (E/W/UA)
 - Dh.
 - Dh.
- The above notes are based on the site of experienced and competent contractors carrying out the work using an approved safe method of working.



Planting Type B
 Volume: 5880m³
 Estimated volume of topsoil: 1000m³
 Max. gradient: 1:3
 Height: 6m
 See note 6

For levels refer to bulk Q234-ATK-COMA-CR07A_SD004_Z-01109

Notes

- Refer to Q234-ATK-CR06-10085 for Landscaping Schedule.
- Refer to Q234-ATK-CR06-00003 for Fencing Schedule (W22, W23 etc).
- Refer to Q234-ATK-CR06-00005 for Fencing Termination Details.
- Refer to management drawings Q234-ATK-CR07A_SD004_H2023-00138.
- Refer to management drawings Q234-ATK-CR07A_SD004_H2023-00138.
- Where commuted call is to be retained, the call is to be retained.
- Where commuted call is to be retained, the call is to be retained.
- Existing trees in this area to be retained.

Legend

- Planting Type C: Species rich grass mix
- Planting Type B: Shrub mix
- Planting Type A: Tree and Shrub mix
- Planting Type D: Conservation area with Wild flower and Grass mix
- Hiberniscalls for slow worms
- Proposed mallee trees
- Proposed oak & poplar trees
- Site Boundary

Revisions

Rev.	Date	Description
P01	2015/01/22	Issue for approval
P02	2015/01/22	Issue for approval
P03	2015/01/22	Issue for approval
P04	2015/01/22	Issue for approval
P05	2015/01/22	Issue for approval
P06	2015/01/22	Issue for approval
P07	2015/01/22	Issue for approval
P08	2015/01/22	Issue for approval
P09	2015/01/22	Issue for approval
P10	2015/01/22	Issue for approval
P11	2015/01/22	Issue for approval
P12	2015/01/22	Issue for approval
P13	2017/02/02	Update for final design

Contract: Old Oak Common
Client: Old Oak Common Depot
Project: Old Oak Common Depot
Drawings: Highways
Sheet: 3 of 3
Scale: 1:500 @ A1
Author: P13
Check: P13
Drawn: P13
Approved: P13
Date: 15/01/2017



5.3.4 Paddington Integrated Project PIP



Fig 5. Paddington Station sedum roof

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ST

ALL DETAIL SHOWN FOR EAST OF THIS LINE IS INDICATIVE
AND WILL BE THE SUBJECT OF SUBMISSION WES/4/19 TAXI FA

GRAND UNION CANAL

ENTRANCE
0.078

LU STATION

PASSENGER OVERBRIDGE

NETWORK RAIL LINK

EXISTING SPAN 4 ROOF

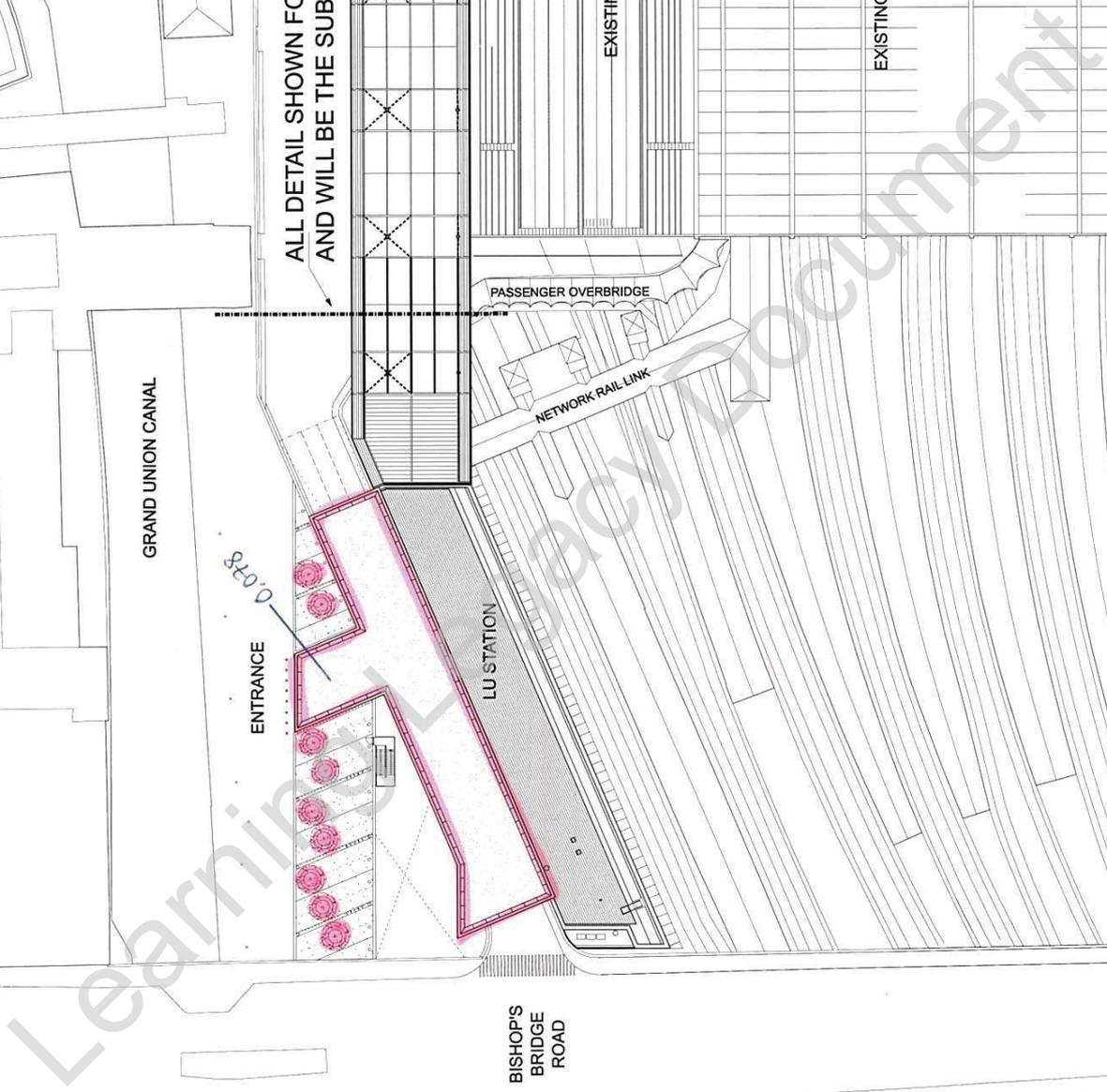
EXISTING SPAN 1-3 ROOF

BISHOP'S
BRIDGE
ROAD

PADDINGTON CENTRAL

50mm

50mm



11/2



5.3.5 Plumstead Portal and Sidings

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For continuation see Draw: C122-OVE-L-DDA-CR148_S0013_1-37152

- Safety, Health and Environmental Information:**
- Notes below are additional to hazards and risks already associated with this type of work:
 - Latest information on Thames Water assets should be sought before excavations are commenced.
 - Any intrusion below ground level human health and ground contamination (PSRE-RR-004) - some hydrocarbons have been located on site. Additionally carbon dioxide is evolved from the Alliumium layer which may affect the ground. Further investigations (PSRE-RR-005 and PSRE-RR-006).
 - UXO discovery may occur, refer to site Environmental Risk Assessment (PSRE-RR-007) and PSRE-RR-008.
 - Consult site utilities plan (PSRE-RR-009) and PSRE-RR-010. All services should be identified and marked out. Endo cat and penny surveys as required (PSRE-RR-021).
- Operations:**
- N/A
 - Site Maintenance
 - Site Access
 - Site Security
 - Site Safety
 - Site Hygiene
 - Site Welfare
 - Site Health
 - Site Environment
 - Site Quality
 - Site Compliance
 - Site Reporting
 - Site Communication
 - Site Coordination
 - Site Collaboration
 - Site Partnership
 - Site Integration
 - Site Alignment
 - Site Consistency
 - Site Coherence
 - Site Unity
 - Site Wholeness
 - Site Simplicity
 - Site Clarity
 - Site Transparency
 - Site Accountability
 - Site Responsibility
 - Site Reliability
 - Site Integrity
 - Site Trustworthiness
 - Site Credibility
 - Site Reputability
 - Site Respectability
 - Site Dignity
 - Site Honorability
 - Site Nobility
 - Site Royalty
 - Site Aristocracy
 - Site Nobility
 - Site Royalty
 - Site Aristocracy
- Design and Construction:**
- See Designers CDM Risk Register Ref: Doc: No: C122-OVE-L-RG-CR148-50006 for full details, risks and mitigation details for C122
 - These notes are based on experienced and competent contractors carrying out the work using an approved safe method of working.

Legend

Seeding	Planting	50mm Gravel finish	Compacted Type 1	Site boundary	Automated watering system - controlled by moisture sensors	Water storage tank with temporary connection to water source (Tap on access platform)
[Green box]	[Tree icon]	[Brown box]	[Orange box]	[Red line]	[Blue dashed line]	[Red dashed line]

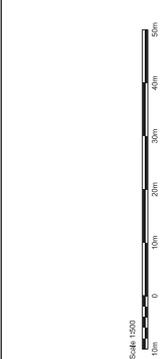
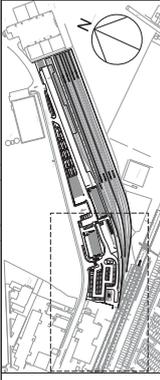
Notes

- This drawing is to be read in conjunction with other specification C122-OVE-L-RG-CR148-50010.

Rev.	Date	Description	By	Check	Appr	Auth
001	07/02/2017	Issued as R4 for construction	CM	PR	SA	AS
002			CM	PR	SA	AS
003			CM	PR	SA	AS
004			CM	PR	SA	AS
005			CM	PR	SA	AS
006			CM	PR	SA	AS
007			CM	PR	SA	AS
008			CM	PR	SA	AS
009			CM	PR	SA	AS
010			CM	PR	SA	AS

Company Logo: Crossrail

Client: Bored Tunnels (Alignment and Track)
Contractor: Crossrail App & Partners Limited
Project: Plumstead Slidings
Task: Soft Landscaping Retaining Wall Screening
Location: Canary Wharf
Drawn: J. STAMP
Scale: 1:500 @ A1
Drawings and CAD File No.: C122-OVE-L-DDA-CR148_S0013_1-37151
Rev.: C01
Sheet: A



Scale: 1:500
Plan
 Scale: 1:500

5.3.6 Pudding Mill Lane and Ham & Wick



Fig 6. Pudding Mill Lane tree planting

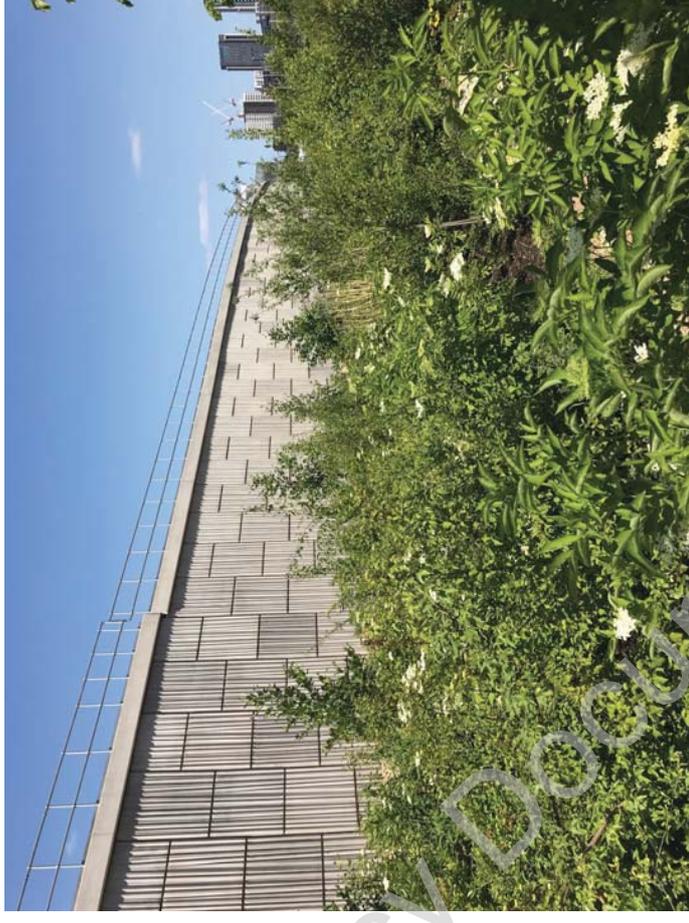


Fig 7. Pudding Mill Lane planting

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Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:
 C1
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Quantification/Classification (E-values)
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Notes
 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

Notes
 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

Notes
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 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

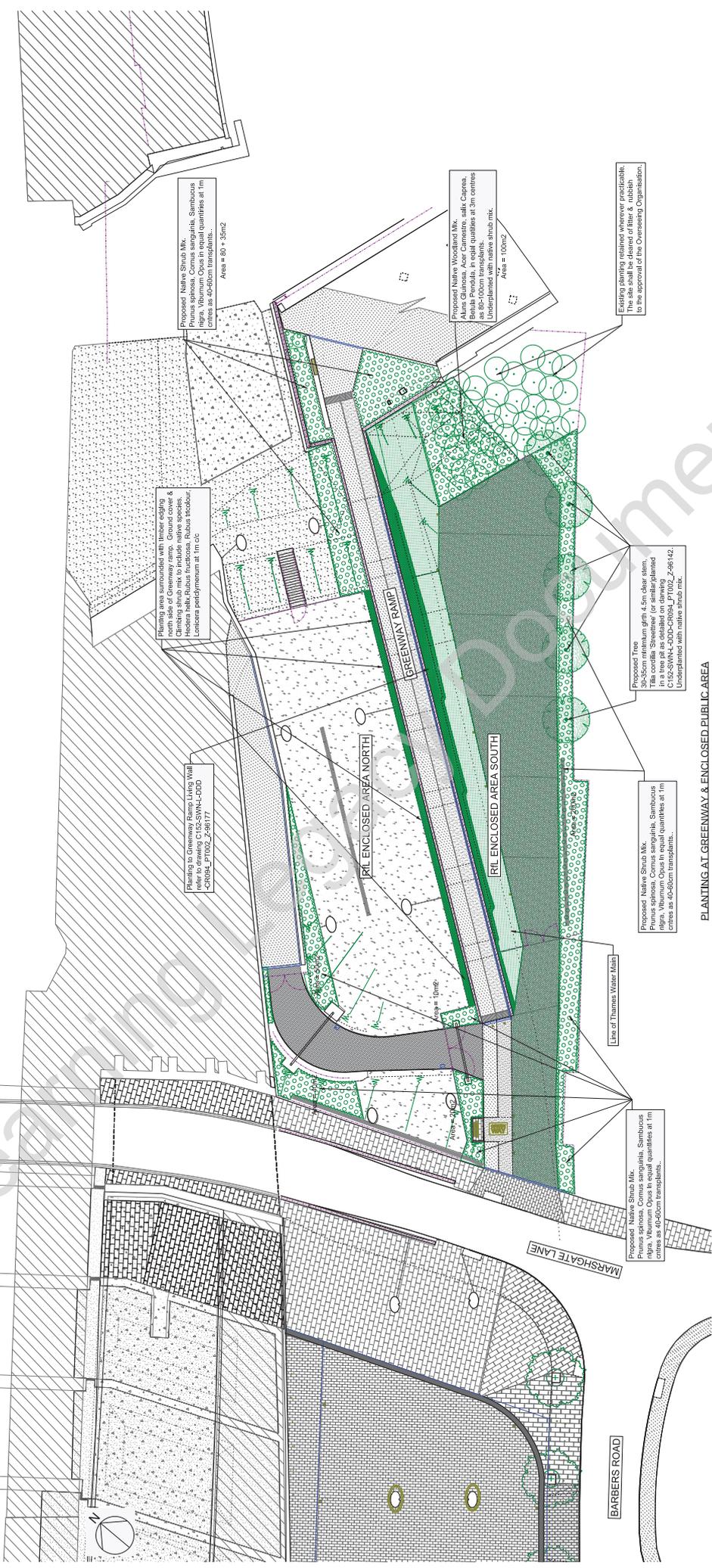
Notes
 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

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 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

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 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170



PLANTING AT GREENWAY & ENCLOSED PUBLIC AREA

Notes
 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

Notes
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 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

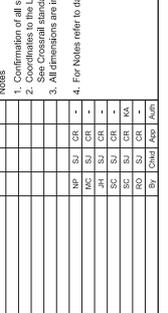
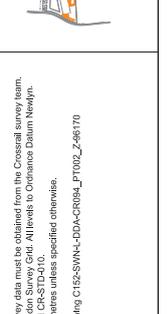
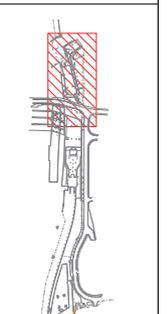
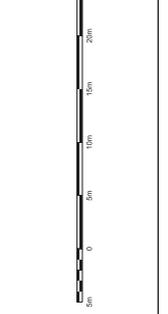
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 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

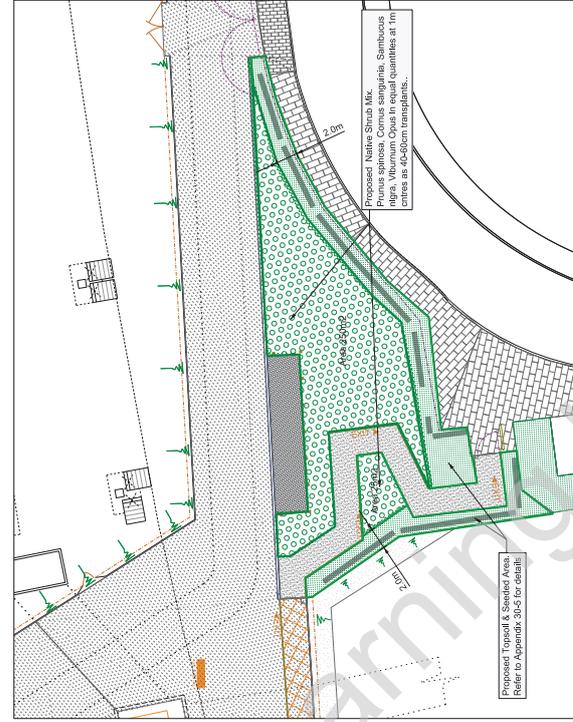
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 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

Notes
 1. All dimensions are in metres unless specified otherwise.
 2. Coordinates of all survey data must be taken from the Crossrail survey team.
 3. See Crossrail standard CR-ST-010.
 4. For Notes refer to drawing C152-SWNL-DDAC-R084_PT1002_Z-96170

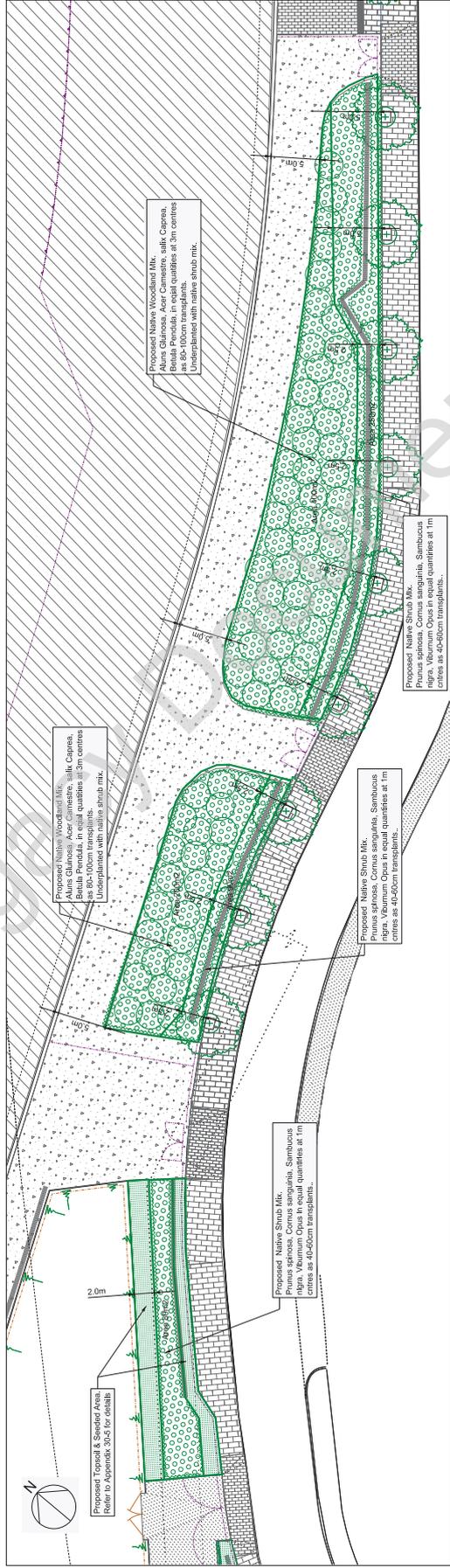
Crossrail
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 UK
 Tel: +44 (0)20 7493 4100
 www.crossrail.co.uk

Wilson Limited
 Pudding Mill Lane Portal
 Pudding Mill Lane Portal
 Trees & Planting
 Greenway Ramp
 CC350
 Date: 12/05/2016
 Drawing and CAD No: C152-SWNL-DDAC-R084_PT1002_Z-96171
 Rev: P05
 Status: S4





PLANTING SOUTH OF THE EIP



PLANTING AT DLR MAINTENANCE AREA BETWEEN EIP & DLR STATION

Safety, Health and Environmental Information
 Notes below are additional to hazards/risks normally associated with this type of work:
 CH: Contaminated
 CR: Cranes
 CL: Cables
 CO: Cables
 OH: Overhead
 OH: Overhead
 MA: Materials
 MI: Manpower
 MH: Mechanical
 DI: Dismantling/Commissioning (Etc.)

Ground Preparation in Planned Areas
 1. Topsoil to be provided to the depth of 150mm.
 2. Topsoil shall be and lightly compacted to the approval of the Overseering Organisation.

Proposed Native Shrub Mix & Native Woodland Mix Planting
 1. Notch plant into growing medium.
 2. Water trees at intervals of 10 days for the first 3 months.
 3. Install spiral rabbit guard around each plant.

Proposed Grass Seeded Areas
 1. Refer to Appendix 30-5 for details.

Maintenance of Native Shrub Mix & Native Woodland Mix
 1. Maintain beds as weed free with a 50mm depth bark mulch.
 2. Water trees at intervals of 10 days for the first 3 months.
 3. Install spiral rabbit guard around each plant.

Maintenance of Tree Planting
 1. Maintain tree pits as weed free with a 80mm depth bark mulch.
 2. Water trees as required in Appendix 30-5

Refer also to Appendix 30-4 to 30-9 of the Urban Drain Specifications
 C152-SWNL-DDA-CR084_FT002-2-06170 for details of planning and maintenance.

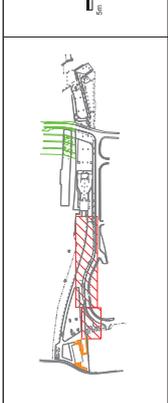
Notes
 1. Confirmation of all survey data must be obtained from the Crossrail survey team.
 2. Coordinates to the London Survey Grid. All levels to Ordnance Datum Newlyn.
 3. All dimensions are in metres unless specified otherwise.

Rev.	Date	By	Check	Appr.	Description
P01	20/04/2016	NP	SJ	CR	
P02	22/05/2016	MC	SJ	CR	
P03	21/05/2016	MA	SJ	CR	EP areas marked to indicate drainage limits
P04	19/05/2016	CR	SJ	CR	EP areas marked to indicate drainage limits
P05	19/05/2016	RO	SJ	CR	EP marked in blue with cross-hatch shading

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 Pudding Mill Lane Portal
 Trees & Planting
 Green Link
 CC350

Drawn and CAD by: M. N.
 Scale: 1:250 @ A1
 C152-SWNL-DDA-CR084_FT002-2-06170
 Rev: P05
 Status: S4



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Rev.	Date	By	Check	Appr.	Description
P01	20/04/2016	NP	SJ	CR	
P02	22/05/2016	MC	SJ	CR	
P03	21/05/2016	MA	SJ	CR	EP areas marked to indicate drainage limits
P04	19/05/2016	CR	SJ	CR	EP areas marked to indicate drainage limits
P05	19/05/2016	RO	SJ	CR	EP marked in blue with cross-hatch shading

5.3.7 Westbourne Park and Royal Oak Portal



Fig 8. Royal Oak Portal planting

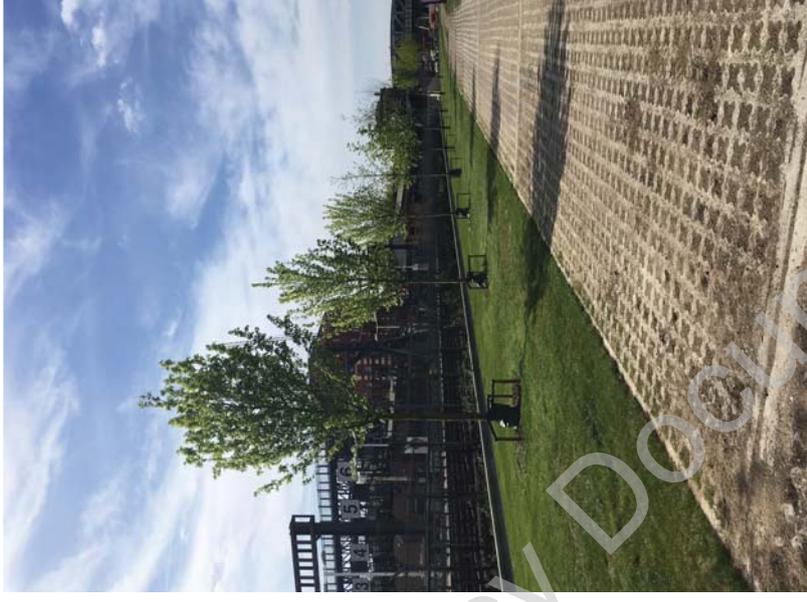


Fig 9. Royal Oak Portal planting

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5.3.8 Whitechapel Station



Fig 10. Whitechapel Station artist impression

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White Chapel - GSM, Station, bridge, CHS, DSS
 FCHS not on this plan



Notes

Rev	Date	By	Desc
PO1	22/07/23	AM	Issued for review
		DM	
		AP	
		DB	

Scale 1:250

0 5m 10m 15m 20m 25m

LEGEND:

- Green roof - Sedum mat roof
- Pre-grown Nature Mat® - 50% plant cover on delivery
- Green roof - Extensive bio-diverse roof
- Mosaic of bare and vegetated areas
- Sedum plug/crushed brick and wild flowers.

Contract: Whitechapel Station Design
Client: BBWV
Location: Whitechapel Stn District Line Link Works
Station Bridge/HCL/GSM/DSS/CHS
Level C - Upper Roof
Landscaping Plan - Station Bridge/GSM/CHS
CC512
Project No: C140-SBM-A-DDA-0061_W5106_C-LAN12
Date: 1:250 @ A1
Rev: PO1

Contractor: Crossrail
Contract No: E14 KQ
Contract Name: GSM/CHS
Contract Description: Whitechapel Station
Contract Location: Whitechapel Station
Contract Reference: C140-SBM-A-DDA-0061_W5106_C-LAN12
Contract Date: 1:250 @ A1
Contract Status: PO1

5.3.9 Limmo Peninsula Shaft



Fig 11. Limmo Peninsula Shaft mound turf



Fig 12. Limmo Peninsula Shaft mound turf and gabion handrail

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5.3.10 Ilford Yard

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- Notes:**
1. Areas identified as hardstanding are a combination of concrete slabs and bituminous surfacing
 2. Parking bays are all 2.4m wide x 4.8m long.
 3. Shrubs: Cornus alba 'Spaechhij' 3litre pot size, Cytisus praecox 3litre pot size, Lonicera pileata 3litre pot size, Potentilla 'Elzabeth' 3litre pot size. Shrubs to be planted at a density of 4 plants/sq m
 4. Shrub Planting - Planting should be undertaken within the planting season of late October to late March. Plants to be planted in pits 150mm wide x 150mm deep and backfilled with 80% topsoil and 20% compost. Planting areas to be mulched after planting with Melcourt Industries coarse grade bark chip mulch (15-100mm) to a depth of 75mm and radius of 0.5m around the base of each plant.
 5. Layout has been developed in plan only. No detailed consideration of surface levels has been given at this stage.
 6. Lighting layout is approximate only, position and specification of columns is subject to confirmation at detailed design stage.
 7. Works outside of red line are for information only

- Key:**
- Red Line Indicating TCPA
 - Application Site Boundary
 - Limit of Deviation
 - Limit of Land to be Acquired or Used
 - Retaining Wall
 - Buildings and Structures to be Demolished or Removed
 - Vehicle Barrier
 - Pedestrian Walking Route
 - Vehicle Restraint Bollard
 - Hardstanding
 - Existing Shrubs
 - Proposed Shrubs
 - Proposed Galvanized Steel Lighting Column, 10m high, with Urbis Road Lantern Luminaire

NOT FOR APPROVAL
Bollard and lighting works in this area are covered under a separately submitted Schedule 7 application. Previous schedule 7 (ref. 1495/12) covers the approved parking layout.

GAF training centre to be removed, to be replaced with hardstanding

Existing hedge to be retained

As replacement for trees removed from within the yard, 6 No. sycamore trees planted at 12/14cm girth size. Location to be agreed on site to avoid planting too close to existing trees

Existing shrubs to be retained as screening to site

CCTV coverage of pedestrian gate to be provided, camera to be gate or lighting column mounted, to be confirmed at detailed design stage

Area to be kept clear

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Rev.	Date	Description	By	Chkd	App	Auth
P05	23.07.13	Cross reference to schedule 7 added	CH	AR	RJS	
P04	15.07.13	TCPA Amended	RD	AR	RJS	
P03	13/06/13	Street lighting added	CH	AR	RJS	
P02	11/06/13	Minor amendments to notes.	JW	AR	RJS	
P01	31/05/13	For Information.	CH	AR	RJS	

Scale :	1:500 @ A3
Dwg No. :	C161-MMD-T-DDA-CR112-SD007-1-40102
Rev. :	P05
Suit. :	S0
Auth :	
App. :	R.J. Smith
Chk. :	A. Richardson
By :	C. Harding
Title : Town and Country Planning Act - (TCPA) Application (RED/1/18)	
Replacement GAF Training Centre and Car Parking	
Proposed Works, Sheet 1 of 2	
Location : Ilford Yard	
Originalator : Mott MacDonald Limited	
Contract : C161 Ilford Yard Stabling Project	

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5.3.11 Woolwich Station

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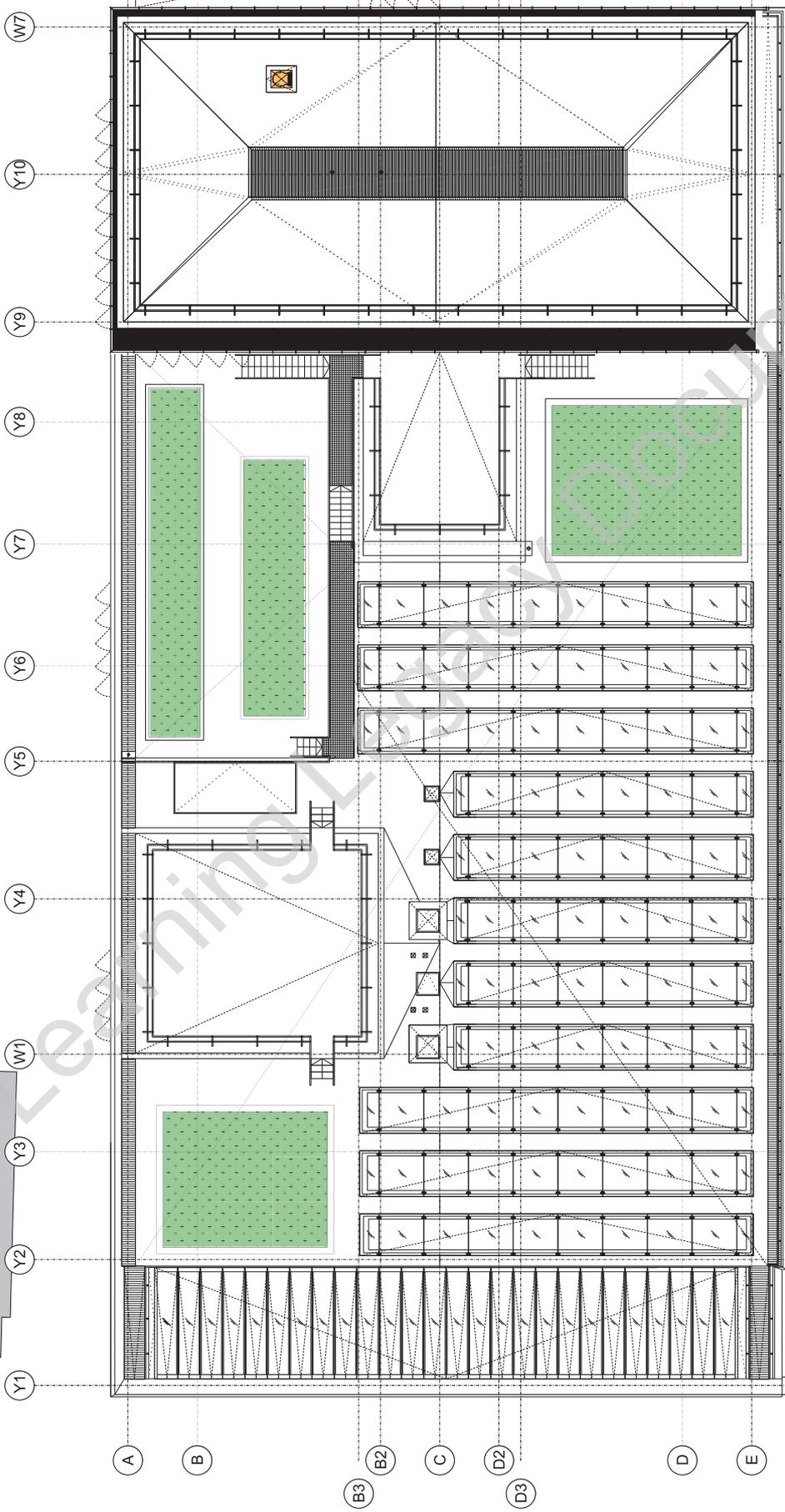
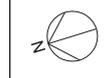
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Safety, Health and Environmental Information
 No significant risk which requires to be communicated to a competent contractor has been identified in relation to this drawing. These notes are based on the use of experienced and competent contractors carrying out the work using an approved safe method of working.

Officer's Square

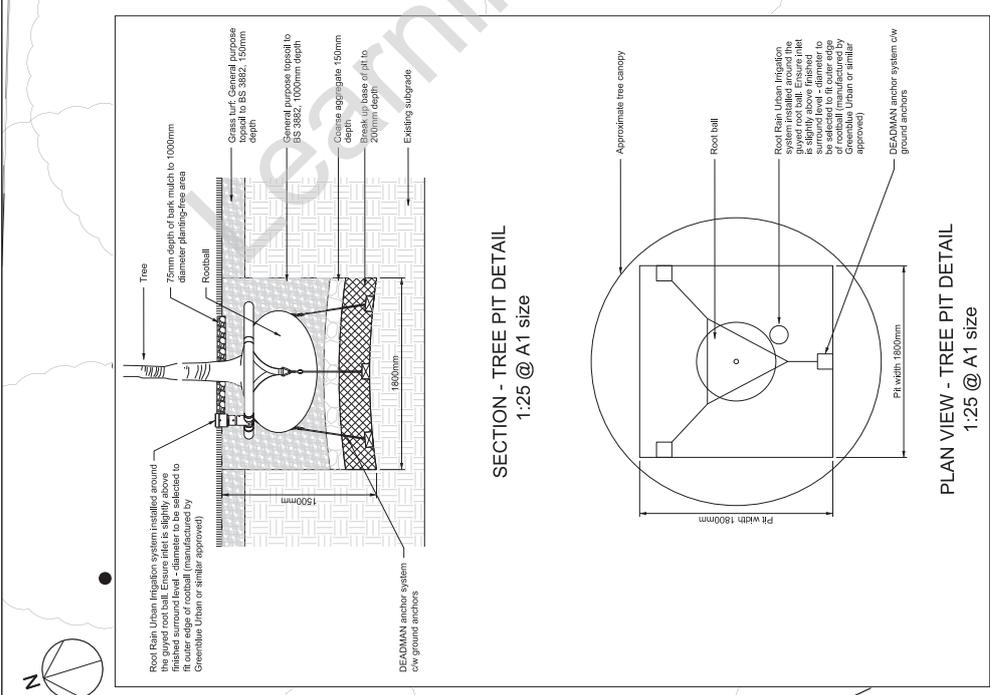
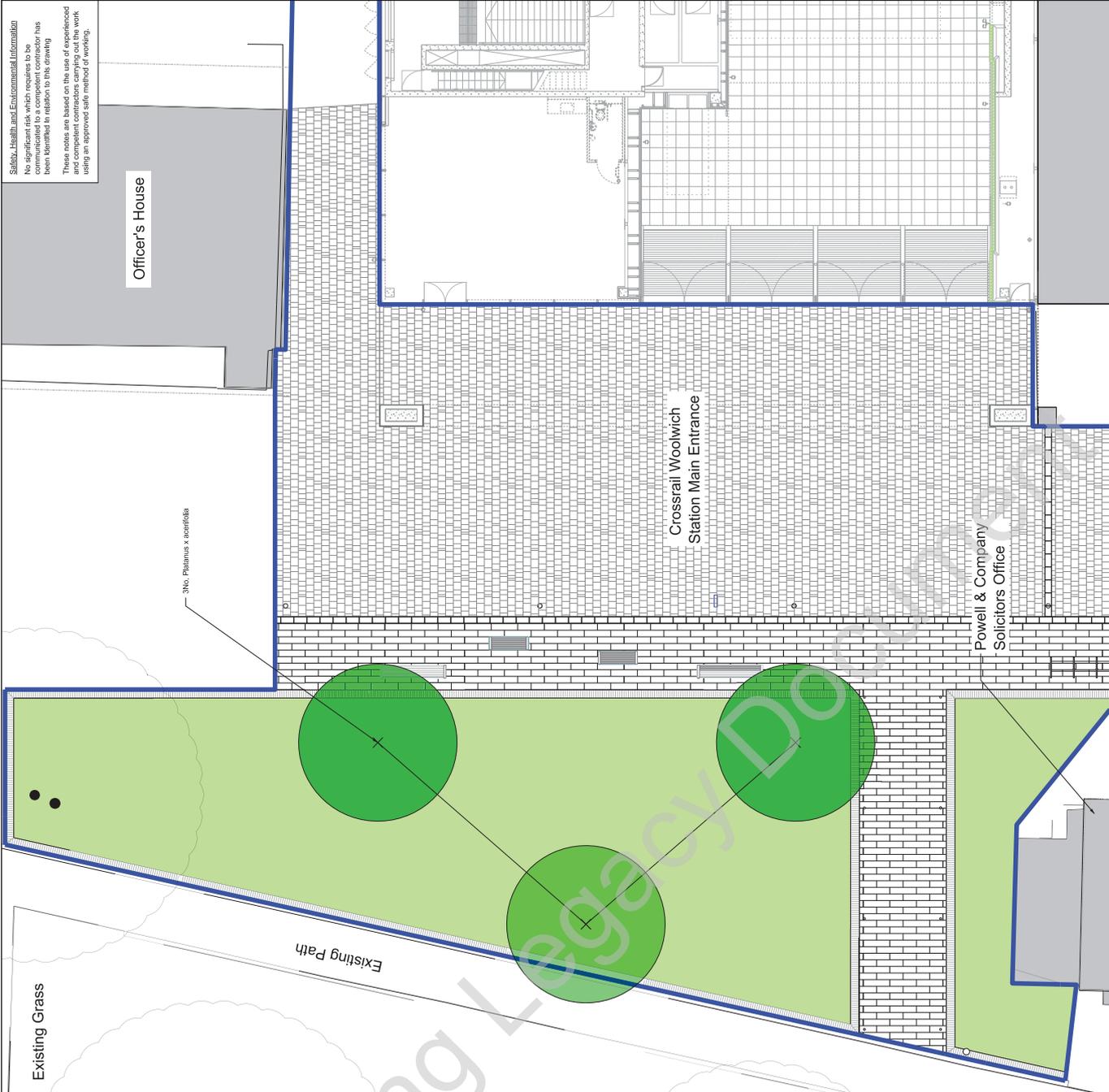
Officer's House



<p>Contract: Woodlith Box and Portal Fit Out Client: Our Beauty Group Limited Location: Woodlith Sin Worksite</p>		<p>Contract No: C50J-BBR-A-DDE-CR147_WS163_D-03200 Rev: CO2</p>	
<p>By: R. BRETHERIDGE App: LWYDRELL App: BJKEENAN</p>		<p>Drawn and CDD No: 1:100@A1 Scale: 1:100@A1</p>	
<p>Project: Woodlith Box and Portal Fit Out Drawing No: CR147_WS163_D-03200</p>		<p>Project: Woodlith Box and Portal Fit Out Drawing No: CR147_WS163_D-03200</p>	
<p>Project: Woodlith Box and Portal Fit Out Drawing No: CR147_WS163_D-03200</p>		<p>Project: Woodlith Box and Portal Fit Out Drawing No: CR147_WS163_D-03200</p>	

<p>Legend - Space Usage</p> <ul style="list-style-type: none"> Units of Development (UD) Public Area (PA) Over Site Development Vertical circulation Roof Parking (RP) Green Space Usage Public Area (PA) Over Site Development 	<p>Scale: 1:100@A1</p>
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<p>Key Plan</p>	<p>Notes</p> <table border="1"> <tr> <th>Rev</th> <th>Date</th> <th>Description</th> </tr> <tr> <td>01</td> <td>24/02/2016</td> <td>Final Issue</td> </tr> <tr> <td>02</td> <td>02/10/2016</td> <td>Revised for RDR</td> </tr> <tr> <td>03</td> <td>20/01/2016</td> <td>Issue 3 Issue</td> </tr> <tr> <td>04</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>05</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>06</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>07</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>08</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>09</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>10</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>11</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> <tr> <td>12</td> <td>01/11/2016</td> <td>Revised for Construction</td> </tr> 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PLANTING SCHEDULES

Number	Species	Specification	Height	Girth	Density
3 No.	<i>Platanus x acerifolia</i>	RB Semi-Mature	500-600 cm	20-25cm	1/spot

Name	Area
Rozawn Mowalton Turf, or similar approved	482.2 m ²

Notes

- Do not scale from this drawing.
- Check all dimensions and levels against the site plan and other drawings.
- To be read in conjunction with Site Landscape Specification.
- Tree positions are to be confirmed pending underground utilities information.
- For planting details refer to drawing CS30-BBR-L-DDA-CR147_WS163_Z-26001.

Rev.	Date	Description	By	Check	Appr.	Auth.
001	13/06/2017	Issue for 2D/3D/05	RS	EA	IT	-
002	13/06/2017	Revisions 026, 028, 029, 030	RS	EA	IT	-
003	13/06/2017	Revised for Gate 3	RS	EA	IT	-

Safety, Health and Environmental Information

No significant risks which require to be communicated to a competent contractor has been identified in relation to this drawing. These risks are based on the use of specialist and competent contractors carrying out the work using an approved safe method of working.

Officer's House

Crossrail Woolwich Station Main Entrance

Powell & Company Solicitors Office

Existing Grass

Existing Path

3 No. Platanus x acerifolia

Legend

- Existing tree to be retained
- Proposed specimen tree
- Proposed grass turf area
- Proposed paving
- Urban Realm boundary

Scale: 1:100 @ A1

Contract: Woolwich Box and Portal Fit Out

Client: Woolwich Beauty Group Limited

Contractor: Woolwich Sin Worksite

Project: Woolwich CE30 WPIB Woolwich Station Urban Realm Landscape Layout Plan

Drawn and checked by: R. SMITH, E. ALLEN, E. WOODS, E. WOODS

Scale: 1:100 @ A1

Sheet: P03

Status: S4

Project No: CS30-BBR-L-DDA-CR147_WS163_Z-26001

5.3.12 Custom House and Victoria Dock



Fig 13. Custom House and Victoria Dock wildflower meadow

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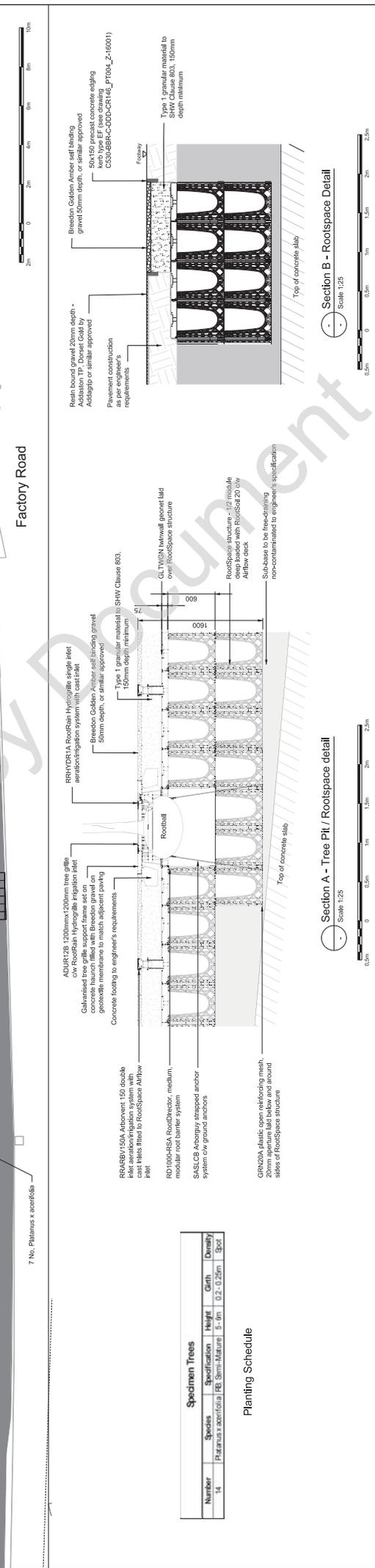
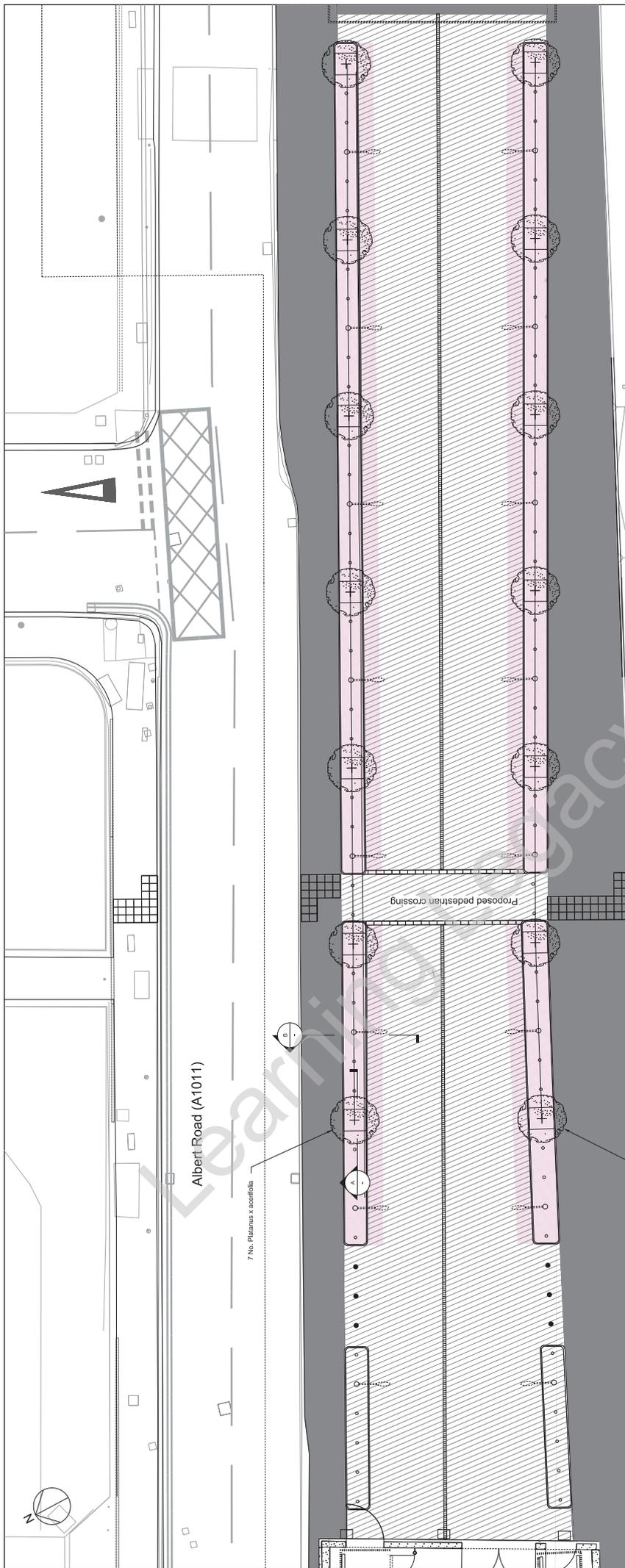
5.3.13 North Woolwich Portal

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Specimen Number	Species	Specification	Height	Girth	Density
14	<i>Platanus x acerifolia</i> (RE)	Semi-Mature	5-6m	0.2-0.25m	Spot

Planting Schedule

Rev	Date	By	Check	Appr	Auth
P01	23/02/2017	Revised for 200000			
P02	22/02/2017	Revised to CIL Comments			

Notes

- Do not scale from this drawing.
- All dimensions are in millimetres unless noted otherwise.
- All co-ordinates are to the London Survey Grid and levels are to the London High Datum, which is 100 metres below the mean sea level at Newlyn.
- Refer to the relevant British Standards for materials and workmanship.
- This drawing is to be read in conjunction with details drawing CS0-BBRC-DDC-CR146_P1004_Z-16001 & CS0-BBRC-SSC-CR146_P1004-50001

Key

- Rein bound gravel - Addition TP - Dorset Gold by Adalgrip or similar approved
- Breaston Golden Amber self-birthing gravel, or similar approved
- RootSpace structures - 1 or 2 module deep (refer to tree pit detail)
- Foamway Construction

Section A - Tree Pit / RootSpace detail
Scale 1:25

Section B - RootSpace Detail
Scale 1:25

Notes

- RootSpace structures - 12 module deep loaded with RootSpace 20 c/w Adalgrip 800
- Sub-base to be free-draining non-contaminated to engineer's specification
- GLTWSN bitwall gravel laid over RootSpace structure
- RootSpace structure = 12 module deep loaded with RootSpace 20 c/w Adalgrip 800
- Type 1 granular material to SHW Clause 803, 150mm depth minimum
- 50mm depth, or similar approved, Breaston Golden Amber self-birthing gravel
- RRHYDR-A RootRain hydrophobic single inlet air/irrigation system with cast inlet
- ADUR12B 1200mm x 1200mm tree grille c/w RootRain Hydrophobic Filtration Inlet
- Calculate tree pit area and concrete base area on concrete base and on tree grille with 50mm depth, or similar approved, geotextile membrane to match adjacent paving
- Concrete footing to engineer's requirements
- RRARB/ISA Abovevent 150, double inlet fitted to RootSpace Allow inlet
- RD100-RSA RootDirector, medium, modular root barrier system
- SASLCB Absorby strapped anchor system c/w ground anchors
- GRN20A plastic open reinforcing mesh, 100mm deep, laid over the ground sides of RootSpace structure

Key

- 140mm Dia Furnibases Smith "Banner" Ballard (Skin polished stainless steel with bright polished bands - demountable unit)
- 140mm Dia Furnibases Smith "Banner" Ballard (Skin polished stainless steel with bright polished bands - fixed unit)
- Proposed specimen tree
- Limits of Deviation (LOD)

Section B - RootSpace Detail
Scale 1:25

Notes

- Rein bound gravel - Addition TP - Dorset Gold by Adalgrip or similar approved
- Breaston Golden Amber self-birthing gravel, or similar approved
- RootSpace structures - 1 or 2 module deep (refer to tree pit detail)
- Foamway Construction

Section B - RootSpace Detail
Scale 1:25

Notes

- Rein bound gravel - Addition TP - Dorset Gold by Adalgrip or similar approved
- Breaston Golden Amber self-birthing gravel, or similar approved
- RootSpace structures - 1 or 2 module deep (refer to tree pit detail)
- Foamway Construction



5.3.14 Stepney Green Shaft

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