

LAND AT THE FORMER TOLLGATE HOTEL
WATLING STREET, GRAVESEND

FLOOD RISK AND DRAINAGE ASSESSMENT

Final Report v1.2
September 2024

Report Title **Land at the former Tollgate Hotel, Watling Street, Gravesend**
Flood Risk and Drainage Assessment
Final Report v1.2

Client BP International Ltd

Date of issue 9 September 2024

Prepared by Kevin Tilford BSc MSc PhD MBA CEnv CWEM FCIWEM *Managing Director*
Tim Brook BSc (Hons) *Technical Director*

Checked & approved by Keely Bonser BSc (Hons) MSc PhD MCIWEM *Director*

This document has been prepared solely as a Flood Risk Assessment for BP International Ltd on behalf of BP Pulse. This report is confidential to BP International Ltd and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by BP International Ltd for the purposes for which it was originally commissioned and prepared.

Contents

Signature Sheet	i
Contents	ii
List of Tables, Figures & Appendices	iii
List of Abbreviations	iv
1 Introduction	4
1.1 Purpose of Report	4
1.2 Structure of the Report	4
1.3 Relevant Documents and Planning Policy	4
1.4 Consultation	5
1.5 Third Party Surveys, Drawings and Assessments	5
1.6 Explanatory Note on Flood Probability	5
2 Site Details and Proposed Development	7
2.1 Site Location	7
2.2 Existing and Proposed Development	7
2.3 Surface Waterbodies in the Vicinity of the Site	8
2.4 Topographic Levels	8
2.5 Ground Conditions	9
3 Planning Policy and Guidance	10
3.1 National Planning Policy and Policy Guidance	10
3.2 Local Planning Policy and Technical Guidance	11
4 Review of Flood Risk	14
4.1 Historical Records of Flooding	14
4.2 Flood Risk from Rivers (Fluvial)	14
4.3 Flood Risk from Small Watercourses and Surface Water (Pluvial)	15
4.4 Flood Risk from Groundwater	16
4.5 Flood Risk from Reservoirs, Canals and Other Water Impounding Structures	16
4.6 Requirement for Sequential Testing	16
4.7 Flood Risk Mitigation Measures	17
5 Surface Water Management	18
5.1 Existing Assets	18
5.2 Surface Water Drainage at the Existing Site	18
5.3 Surface Water Drainage at the Redeveloped Site	18
6 Summary and Recommendations	23

List of Tables

Table 1: Site Summary of Flood Risk from All Sources	17
Table 2: Maintenance Requirements	20

List of Figures

Figure 1: Site Location	7
Figure 2: Aerial Photographs of Site	7
Figure 3: Digital Terrain Model from LiDAR Data	8
Figure 4: Flood Map for Planning	14
Figure 5: Flood Risk from Surface Water	15
Figure 6: JBA Groundwater Flood Risk Indicator Map	16

List of Appendices

Appendix A: Site Location plan, Existing Site Plan, and Proposed Site Plan and Elevations	
Appendix B: Topographic Survey	
Appendix C: Infiltration Testing	
Appendix E: Public Sewer Records	
Appendix F: Drainage Survey	
Appendix G: Surface Water Attenuation – Storage Volume Calculations	
Appendix H: Preliminary Surface Water Drainage Layout	

List of Abbreviations

AEP	Annual Exceedance Probability	FWMA	Flood and Water Management Act
AOD	Above Ordnance Datum	FWS	Flood Warning System
ASGWF	Areas Susceptible to Groundwater Flooding	GSPZ	Groundwater Source Protection Zone
bgl	Below Ground Level	ha	Hectare
BGS	British Geological Survey	IDB	Internal Drainage Board
BRE	Building Research Establishment	km	Kilometres
BSI	British Standards Institute	LFRMS	Local Flood Risk Management Strategy
CC	Climate Change	LiDAR	Light Detection and Ranging
CCMA	Coastal Change Management Area	LLFA	Lead Local Flood Authority
CDA	Critical Drainage Area	LPA	Local Planning Authority
CFMP	Catchment Flood Management Plan	m	Metres
CIRIA	Construction Industry Research and Information Association	NFM	Natural Flood Management
CRT	Canal and River Trust	NGR	National Grid Reference
DEFRA	Department for Environment, Food and Rural Affairs	NPPF	National Planning Policy Framework
EA	Environment Agency	NVZ	Nitrate Vulnerable Zone
FCERM	Flood and Coastal Erosion Risk Management	OS	Ordnance Survey
FFL	Finished Floor Level	PFRA	Preliminary Flood Risk Assessment
FMP	Flood Management Plan	PPG	Planning Practice Guidance
FRA	Flood Risk Assessment	RBD	River Basin District
FRDA	Flood Risk and Drainage Assessment	RBMP	River Basin Management Plan
FRDSA	Flood Risk, Drainage and Sequential Assessment	RFI	Request for Information (to the EA)
FRMP	Flood Risk Management Plan	RMA	Risk Management Authority
FRSA	Flood Risk and Sequential Assessment	RoFSW	Risk of Flooding from Surface Water
FRSSA	Flood Risk Sequential Site Assessment	SFRA	Strategic Flood Risk Assessment
FWA	Flood Warning Area	SMP	Shoreline Management Plan
FWEP	Flood Warning and Evacuation Plan	SoP	Standard of Protection
		SSSI	Site of Special Scientific Interest
		SuDS	Sustainable Drainage System
		SWMP	Surface Water Management Plan
		WFD	Water Framework Directive

1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by BP International Ltd on behalf of BP Pulse to prepare a Flood Risk and Drainage Assessment (FRDA) report to accompany a full planning application for the proposed redevelopment of land at the former Tollgate Hotel, Watling Street, Gravesend ("the site") for use as a fuel filling station (FFS) and EV charging hub.

The assessment has been undertaken in accordance with the requirements of the NPPF and the PPG.

1.2 Structure of the Report

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Background information
- Section 3** National and local flood risk and drainage planning policy
- Section 4** Potential sources of flooding and mitigation measures
- Section 5** Presents an illustrative surface water drainage scheme
- Section 6** Summary of key findings and recommendations

1.3 Relevant Documents and Planning Policy

The assessment has been informed by the following documents:

- CIRIA SuDS Manual (C753), December 2015;
- Non-Statutory Technical Standards for Sustainable Drainage, DEFRA, March 2015;
- NPPF, Updated 20 December 2023, <https://www.gov.uk/government/publications/national-planning-policy-framework--2>;
- PPG Section 7 - Flood Risk and Coastal Change, updated on 25 August 2022, <https://www.gov.uk/guidance/flood-risk-and-coastal-change>;
- Preparing a Flood Risk Assessment – Standing Advice, EA, Updated 23 August 2024, <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>;
- Flood Risk Assessments - Climate Change Allowances, EA, Updated 27 May 2023, <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.
- Local Flood Risk Management Strategy Document, Kent County Council, December 2019;
- Kent Minerals and Waste Local Plan – Strategic Flood Risk Assessment, Kent County Council, June 2013
- Local Flood Risk Management Strategy, Kent County Council, June 2013;
- Strategic Flood Risk Assessment of Kent Thameside, Kent Thameside Delivery Board, December 2005
- Updating the Strategic Flood Risk Assessment, Kent Thameside Delivery Board, December 2009;
- Flood Risk to Communities – Gravesham, Kent County Council, September 2017;
- Phase 1 Environmental Desk Study Report (Preliminary Risk Assessment), Former Tollgate Hotel, Watling Street, Gravesend, Subadra Consulting Ltd, July 2022;
- Geo-Environmental Investigation Report, Former Tollgate Hotel, Watling Street, Gravesend, Subadra Consulting Ltd, September 2012;
- Infiltration Test Report – Tollgate, Gravesend, Report ref: BP12954 CL 007, December 2022;
- A Guide for Master Planning Sustainable Drainage into Developments, Prepared by the Lead Local Flood Authorities of the South East of England, AECOM, Undated;
- The Kent Design Guide Making it Happen – Sustainability (Drainage Systems), Kent County Council, Undated.

1.4 Consultation

The assessment has been informed by the following consultations:

- Environment Agency: Chargeable pre-application service ref: ENVPAC/1/KSL/00582. Meeting with an officer of the Ground Water & Contaminated Land held on 18 October 2023.
- Kent County Council (lead local flood authority): Chargeable pre-application service ref: NON/2022/091856. Written response received from Flood and Water Management team on 3 October 2022.

1.5 Third Party Surveys, Drawings and Assessments

The assessment has been informed by the following third party surveys, drawings and assessments

- Drainage Survey, Dene-Tech Services. Survey undertaken on 25 November 2022 (refer **Appendix F** of this report);
- Infiltration Testing, Subadra Consulting Ltd. Testing undertaken on 29-30 November 2022 (refer **Appendix D** of this report);
- Infiltration Testing, Subadra Consulting Ltd. Testing undertaken on 15 August 2012 (refer **Appendix C** of this report);
- Infiltration Test Report, Subadra Consulting Ltd, Report ref: BP12954 CL 007, December 2022 (refer **Appendix C** of this report);
- Topographical Survey, Malcolm Hughes Land Surveyors. Survey undertaken in March 2013. (refer **Appendix B** of this report);
- Site Location Plan, BP Pulse, Drg. ref: 14170-LOC Rev E, 10 May 2024 (refer **Appendix A** of this report);
- Existing Site Layout, BP Pulse, Drg. ref: 14170-20-1 Rev D, 10 May 2024 (refer **Appendix A** of this report);
- Proposed Site Layout, BP Pulse, Drg. ref: 14170-22 Rev F, 6 September 2024 (refer **Appendix A** of this report);
- Existing Site Elevations, BP Pulse, Drg. ref: 14170-23 Rev F, 6 September 2024 (refer **Appendix A** of this report).

1.6 Explanatory Note on Flood Probability

This report refers to the likelihood of a flood event occurring in terms of an annual exceedance probability (AEP) expressed as a percentage. This terminology is consistent with the definition of flood zones presented in Table 1 of the PPG (refer to **Section 4.3** of this report).

The AEP is the reciprocal of the return period which describes the rarity of an event in terms of its statistical reoccurrence interval in years.

For example, a '1 in 30 year flood' has a $1/30 = 0.033$ (3.3%) probability of occurring or being exceeded in any one year, whilst a '1 in 100 year flood' has a $1/100 = 0.01$ (1.0%) probability of occurring or being exceeded in any one year.

Annual Exceedance Probability	Annual Exceedance Probability (expressed as a %)	Return Period (years)	Alternative Expression
1.000	100.0%	1	1 in 1
0.500	50.0%	2	1 in 2
0.435	43.5%	2.3	1 in 2.3 (QBAR)
0.100	10.0%	10	1 in 10
0.050	5.0%	20	1 in 20
0.033	3.3%	30	1 in 30
0.020	2.0%	50	1 in 50
0.010	1.0%	100	1 in 100
0.005	0.5%	200	1 in 200
0.001	0.1%	1,000	1 in 1000

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The site is located at the former Tollgate Hotel, to the north of the A2 Watling Street and to the east of the A227 Wrotham Road and south of Wrotham Road, at Ordnance Survey National Grid Reference TQ 642 712, as shown in **Figure 1**. The area of the application site (red-line on **Figure 1**) is approximately 1.22 ha.

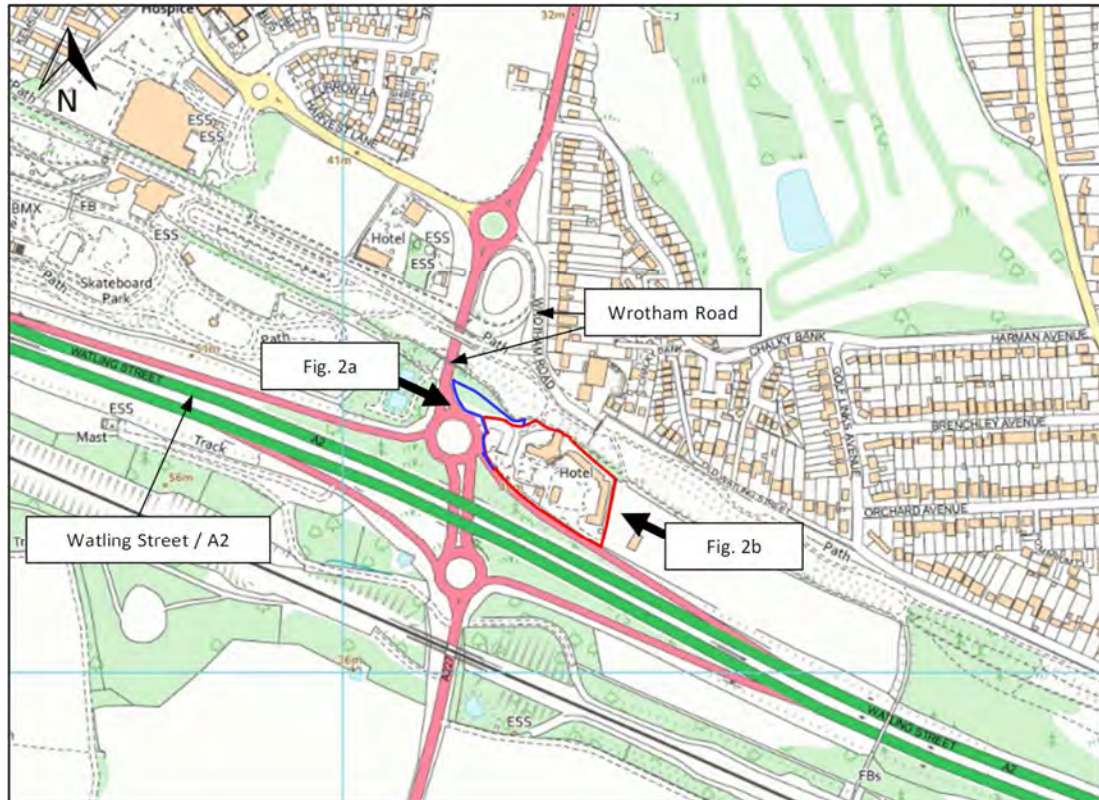


Figure 1: Site Location

2.2 Existing and Proposed Development

The site currently comprises three large buildings and two small buildings (all derelict), hardstanding surfaces and areas of scrubland, grassland and trees as shown on the drone footage taken on 18 May 2022 (**Figure 2**).

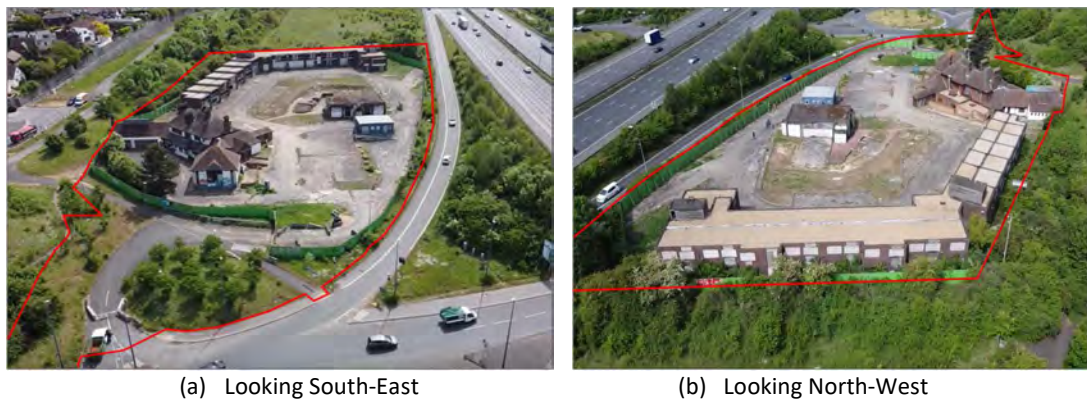


Figure 2: Aerial Photographs of Site

The proposed development entails the demolition of all buildings and the construction of a service station comprising EV charging bays, fuel forecourt with 2 no. underground fuel storage tanks¹, sales building, parking areas, access road, and areas of soft landscaping.

Access to the facility will be from Wrotham Road to the west of the site. The proposed layout is provided in **Appendix A**.

The NPPF classifies buildings used for shops and car parking as Less Vulnerable to flood risk. Fuel filling stations are not specifically listed in Annex 3 of the NPPF (“Flood risk vulnerability classification”) but are widely accepted to also be a Less Vulnerable use.

2.3 Surface Waterbodies in the Vicinity of the Site

There are six ponds within 500 m of the site; two balancing ponds 50 m west of the site, three ponds south of Watling Street, and one pond approximately 330 m north-east of the site at Mid Kent Golf Club. The River Thames is approximately 3.2 km north of the site.

2.4 Topographic Levels

A topographic survey of the site has been undertaken by Malcolm Hughes Land Surveyors (**Appendix B**) and LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 3**.

Ground levels are indicated to range between 36.0 to 39.0 m AOD, with levels generally falling in a westerly direction. The ground level at the sites access point is in the region of 38.1 m AOD.

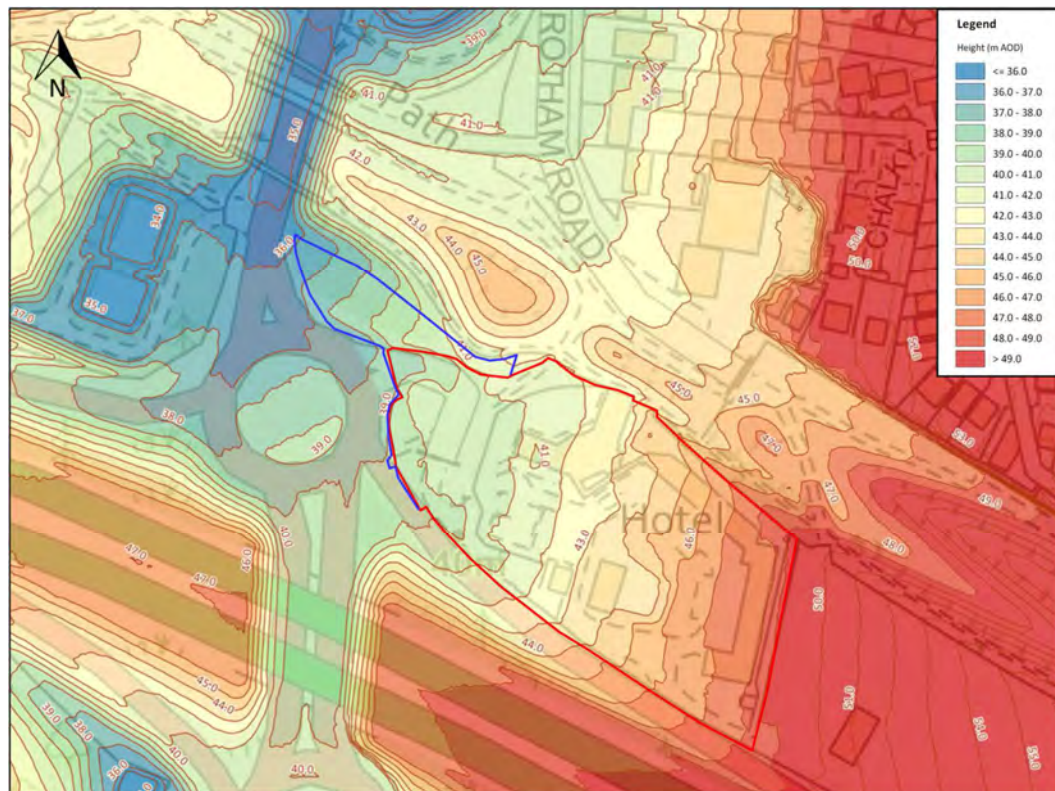


Figure 3: Digital Terrain Model from LiDAR Data

¹ An above ground/below ground storage tank risk assessment has been undertaken by Subadra Consulting Ltd – ‘Appraisal of Risks Associated with New Fuel Tank Installation’, report reference BP12945CL008, February 2023

2.5 Ground Conditions

According to the Soilscape soils dataset produced by the Cranfield Soil and AgriFood Institute², soil conditions at the site and within the surrounding area are freely draining lime-rich loamy soils.

British Geological Survey mapping of surface geology³ indicates the underlying bedrock formation comprises chalk of the Lewes Nodular, Seaford, and Newhaven formations. No superficial deposits are recorded at the site although a narrow band of Head Deposits (clay, silt, sand and gravel) is indicated to the west of the site on a north-south alignment, broadly along the A227 Wrotham Road.

A Phase 1 Environmental Desk Study report was issued by Subadra Consulting Ltd in July 2022. The report references a combined geotechnical and environmental investigation undertaken by Subadra Consulting Ltd in September 2012 that comprised of eight boreholes to a maximum depth of circa 18.0 m bgl.

Ground conditions were recorded as Made Ground to a maximum depth of 1.0 m overlying a structured layer white rubbly to blocky chalk, or structureless chalk with occasional sand or flints. The chalk layer extended to at least 18.0 m bgl, the maximum drilling depth. No groundwater strike was recorded in any of the boreholes.

Three infiltration tests⁴ were carried out in 2012 (**Appendix C**) in various locations across the site with the following results:

- TP001: 2.178×10^{-4} m/s or 0.784 m/hr
- TP002: no rate calculated
- TP003: 8.082×10^{-5} m/s or 0.291 m/hr.

Additional infiltration testing was carried out by Subadra Consulting Ltd in December 2022 (**Appendix C**) to supplement the testing undertaken in 2012, with the following results:

- TP101: 1.632×10^{-5} m/s or 0.059 m/hr
- TP102: 1.347×10^{-4} m/s or 0.485 m/hr
- TP103: 1.140×10^{-5} m/s or 0.050 m/hr.

With regards the risk of ground dissolution, the Phase 1 Environmental Desk Study report (Preliminary Risk Assessment) prepared by Subadra Consulting Ltd (July 2022) states that although soluble rocks are present within the ground, few dissolution features are likely to be present, and the potential for difficult ground conditions or localised subsidence are at a level where they need not be considered.

According to the MAGIC website⁵ the underlying bedrock is classified as a Principal aquifer. These are layers of rock that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The site is shown to be located within a Zone II – Outer Protection designated groundwater source protection zone. This is defined by a 400 day travel time from a point below the water table and has a minimum radius of 250 or 500 m around the source, depending on the size of the abstraction.

The site is underlain by the North Kent Medway Chalk groundwater body and is assessed under the Water Framework Directive (WFD). The groundwater body (WFD ID: GB40601G500300) has an overall WFD status of Poor.

² www.landis.org.uk/soilscape/

³ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁴ Infiltration tests undertaken in accordance with BRE 365 guidelines

⁵ <https://magic.defra.gov.uk/MagicMap.aspx>

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Policy Guidance

The thrust of national planning policy, as articulated in the NPPF is that inappropriate development in areas at risk of flooding should be avoided where possible, as summarised below:

- Inappropriate development in areas at risk of flooding should be avoided and that development should be directed away from areas at highest risk (whether existing or future), but where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere (NPPF para. 165).
- The policy of seeking to steer development to areas with the lowest risk of flooding, from any source, is implemented through the application of the flood risk Sequential Test. Development should not be allocated or permitted if there are reasonably available sites, appropriate for the proposed development in areas with a lower risk of flooding. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding (NPPF para. 168).
- If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives) the Exception Test may have to be applied. The need for the test will depend on the potential vulnerability of the site and of the development proposed (as set out in Annex 3 of NPPF; also PPG Table 2) (NPPF para. 169). For example, the Exception Test need not be applied for less vulnerable development in any flood zone, or for more vulnerable development in flood zones 1 or 2.
- Where the Exception Test must be applied, application of the test for development proposals at the application stage should be informed by a site-specific flood risk assessment. For the test to be passed it should be demonstrated that: (a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; (b) and the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall (NPPF para. 170). Both elements of the test should be satisfied for the development to be permitted (NPPF para. 171).
- A site-specific flood risk assessment should be provided for all development in flood zones 2 and 3 [whilst] in flood zone 1, an assessment should accompany all proposals involving: sites of 1 ha or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use (NPPF para. 173).
- Development should not increase flood risk elsewhere (NPPF para. 173).
- Development should only be allowed in areas at risk of flooding where the flood risk assessment (and the sequential and exception tests, as applicable), demonstrate that: a) within the site, the most vulnerable development is located in areas of lowest flood risk (unless there are overriding reasons to prefer a different location); b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; c) the development incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate; d) any residual (flood) risk can be safely managed; and e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan (NPPF para.173).
- Applications for some minor development and changes of use should not be subject to the sequential or exception tests (NPPF para. 174). The exceptions are stated in Footnote 60.
- Major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems should: a) take account of advice from the lead local flood authority; b) have appropriate proposed minimum operational standards; c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and d) where possible, provide multifunctional benefits (NPPF para. 175).

Guidance on the application of the sequential and exception test is provided in the PPG. For example:

- The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in

current and future (i.e. taking climate change into account) medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding (PPG para. 023).

- Where it is not possible to locate development in low risk areas, the Sequential Test should go on to compare reasonably available sites within medium risk areas and then, only where there are no reasonably available sites in low and medium risk areas, within high risk areas (PPG para. 024).
- Initially, the presence of existing flood risk management infrastructure should be ignored, as the long-term funding, maintenance and renewal of this infrastructure is uncertain. Climate change will also impact upon the level of protection infrastructure will offer throughout the lifetime of development (PPG para. 024).
- The Sequential Test should be applied to 'Major' and 'Non-major development' proposed in areas at risk of flooding, but it will not be required where; the site has been allocated for development and subject to the test at the plan making stage (provided the proposed development is consistent with the use for which the site was allocated and provided there have been no significant changes to the known level of flood risk to the site, now or in the future which would have affected the outcome of the test); the site is in an area at low risk from all sources of flooding, unless the Strategic Flood Risk Assessment, or other information, indicates there may be a risk of flooding in the future; the application is for a development type that is exempt from the test, as specified in footnote 56 of the NPPF (PPG para. 027).
- For individual planning applications subject to the Sequential Test, the area to apply the test will be defined by local circumstances relating to the catchment area for the type of development proposed. For some developments this may be clear, for example, the catchment area for a school. In other cases, it may be identified from other Plan policies. For example, where there are large areas in Flood Zones 2 and 3 (medium to high probability of flooding) and development is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives. Equally, a pragmatic approach needs to be taken where proposals involve comparatively small extensions to existing premises (relative to their existing size), where it may be impractical to accommodate the additional space in an alternative location. For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the local planning authority boundary (PPG para. 027).
- 'Reasonably available sites' are those in a suitable location for the type of development with a reasonable prospect that the site is available to be developed at the point in time envisaged for the development. These could include a series of smaller sites and/or part of a larger site if these would be capable of accommodating the proposed development. Such lower-risk sites do not need to be owned by the applicant to be considered 'reasonably available' (PPG para. 028).
- The Exception Test should only be applied as set out in Table 2 [of the PPG ("Flood Risk Vulnerability and Flood Zone Incompatibility")] and only if the Sequential Test has shown that there are no reasonably available, lower risk sites, suitable for the proposed development, to which the development could be steered (PPG para. 032).

3.2 Local Planning Policy and Technical Guidance

The Gravesham Local Plan Core Strategy was adopted in September 2014. The following policy is relevant in respect of flood risk and drainage:

Policy CS18: Climate Change states:

Flood Risk

5.14.36 With the exception of the previously developed sites along the Thames Riverside (see Policies CS03, CS04 and CS05) and those other regeneration sites which have already been evaluated in accordance with the sequential and exception tests at the application stage, development will be directed sequentially to those areas at least risk of flooding.

5.14.37 Proposals in areas at risk of flooding must be accompanied by a Flood Risk Assessment (in accordance with national policy and Environment Agency standing guidance as appropriate) and a Flood Risk Management Plan (if required) to demonstrate that they are adequately defended and safe over their lifetime. Planning permission will be refused for schemes which do not pass the sequential and exception tests.

5.14.38 The Council will prioritise the maintenance, improvement or replacement of flood defence infrastructure over other land uses where relevant. In addition to meeting their own flood defence and management needs, the Council will expect new development to take advantage of opportunities to reduce the causes and impacts of flooding from all sources where it is technically and financially feasible.

Water Quality

5.14.39 As part of its approach to climate change and environmental improvement, the Council will have regard to the delivery of the Water Framework Directive and associated Thames River Basin Management Plan objectives to support water bodies being progressively improved to “good” status over the plan period.

Sustainable Drainage and Surface Water Run-Off

5.14.40 The Council will seek to minimise the impact of drainage from new development on waste water systems. In particular, the Council will:

- *Require that surface water run-off from all new development has, as a minimum, no greater adverse impact than the existing use; and*
- *Require the use of Sustainable Drainage Systems on all developments where technically and financially feasible.*

The Emerging Local Plan - Regulation 18 Stage 2 Consultation Part 2: Draft Development Management Policies Document (October 2020) contains the following policies which are relevant to flood risk and drainage:

Policy FW 1: Managing Water Quality states:

Proposals that enhance water quality in accordance with the objectives of the Water Framework Directive and Thames River Basin District RBMP objectives will be supported. Where development (alone or in combination) has the potential to have an adverse impact on water quality and the achievement of the above objectives, an assessment prepared by a suitably qualified person will be required detailing the nature and scale of such impacts and how such impacts will be addressed. Schemes that would be likely to result in an unacceptable reduction in water quality (having regard to any proposals to mitigate such impacts) will not be permitted.

Policy FW3: Managing Flood Risk states:

Applications for planning permission will be determined in accordance with national planning policy and guidance on flood risk. When considering proposals where flood risk is an issue, the Council will seek to secure an overall reduction in flood risk, wherever possible. Development will only be permitted where it will not be at an unacceptable risk of flooding on the application site itself, and there would be no unacceptable increase of flood risk elsewhere.

Where a development site is identified as being at risk of flooding, a site-specific Flood Risk Assessment (FRA) appropriate to the scale and nature of the development and the level of risk involved will be required in line with advice set out within national Planning Practice Guidance, having regard to the vulnerability of potential users or occupiers of the site.

The FRA should assess potential risk over the lifetime of the development and take into account the effect of climate change factors based on the most recent United Kingdom Climate Projections (UKCP) available at the time of the application.

Development proposals should be designed to withstanding flood loadings likely to be placed upon them and incorporate suitable flood protection and mitigation measures appropriate to the nature and scale or risk identified within the FRA to ensure that the safety of users and occupiers is assured over the lifetime of the development.

Proposals in areas potentially at risk of flooding should also be designed to be flood resilient. The Council will require evidence of how this has been taken into consideration at the application stage, with details of how such features are intended to be secured on the implementation of the scheme.

The need for Flood Risk Management Plans to manage residual risk will be determined on a case by case basis and secured by the imposition of planning conditions or other legally binding mechanisms, as appropriate.

Where proposals rely on existing flood defence infrastructure or require upgrades to existing or the installation of new infrastructure to facilitate development, sufficient detail and evidence shall be provided as part of the application for the Council to determine the adequacy of the intended measures. Evidence of the condition and longevity of existing defences; how any upgrade of existing or installation of new defences will be secured; and the mechanism by which such defences will be maintained over the lifetime of the development and by whom will also be required, as appropriate.

The Council will prioritise the maintenance, improvement or replacement of flood defence infrastructure over other land uses where relevant, inclusive of any strategic upgrade to the tidal flood defences under the Thames Estuary 2100 Plan. Development that would harm the effectiveness of existing flood defences or prejudice their maintenance and management due to proximity or other factors will not be permitted.

Policy FW5: Managing Surface Water Drainage states:

The Council will require the use of sustainable drainage within developments, where this is appropriate. In the case of major developments, there will be a presumption that Sustainable Drainage Systems will be used to manage surface water run-off and alternatives will not be approved unless it is demonstrated, through the submission of evidence, that it is not feasible or inappropriate to do so.

Applications for major development should be supported by a Surface Water Strategy, detailing how the site will be drained in accordance with sustainable drainage principles or, where an alternative is proposed, the justification for the deviation from the policy requirement and details of the alternative scheme.

In all cases, the Council will require that surface water run-off from all new development has, as a minimum, no greater adverse impact than the existing use. In areas where there is evidence of existing surface water flooding issues, or these may result over time as a result of climate change, the Council will seek a lower rate of surface water run-off to reduce flood risk overall.

The Surface Water Strategy should be prepared in accordance with the requirements of the Kent County Council document - Drainage and Planning Policy Statement (June 2017 or as subsequently updated) and contain sufficient information for the Council (in consultation with the Lead Local Flood Authority) to assess the adequacy and appropriateness of the drainage scheme proposed.

Details of the arrangements to be put in place to ensure on-going maintenance of the drainage system for the lifetime of the development and the mechanism by which these will be secured should also be provided.

The Council will apply conditions to any grant of planning permission requiring the submission of a completion certificate prepared by a suitably qualified person to ensure that the Sustainable Drainage System has been fully implemented in accordance with the approved plans, as appropriate.

In designing Sustainable Drainage Systems, applicants will also be expected to show that they have considered opportunities to incorporate features to improve water quality, mitigate pollution, and enhance green infrastructure (including biodiversity) where it is appropriate to do so.

4 REVIEW OF FLOOD RISK

4.1 Historical Records of Flooding

The Environment Agency Recorded Flood Outlines map⁶, the 2005 SFRA (including the 2009 update SFRA) and the 2013 SFRA do not hold any records of historical flood events within the vicinity of the site.

4.2 Flood Risk from Rivers (Fluvial)

The EA Flood Map for Planning (**Figure 4**) indicates the site to be located in flood zone 1. Table 1 of the PPG defines flood zones within the vicinity of the site as follows:

- Flood zone 1: Low Probability. Land having a less than 0.1% annual probability of river or sea flooding;
- Flood zone 2: Medium Probability. Land having between a 1% and 0.1% annual probability of river flooding or between a 0.5% and 0.1% annual probability of sea flooding;
- Flood zone 3a: High Probability. Land having a 1% or greater annual probability of river flooding or a 0.5% or greater annual probability of sea flooding;
- Flood zone 3b: Functional Floodplain. Land where water from rivers or the sea has to flow or be stored in times of flood. Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as a 0.1% annual probability of flooding).

It is concluded that the site is not at risk of flooding from rivers (fluvial).

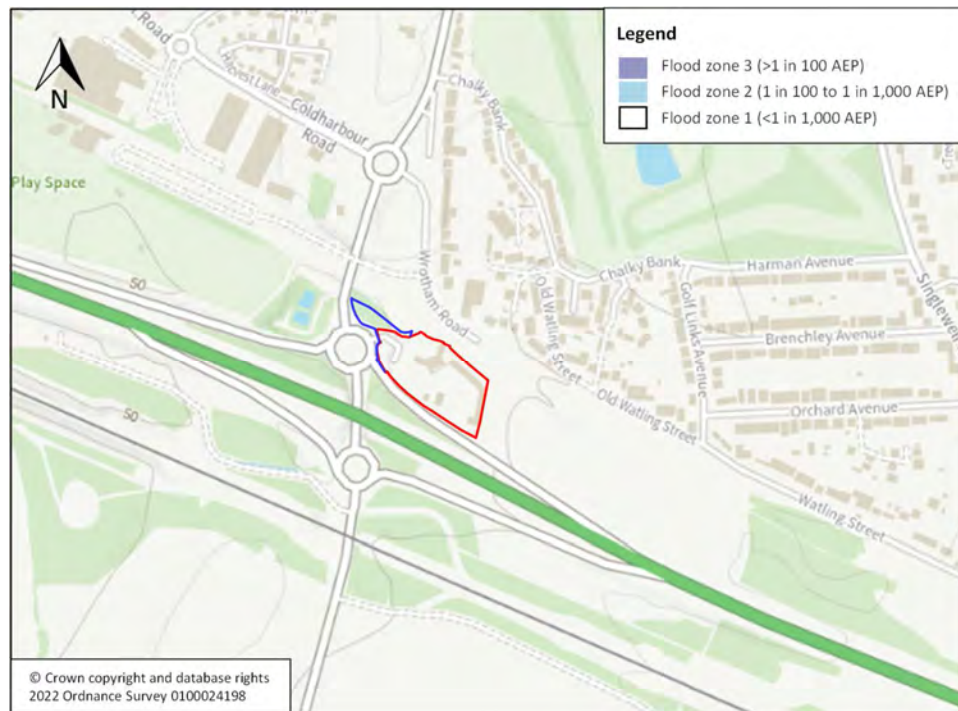


Figure 4: Flood Map for Planning

Source: gov.uk website; Accessed: September 2024

⁶ <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/RecordedFloodOutlines&Mode=spatial>

4.3 Flood Risk from Small Watercourses and Surface Water (Pluvial)

The EA Flood Risk from Surface Water map (**Figure 5**) indicates that the site is at a Very Low risk of flooding from surface water. The mapping does indicate surface water pathways to the west of the site along the A227 Wrotham Road and along the eastbound slip road to the A2 Watling Street to the south of the site; however, neither impinge on the site and neither would be expected to impact on site access.



Figure 5: Flood Risk from Surface Water
Source: gov.uk website; Accessed: September 2024

4.4 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (**Figure 6**) indicates that groundwater levels at the site may be 0.5 to >5.0 m bgl (defined as Very Low to Low risk) during a 1 in 100 AEP groundwater flood event.

However, given the extensive hardstanding nature of the existing site and surrounding area the emergence of groundwater at the surface is expected to be limited. In addition, groundwater was not encountered during fieldwork at the site (refer **Section 2.5**).

It is concluded that the site is at a low risk of flooding from groundwater.

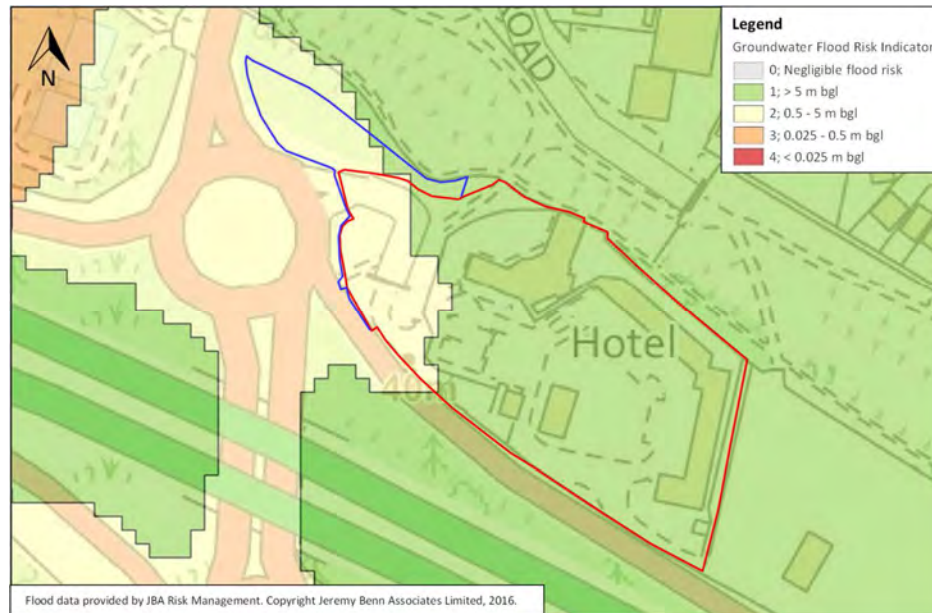


Figure 6: JBA Groundwater Flood Risk Indicator Map

Source: Blue Sky Maps; Accessed: September 2022

4.5 Flood Risk from Reservoirs, Canals and Other Water Impounding Structures

There are no canals located within the immediate vicinity of the site. The Flood Risk from Reservoirs map (not shown) indicates that the site is not at risk of flooding from such sources.

The site is generally at a higher or equivalent elevation to the balancing ponds to the west of the site, with intervening infrastructure between the site and ponds at higher elevations than the ponds. The pond to the north-east of the site is associated with Mid Kent Golf Club with intervening land between the pond and site approximately 5.0 m above the pond.

It is concluded that the site is not at risk of flooding from reservoirs, canals or other water impounding structures.

4.6 Requirement for Sequential Testing

The NPPF states that the Sequential Test is intended to be applied to all sources of flood risk, not just river/sea flooding.

A summary of the assessment of flood risk from all sources using a low, medium and high risk classification is presented in **Table 1**. On the basis of the assessment, it is concluded that the proposals satisfy the requirements of the flood risk Sequential Test and that no sequential assessment of potential alternative sites is required.

Table 1: Site Summary of Flood Risk from All Sources

Source	Risk Level					Source
	None/Negligible	Very Low	Low	Medium	High	
Sea	✓					a, b
Rivers (fluvial)	✓					a, b
Small watercourses		✓				a, b, c, f
Surface water (pluvial)		✓				b, c
Reservoirs	✓					b, d, f
Canals	✓					b, f
Other water impounding structures	✓					b, f
Groundwater			✓			b, e, g

Sources of information: (a) EA Flood Map for Planning (Rivers and Sea); (b) SFRA (December 2005 and 2009); (c) EA Flood Risk from Surface Water; (d) EA Flood Risk from Reservoirs; (e) JBA Groundwater Flood Risk Indicator Map; (f) OS mapping; (g) Site Investigation.

4.7 FLOOD RISK MITIGATION MEASURES

The risk of flooding to the proposed development from all identified sources is assessed to be negligible/low. As such, no specific flood risk measures are proposed.

Notwithstanding this, it is recommended that the finished floor level of the proposed sales building is at least 150 mm above adjacent ground levels, with ground levels sloping down from the building.

This measure will, subject to the implementation of an appropriately designed surface water drainage scheme, enable surface water runoff to be appropriately managed thereby mitigating the risk of it affecting the sales building.

5 SURFACE WATER MANAGEMENT

5.1 Existing Assets

Southern Water (SW) public sewer records (**Appendix E**) indicate that no public surface water sewers are present within the vicinity of the site. The records indicate that a 150 mm diameter public foul water sewer is located within the northern/western portion of the site. The head of the sewer is located adjacent to the existing hotel building (manhole ref: 2201).

5.2 Surface Water Drainage at the Existing Site

A drainage survey of the site was undertaken by Dene-Tech Services Ltd on 25 November 2022. The drainage survey plan is provided in **Appendix F**. The survey found that all on-site manholes were foul only and that no surface water sewers were found on site. The survey identified that all downpipes drain directly into the ground. All surface water drainage channels, and almost all gullies were found to be completely blocked by debris.

Based on the findings of the drainage survey, supported by ground conditions (refer **Section 2.5**), and the absence of any nearby watercourses or public surface water sewers, it is assumed that surface water runoff from impermeable surfaces at the site discharges to the ground.

As it is assumed that the surface water drainage system drains into the ground, the pre-development peak runoff has not been considered.

5.3 Surface Water Drainage at the Redeveloped Site

5.3.1 Disposal of Surface Water

In accordance with the PPG, surface water runoff should be disposed of according to the following hierarchy: Into the ground (infiltration); To a surface water body; To a surface water sewer, highway drain, or another drainage system; To a combined sewer.

Based on ground conditions and infiltration testing results (refer **Section 2.5**), the disposal of surface water by infiltration is feasible. Accordingly, surface water runoff will be disposed of to the ground.

Due to the potential presence of contaminants, any runoff from the fuel storage and filling area will discharge into a 150 mm diameter public foul water sewer located within the site via a Class 1 full retention separator.

5.3.2 Post Development Impermeable Area

Based on the proposed site layout plan (**Appendix A**), the area of impermeable surfaces within the proposed development has been calculated to be 0.629 ha.

5.3.3 Peak Flow Control

Based on the infiltration testing results stated in **Section 2.5**, infiltration rates of 1.347×10^{-4} m/s (0.485 m/hr), 1.40×10^{-5} m/s (0.050 m/hr), and 8.082×10^{-5} m/s (0.291 m/hr) have been used at three disposal locations across the site.

5.3.4 Attenuation Storage

Attenuation storage will be provided to store surface water runoff generated across the impermeable surfaces at the redeveloped site.

The three attenuation facilities have been modelled using the Network module of MicroDrainage (**Appendix G**). The required storage volumes have been sized to store runoff generated from impermeable surfaces during the 1.0% AEP rainfall event including a 45% climate change allowance, as follows:

- Access road: Runoff will discharge into an infiltration basin. Assuming an infiltration rate of 1.347×10^{-4} m/s (0.485 m/hr), a total storage volume of 55.5 m³ would be required. The storage volume could be accommodated within the infiltration basin, with an area of 126.3 m² and a depth of 1.5 m.
- Main Car Park: Runoff will discharge into an geo-cellular infiltration tank. Assuming an infiltration rate of 1.40×10^{-5} m/s (0.050 m/hr), a total storage volume of 168.9 m³ would be required. The storage volume could be accommodated within the geo-cellular infiltration tank, with an area of 210.0 m² and a depth of 0.8 m.
- Sales Building Roof, Adjacent Parking Spaces, and Forecourt Canopy: Runoff will discharge into a geo-cellular infiltration tank. Assuming an infiltration rate of 8.082×10^{-5} m/s (0.291 m/hr), a total storage volume of 127.3 m³ would be required. The storage volume could be accommodated within the geo-cellular infiltration tank, with an area of 160.0 m² and a depth of 0.8 m.

Additional attenuation storage will be provided within the surface water pipe and manhole network.

A preliminary surface water drainage layout is provided in **Appendix H**.

5.3.5 Exceedance Routes

Flows resulting from rainfall in excess of the 1.0% AEP event plus climate change will be managed in exceedance routes. It is assumed that as the development proposals progress, the design of the site would ensure flood flows are directed away from built development.

5.3.6 Pollution Control

Table 26.2 of the CIRIA SuDS Manual identifies commercial roofs and sites where fuels are to be delivered, handled and stored as having a low to high pollution hazard level. Table 26.2 of the CIRIA SuDS Manual 2015 indicates that the pollution hazard indices associated with commercial roofs and sites where fuels are to be delivered, handled and stored for total suspended solids, hydrocarbons and metals are 0.30, 0.20 and 0.05 and 0.8, 0.8 and 0.9 respectively.

Table 26.3 of the CIRIA SuDS Manual indicates that the SuDS mitigation indices for filter drains, permeable paving and detention basins for total suspended solids, hydrocarbons and metals are 0.4, 0.4 and 0.4; 0.70, 0.60 and 0.70; and 0.5, 0.5 and 0.6 respectively.

The use of filter drains and permeable block paving will also help prevent debris from entering the surface water drainage system, reducing the risk of blockage.

Class 1 full retention separators will be installed to serve the petrol filling station and will capture hydrocarbon pollutants, along with any fuel spillages, preventing them from entering the surface water drainage system.

A Class 1 bypass separator will be installed to serve the parking area and will capture hydrocarbon pollutants preventing them from entering the surface water drainage system.

In addition to the above water quality measures, the building will consist of a green roof while catchpit manholes and silt traps in gullies/channels drains will help prevent contaminants effecting the principal aquifer and the Zone II – Outer Protection designated groundwater source protection zone.

5.3.7 Adoption and Maintenance of SuDS

It is anticipated that the proposed drainage will be maintained by the site owner or a private management company. An indicative maintenance schedule is presented in **Table 2**.

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Infiltration Basin		
Regular maintenance	Remove litter and debris	Monthly
	Cut grass	Monthly during grow season Or as required)
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly for first year, then annually or as required
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets/outlets	Annually (or as required)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years, or as required
	Remove sediments from inlets/outlets and main basin when required	
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	
	Repair/rehabilitation of inlets/outlets	
	Relevel uneven surface and reinstate design levels	
Permeable Paving		
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer’s recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	
		Rehabilitation of surface and upper substructure by remedial sweeping
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth- if required, take remedial action	Three-monthly, 48h after large storms in first six months

Schedule	Required action	Frequency
	Inspect silt accumulation rates and establish appropriate brushing frequencies accumulation rates and establish appropriate removal frequencies	Annually
	Monitor inspection chambers	
Geo-cellular infiltration tank		
Regular maintenance	Inspect and identify any areas that are not operating correctly	Monthly for 3 months, then annually
	Remove debris from the catchment surface	Monthly
	Remove sediment from internal forebays	Annually, or as required
Remedial action	Repair inlet/outlet and vents	As required
	Reconstruct infiltration structure and/or replace void fill, if performance deteriorates or failure occurs	
	Replacement of clogged geotextile (will require reconstruction)	
Monitoring	Inspect catchpit manholes and note rate of sediment accumulation	Monthly in the first year and then annually
	Inspect inlet/outlet and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required
	Check infiltration tank to ensure emptying is occurring	Annually
Green Roofs		
Routine maintenance	Inspect for weed growth and remove, including litter and debris	As required
	Inspect irrigation system	Daily during installation, then bi-monthly
	Inspect drain outlet for blockages, etc.	Monthly
Remedial actions	Wildflowers watering (evening only)	Every 2-3 days after 1-2 weeks of no rain Every evening after 3-4 weeks of no rain
	Intensive green roofs (bigger plants; trees and bushes, etc.) watering (evening only)	Every 2-3 days after 2-3 weeks of no rain
	Sedum roof watering (evening only)	Every 2-3 days after 3-4 weeks of no rain
	Warning: do not overwater green roofs as this can cause membrane stress leading to leaks and breakages	
	For deep substrates, remove moss and replace with plants such as lesser celandine, vinca minor and wood anemone	As required
	For shallow substrates, remove moss and plant sedum cuttings	1-2 years
Monitoring	Inspect vegetation growth and remove where sedum or other plants encroach onto unwanted areas. Use cuttings to refill areas that might lack vegetation	2-3 months
Filter Drain		
Regular maintenance	Remove litter including leaf litter and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly

Schedule	Required action	Frequency
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly (or as required)
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly (or as required)
	Clear perforated pipework of blockages	As required

6 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of BP International Ltd and relates to the proposed redevelopment of land at the former Tollgate Hotel, Watling Street, Gravesend as a fuel filling station and EV charging hub.

A site-specific assessment of flood risk has been undertaken in accordance with the requirements of national and local planning policy. The assessment has determined that the risk of flooding from all known/identified sources is Low.

It is concluded that the proposals satisfy the requirements of the flood risk Sequential Test and that no sequential assessment of potential alternative sites is required.

The assessment demonstrates that the proposed development may be completed in accordance with the requirements of planning policy subject to the following:

- Finished floor levels to be set 150 mm above adjacent ground levels
- The detailed drainage design to be submitted to and approved by the local planning authority prior to the commencement of development.

The assessment reviews how surface water from the site currently drains and presents a preliminary scheme for the management of surface water from the proposed development.

A summary of the principal findings and proposals is provided below:

- The topographical survey indicates several gullies and inspection chambers within the hardstanding concrete areas from which it is assumed surface water discharges to ground.
- The disposal of surface water via infiltration is assessed to be feasible due to known ground conditions and infiltration testing results. It is subsequently proposed to direct surface water runoff from the redeveloped site to ground.
- Attenuation storage could be provided by a combination of above and below ground storage facilities including green roofs, geo-cellular infiltration tanks and an infiltration basin.
- The surface water drainage system, including SuDS features, will remain private and would be the responsibility of the site owner, which may be maintained by a management company.

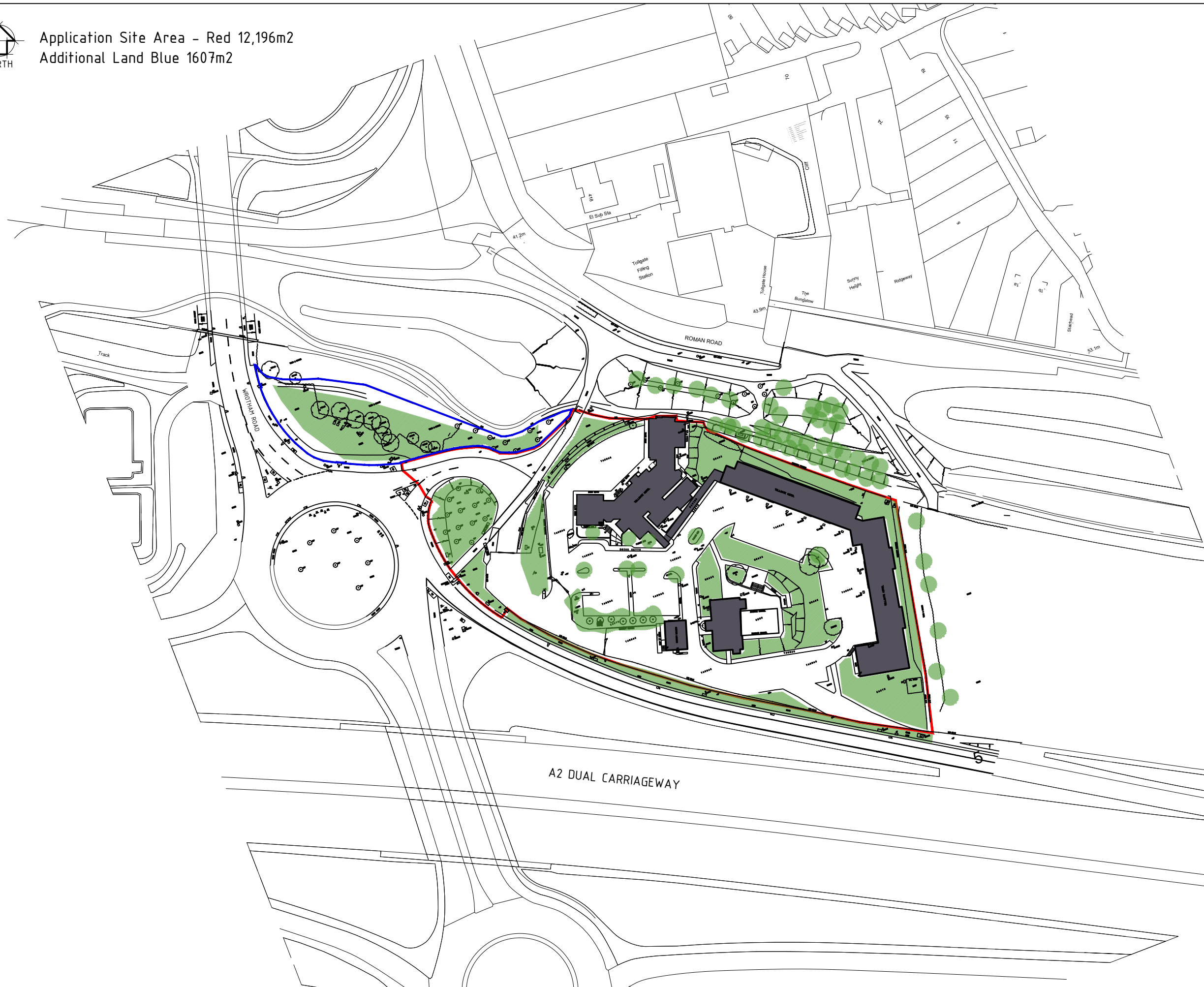
Groundwater will be protected via various treatment methods. Green roofs, permeable paving, filter drains, Class 1 full retention and bypass separators, catchpit manholes and silt traps in gullies/channel drains will help prevent contaminants discharging to ground. The fuel storage and filling area will incorporate a separate drainage system which will capture potential contaminated runoff/spillages and direct it to the public foul water sewer within the site.

APPENDIX A

Site Location plan, Existing Site Plan, and Proposed Site Plan and Elevations



Application Site Area - Red 12,196m²
Additional Land Blue 1607m²



**	*****	*****
**	*****	*****
**	*****	*****
**	*****	*****
E	10.05.24	REDLINE AREA CO ORDINATED TO OTHER DOCS
D	30.04.24	FURTHER ADJUSTMENT TO BLUELINE
C	19.04.24	FURTHER ADJUSTMENT TO REDLINE
B	25.03.24	AMENDED RED AND BLUE LINES TO HIGHWAYS INFO
A	01.02.24	AMENDED AREA

NR	DATE	DESCRIPTION
REVISIONS		
STATUS		



BP Pulse Breckland, Linford Wood Milton Keynes Buckinghamshire MK14 6GY		TOLLGATE SERVICE AREA WATLING STREET GRAVESEND KENT DA11 7NP	
DRAWN: PB DATE: JAN 24 DESIGN CHECKED: AM DATE: JAN 24 APPROVED: ***** DATE: *****		OS LOCATION PLAN	
DATE: JAN 24 SCALE: 1:1250@A3		ARCHITECT: MBH	

BP DRAWING NUMBER		REV
EV005-PS-LAY-000-GB00015044-0001-001		B01

MBH DRAWING NUMBER		REV
14170-LOC		E

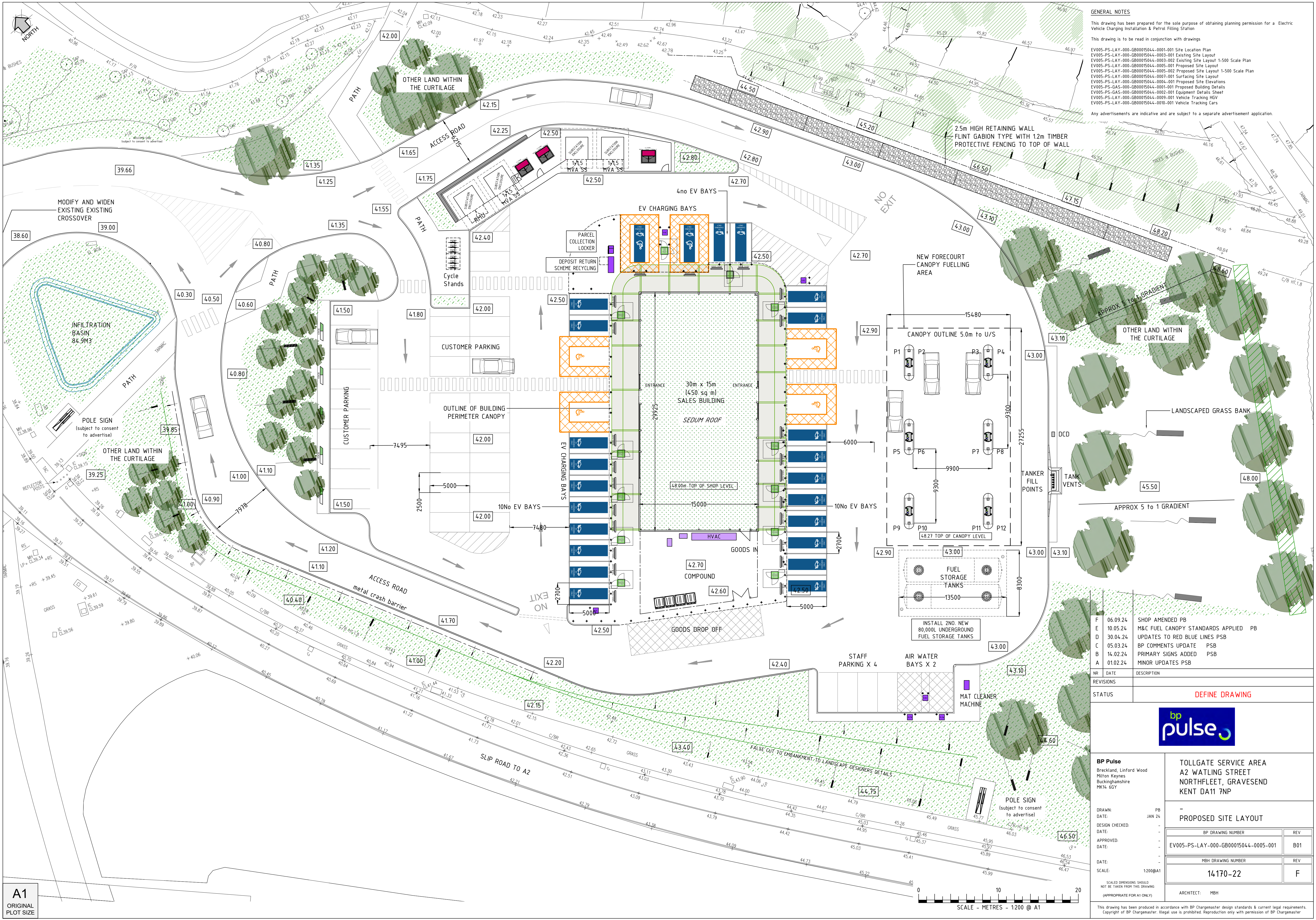
SCALED DIMENSIONS SHOULD NOT BE TAKEN FROM THIS DRAWING (APPROPRIATE FOR A1 ONLY)

This drawing has been produced in accordance with BP Chargemaster design standards & current legal requirements. Copyright of BP Chargemaster. Illegal use is prohibited. Reproduction only with permission of BP Chargemaster



SCALE - METRES - 1:1250





GENERAL NOTES

This drawing has been prepared for the sole purpose of obtaining planning permission for a Electric Vehicle Charging Installation & Petrol Filling Station

This drawing is to be read in conjunction with drawings

EV005-PS-LAY-000-GB00015044-0001-001 Site Location Plan
EV005-PS-LAY-000-GB00015044-0003-001 Existing Site Layout
EV005-PS-LAY-000-GB00015044-0003-002 Existing Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0005-001 Proposed Site Layout
EV005-PS-LAY-000-GB00015044-0005-002 Proposed Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0007-001 Surfacing Site Layout
EV005-PS-LAY-000-GB00015044-0004-001 Proposed Site Elevations
EV005-PS-GAS-000-GB00015044-0001-001 Proposed Building Details
EV005-PS-GAS-000-GB00015044-0002-001 Equipment Details Sheet
EV005-PS-LAY-000-GB00015044-0009-001 Vehicle Tracking HGV
EV005-PS-LAY-000-GB00015044-0010-001 Vehicle Tracking Cars

Any advertisements are indicative and are subject to a separate advertisement application.

F	06.09.24	SHOP AMENDED PB	
E	10.05.24	M&C FUEL CANOPY STANDARDS APPLIED	PB
D	30.04.24	UPDATES TO RED BLUE LINES PSB	
C	05.03.24	BP COMMENTS UPDATE	PSB
B	14.02.24	PRIMARY SIGNS ADDED	PSB
A	01.02.24	MINOR UPDATES PSB	

NR	DATE	DESCRIPTION
1		

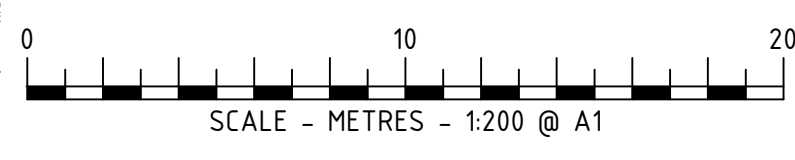
STATUS **DEFINE DRAWING**

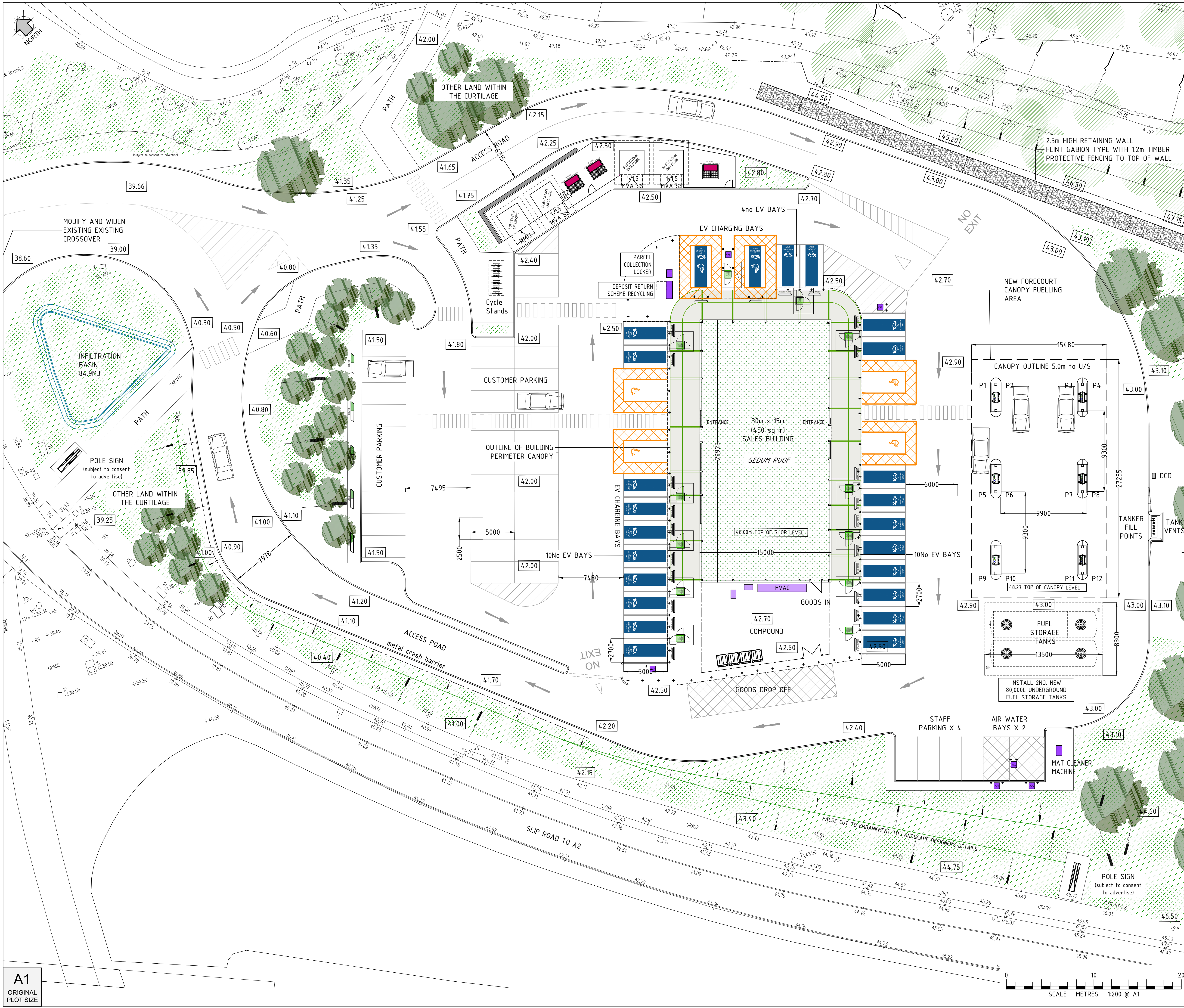


BP Pulse Breckland, Linfood Wood Milton Keynes Buckinghamshire MK16 6GY		TOLLGATE SERVICE AREA A2 WATLING STREET NORTHFLEET, GRAVESEND KENT DA11 7NP	
PROPOSED SITE LAYOUT			
DRAWN:	PB	BP DRAWING NUMBER	REV
DATE:	JAN 24		
DESIGN CHECKED:	-		
DATE:	-		
APPROVED:	-		
DATE:	-		
SCALE:	1:200@A1	MBH DRAWING NUMBER	REV
SCALED DIMENSIONS SHOULD NOT BE TAKEN FROM THIS DRAWING (APPROPRIATE FOR A1 ONLY)		14170-22	F
		ARCHITECT:	MBH

This drawing has been produced in accordance with BP Chargemaster design standards & current legal requirements. Copyright of BP Chargemaster. Illegal use is prohibited. Reproduction only with permission of BP Chargemaster

A1
ORIGINAL
PLOT SIZE





GENERAL NOTES

This drawing has been prepared for the sole purpose of obtaining planning permission for a Electric Vehicle Charging Installation & Petrol Filling Station

This drawing is to be read in conjunction with drawings

EV005-PS-LAY-000-GB00015044-0001-001 Site Location Plan
EV005-PS-LAY-000-GB00015044-0003-001 Existing Site Layout
EV005-PS-LAY-000-GB00015044-0003-002 Existing Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0005-001 Proposed Site Layout
EV005-PS-LAY-000-GB00015044-0005-002 Proposed Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0007-001 Surfacing Site Layout
EV005-PS-LAY-000-GB00015044-0004-001 Proposed Site Elevations
EV005-PS-GAS-000-GB00015044-0001-001 Proposed Building Details
EV005-PS-GAS-000-GB00015044-0002-001 Equipment Details Sheet
EV005-PS-LAY-000-GB00015044-0009-001 Vehicle Tracking HGV
EV005-PS-LAY-000-GB00015044-0010-001 Vehicle Tracking Cars

Any advertisements are indicative and are subject to a separate advertisement application.

NR	DATE	DESCRIPTION
F	06.09.24	SHOP AMENDED PB
E	10.05.24	M&C FUEL CANOPY STANDARDS APPLIED PB
D	30.04.24	UPDATES TO RED BLUE LINES PSB
C	05.03.24	BP COMMENTS UPDATE PSB
B	14.02.24	PRIMARY SIGNS ADDED PSB
A	01.02.24	MINOR UPDATES PSB

NR	DATE	DESCRIPTION
1	01.02.24	DEFINE DRAWING

BP Pulse
Breckland, Linfood Wood
Milton Keynes
Buckinghamshire
MK16 6GY

**TOLLGATE SERVICE AREA
A2 WATLING STREET
NORTHFLEET, GRAVESEND
KENT DA11 7NP**

PROPOSED SITE LAYOUT

BP DRAWING NUMBER	REV
EV005-PS-LAY-000-GB00015044-0005-001	B01

MBH DRAWING NUMBER	REV
14170-22	F

ARCHITECT: MBH

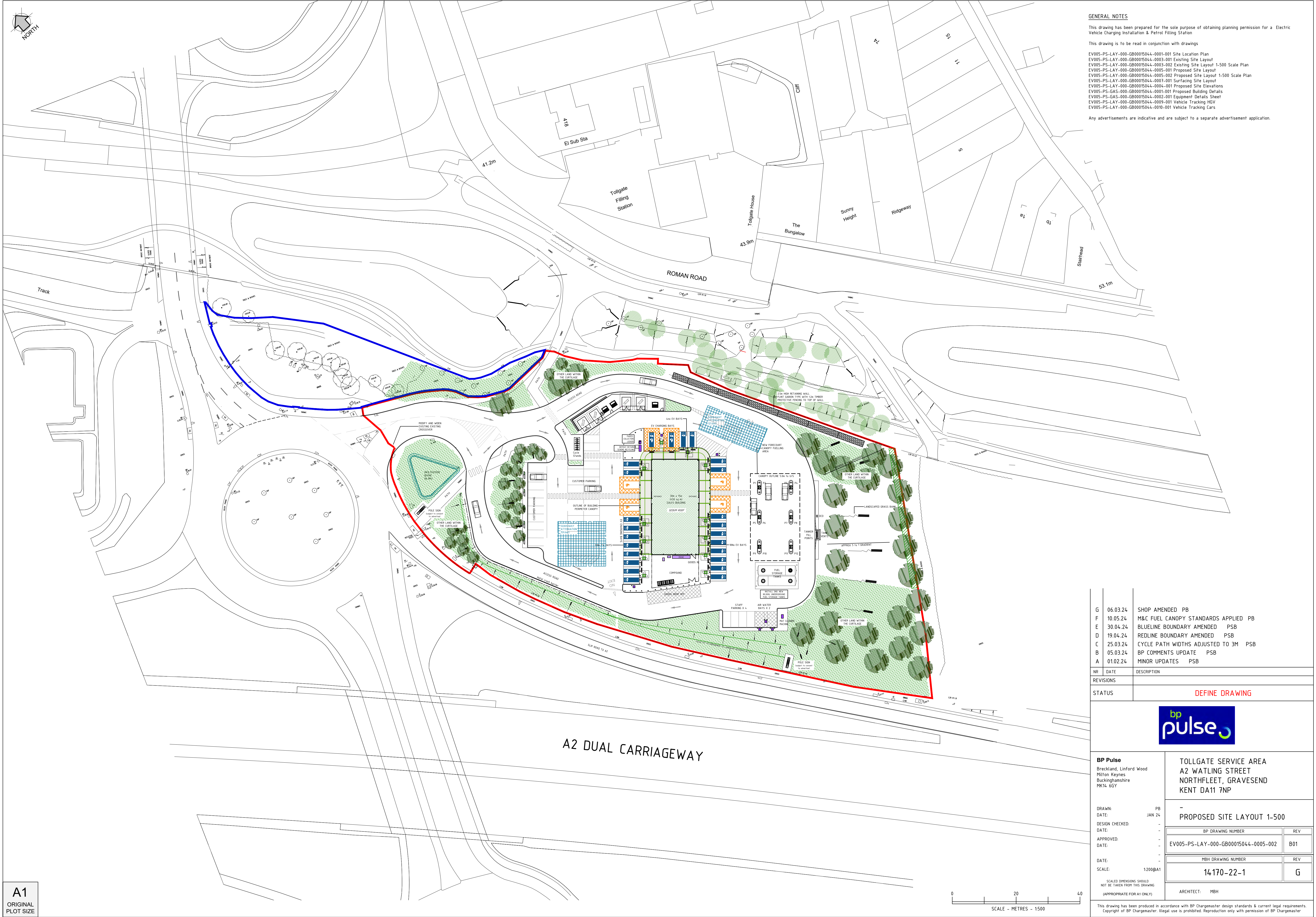
BP Pulse

DRAWN: PB
DATE: JAN 24
DESIGN CHECKED:
DATE:
APPROVED:
DATE:
SCALE: 1:200@A1

SCALED DIMENSIONS SHOULD NOT BE TAKEN FROM THIS DRAWING (APPROPRIATE FOR A1 ONLY)

This drawing has been produced in accordance with BP Chargemaster design standards & current legal requirements. Copyright of BP Chargemaster. Illegal use is prohibited. Reproduction only with permission of BP Chargemaster

A1
ORIGINAL
PLOT SIZE



GENERAL NOTES

This drawing has been prepared for the sole purpose of obtaining planning permission for a Electric Vehicle Charging Installation & Petrol Filling Station

This drawing is to be read in conjunction with drawings

EV005-PS-LAY-000-GB00015044-0001-001 Site Location Plan
EV005-PS-LAY-000-GB00015044-0003-001 Existing Site Layout
EV005-PS-LAY-000-GB00015044-0003-002 Existing Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0005-001 Proposed Site Layout
EV005-PS-LAY-000-GB00015044-0005-002 Proposed Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0007-001 Surfacing Site Layout
EV005-PS-LAY-000-GB00015044-0004-001 Proposed Site Elevations
EV005-PS-GAS-000-GB00015044-0001-001 Proposed Building Details
EV005-PS-GAS-000-GB00015044-0002-001 Equipment Details Sheet
EV005-PS-LAY-000-GB00015044-0009-001 Vehicle Tracking HGV
EV005-PS-LAY-000-GB00015044-0010-001 Vehicle Tracking Cars

Any advertisements are indicative and are subject to a separate advertisement application.

G	06.03.24	SHOP AMENDED	PB
F	10.05.24	M&C FUEL CANOPY STANDARDS APPLIED	PB
E	30.04.24	BLUELINE BOUNDARY AMENDED	PSB
D	19.04.24	REDLINE BOUNDARY AMENDED	PSB
C	25.03.24	CYCLE PATH WIDTHS ADJUSTED TO 3M	PSB
B	05.03.24	BP COMMENTS UPDATE	PSB
A	01.02.24	MINOR UPDATES	PSB

NR	DATE	DESCRIPTION
REVISIONS		
STATUS		DEFINE DRAWING



BP Pulse
Breckland, Linford Wood
Milton Keynes
Buckinghamshire
MK14 6GY

TOLLGATE SERVICE AREA
A2 WATLING STREET
NORTHFLEET, GRAVESEND
KENT DA11 7NP

DRAWN: -
DATE: -
DESIGN CHECKED: -
DATE: -
APPROVED: -
DATE: -
DATE: -
SCALE: 1:200@A1

PB

JAN 24

-

-

-

-

-

-

-

SCALED DIMENSIONS SHOULD
NOT BE TAKEN FROM THIS DRAWING
(APPROPRIATE FOR A1 ONLY)

-
PROPOSED SITE LAYOUT 1-500

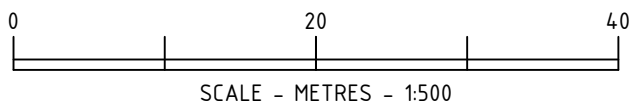
BP DRAWING NUMBER		REV
EV005-PS-LAY-000-GB00015044-0005-002		B01

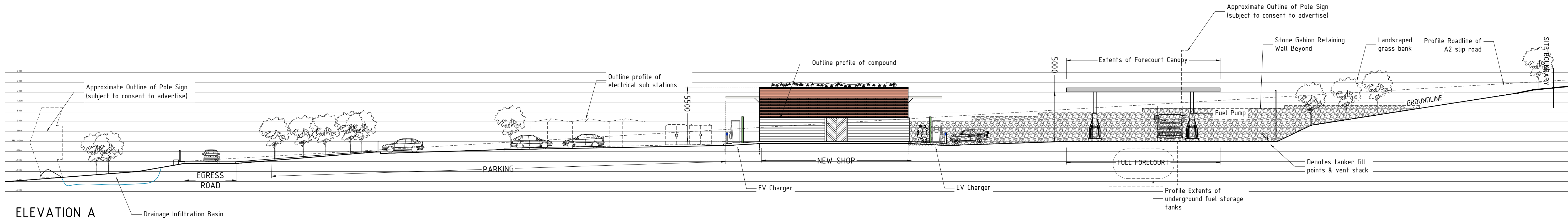
MBH DRAWING NUMBER		REV
14170-22-1		G

ARCHITECT: MBH

This drawing has been produced in accordance with BP Chargemaster design standards & current legal requirements.
Copyright of BP Chargemaster. Illegal use is prohibited. Reproduction only with permission of BP Chargemaster

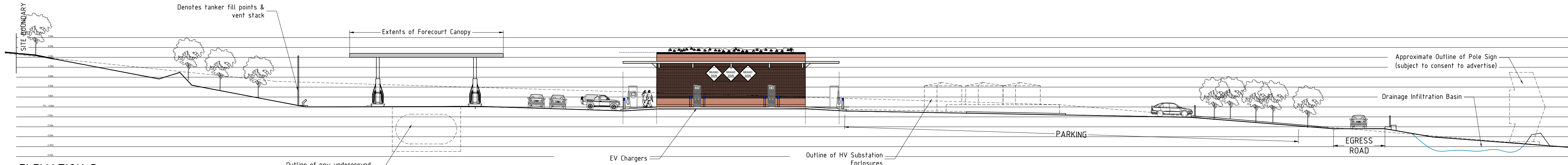
A1
ORIGINAL
PLOT SIZE





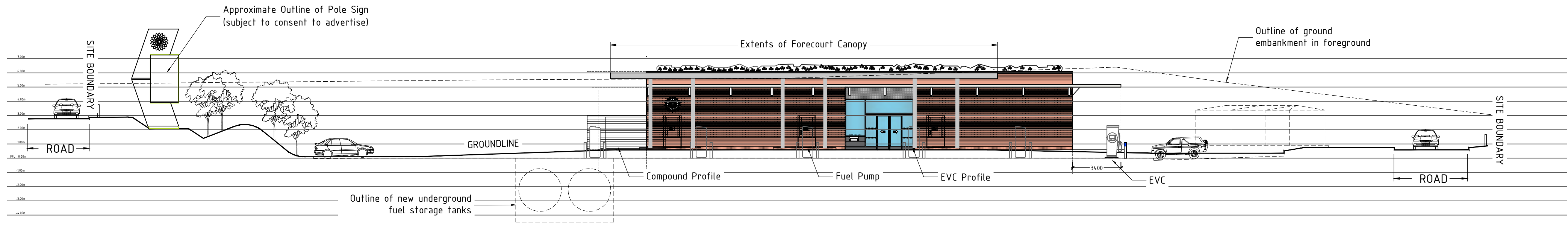
ELEVATION A

SCALE 1:200



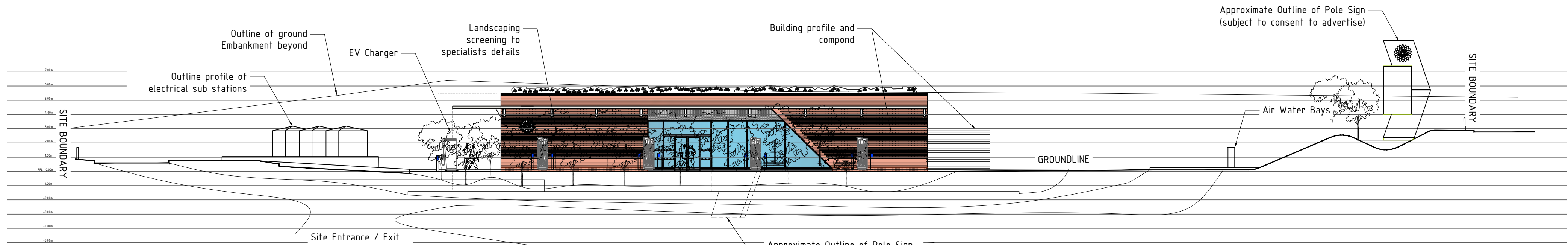
ELEVATION B

SCALE 1:200



ELEVATION C

SCALE 1:200



ELEVATION D

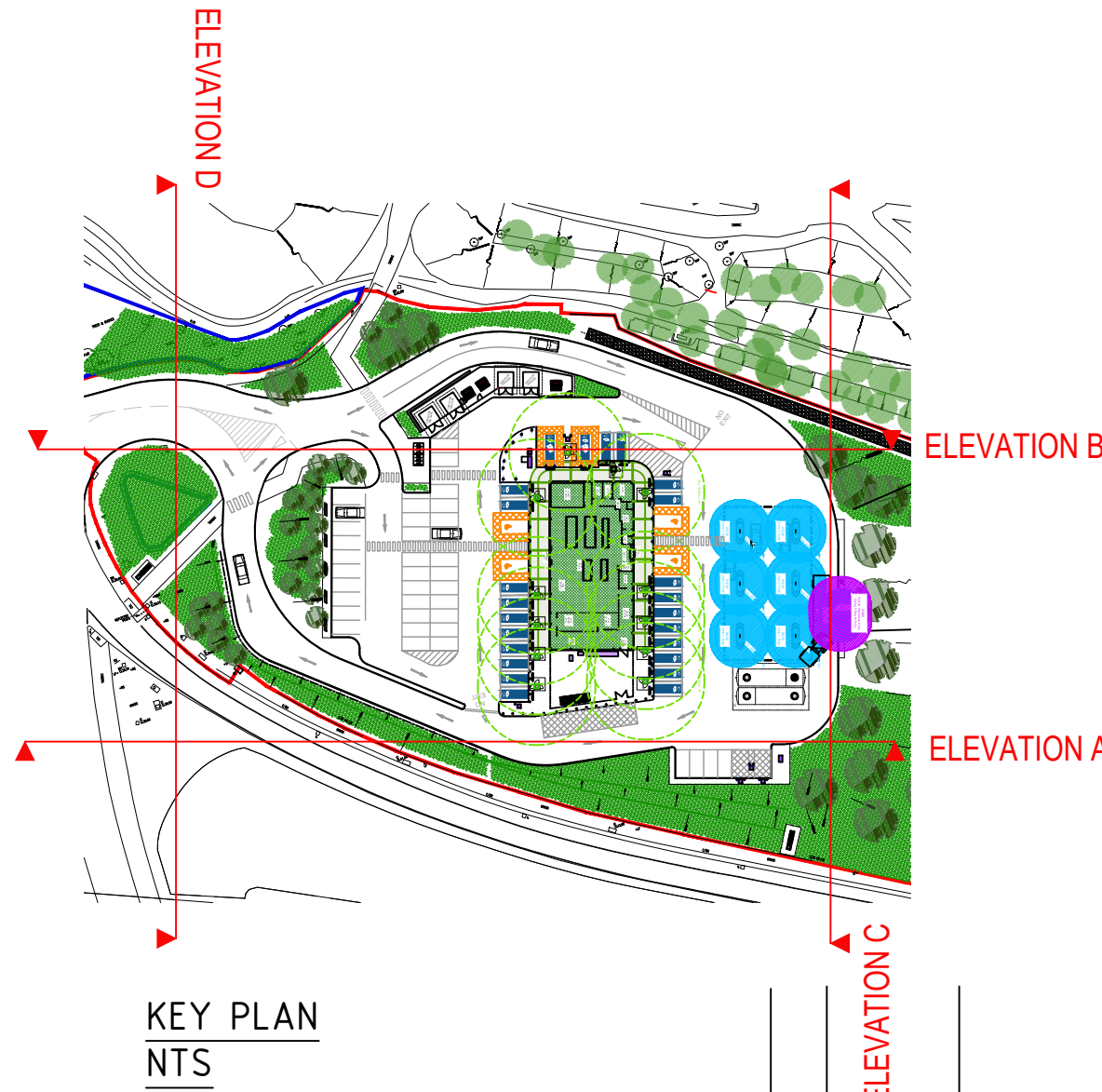
GENERAL NOTES

This drawing has been prepared for the sole purpose of obtaining planning permission for a Electric Vehicle Charging Installation & Petrol Filling Station

This drawing is to be read in conjunction with drawings

EV005-PS-LAY-000-GB00015044-0001-001 Site Location Plan
EV005-PS-LAY-000-GB00015044-0003-001 Existing Site Layout
EV005-PS-LAY-000-GB00015044-0003-002 Existing Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0005-001 Proposed Site Layout
EV005-PS-LAY-000-GB00015044-0005-002 Proposed Site Layout 1:500 Scale Plan
EV005-PS-LAY-000-GB00015044-0007-001 Surfacing Site Layout
EV005-PS-LAY-000-GB00015044-0006-001 Proposed Site Elevations
EV005-PS-GAS-000-GB00015044-0001-001 Proposed Building Details
EV005-PS-GAS-000-GB00015044-0002-001 Equipment Details Sheet
EV005-PS-LAY-000-GB00015044-0009-001 Vehicle Tracking HGV
EV005-PS-LAY-000-GB00015044-0010-001 Vehicle Tracking Cars

Any advertisements are indicative and are subject to a separate advertisement application.



KEY PLAN
NTS

F	06.09.24	AMENDED SHOP	PB
E	10.05.24	UPDATES WITH M&C FUEL CANOPY	PB
D	02.04.24	VENT POSTION ADDED	PSB
C	05.03.24	BP COMMENTS ADDED	PSB
B	14.02.24	PRIMARY SIGNS ADDED	PSB
A	01.02.24	MINOR REVISIONS	PSB

NR	DATE	DESCRIPTION
REVISIONS		
STATUS		DEFINE DRAWING



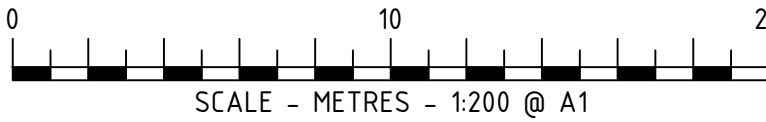
BP Pulse Breckland, Linford Wood Milton Keynes Buckinghamshire MK14 6GY	TOLLGATE SERVICE AREA A2 WATLING STREET NORTHFLEET, GRAVESEND KENT DA11 7NP					
	- PROPOSED SITE ELEVATIONS					
	<table><tr><td>BP DRAWING NUMBER</td><td>REV</td></tr><tr><td>EV005-PS-LAY-000-GB00015044-0004-001</td><td>B01</td></tr></table>		BP DRAWING NUMBER	REV	EV005-PS-LAY-000-GB00015044-0004-001	B01
	BP DRAWING NUMBER	REV				
	EV005-PS-LAY-000-GB00015044-0004-001	B01				
<table><tr><td>MBH DRAWING NUMBER</td><td>REV</td></tr><tr><td>14170-23</td><td>F</td></tr></table>		MBH DRAWING NUMBER	REV	14170-23	F	
MBH DRAWING NUMBER	REV					
14170-23	F					
ARCHITECT: MBH						

DRAWN: PB
DATE: JAN 24
DESIGN CHECKED: -
DATE: -
APPROVED: -
DATE: -
SCALE: 1:200@A1

SCALED DIMENSIONS SHOULD
NOT BE TAKEN FROM THIS DRAWING
(APPROPRIATE FOR A1 ONLY)

This drawing has been produced in accordance with BP Chargemaster design standards & current legal requirements. Copyright of BP Chargemaster. Illegal use is prohibited. Reproduction only with permission of BP Chargemaster

A1
ORIGINAL
PLOT SIZE

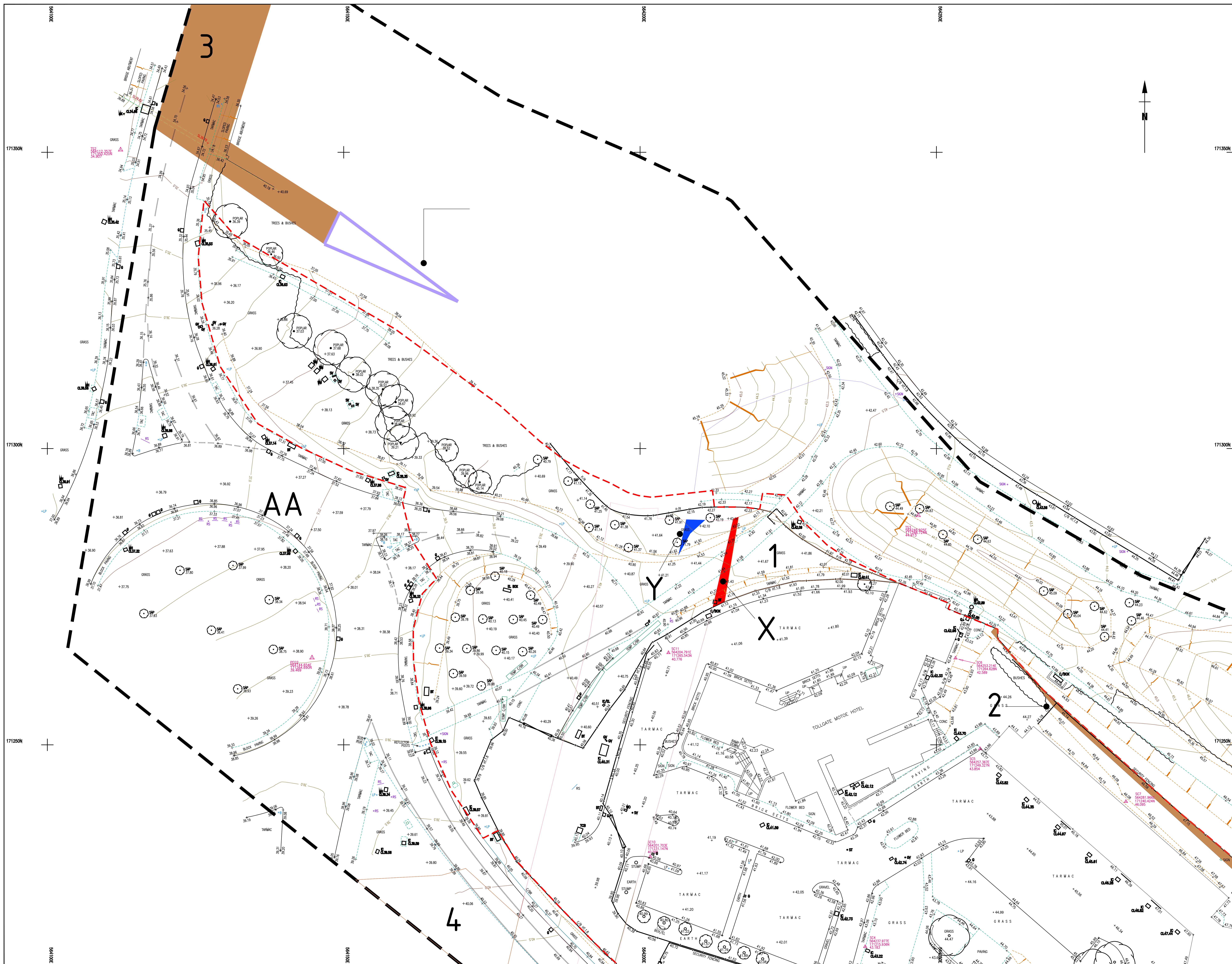


APPENDIX B

Topographic Survey



Survey Notes		Grid: National	
Levels:		Related to 650M2 GPS Datum	
Notes			
Topographical Survey Legend BUILDINGS AND TOWNS GENERAL INFORMATION ROADS STREET FURNITURE RELIEF AND VEGETATION LEVEL AND HEIGHT INFORMATION SURVEY INFORMATION SYMBOLS GEOTECHNICAL INFORMATION			
Sheet Index			
Rev. Date Description			
A 26/03/13 Survey Extended			
MALCOLM HUGHES LAND SURVEYORS Chartered Land Surveyors 65 Grosvenor Street, Suite, Manchester M3 3TH, Tel: 0161 955 1265 survey@mhsl.co.uk			
Accreditations			
Client			
BP OIL			
WITAN GATE HOUSE, 500-600 WITAN GATE CENTRAL MILTON KEYNES, MK9 1ES			
Project			
TOLLGATE MOTOR HOTEL WROTHAM ROAD, GRAVESEND DA11 7NP			
Drawing Title			
TOPOGRAPHICAL SURVEY			
Drawn by DJ 25/03/13			
Survey Date March 2013			
Checked by BM 25/03/13			
Scale 1:200			
Drawing No 10915-1			
Version A			

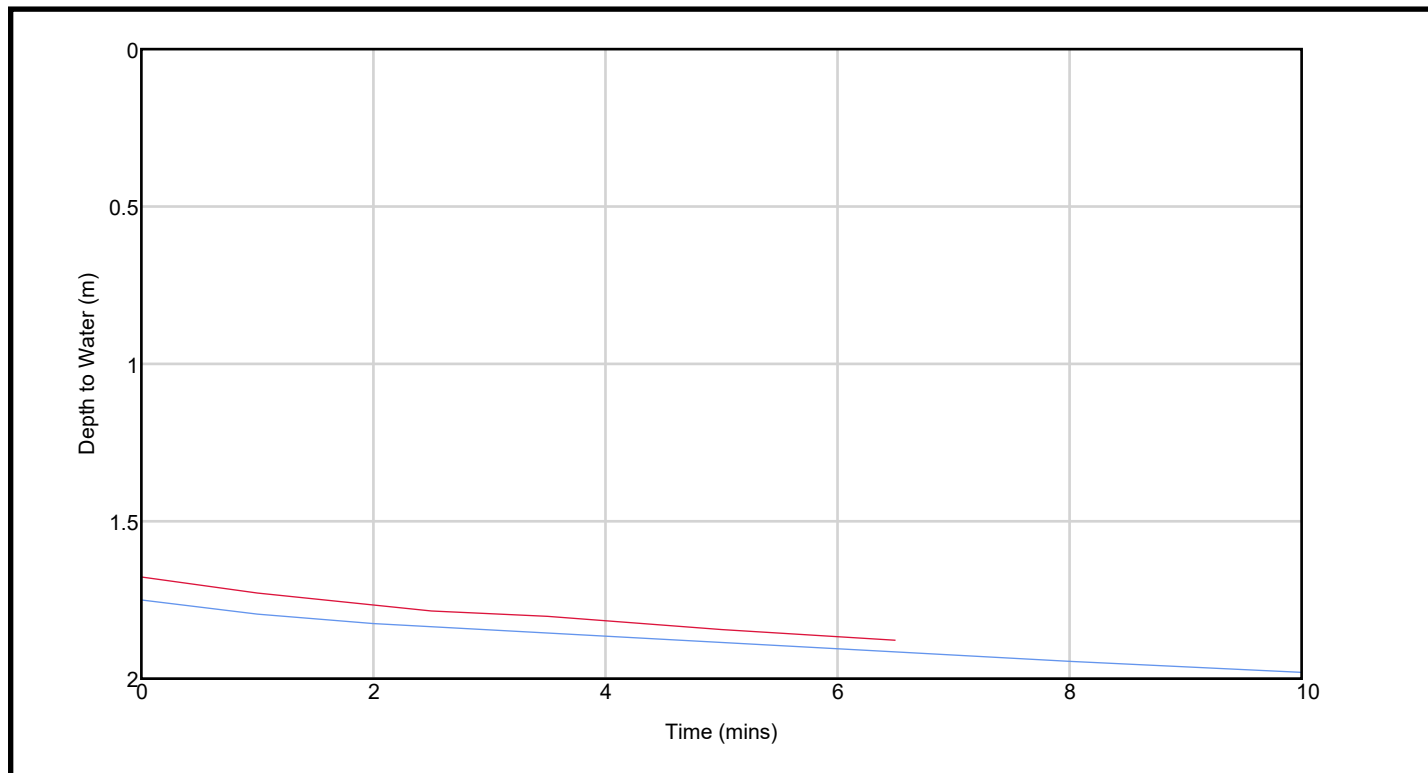
[illegible]

APPENDIX C

Infiltration Testing

Soakaway Test - TP001

Project Name	Tollgate, Gravesend	Date	15th August 2012
Project Code	BP12954	Technician	Steven Partridge
Test	BRE Special Digest 365	Permeability	0.00021779m/sec*



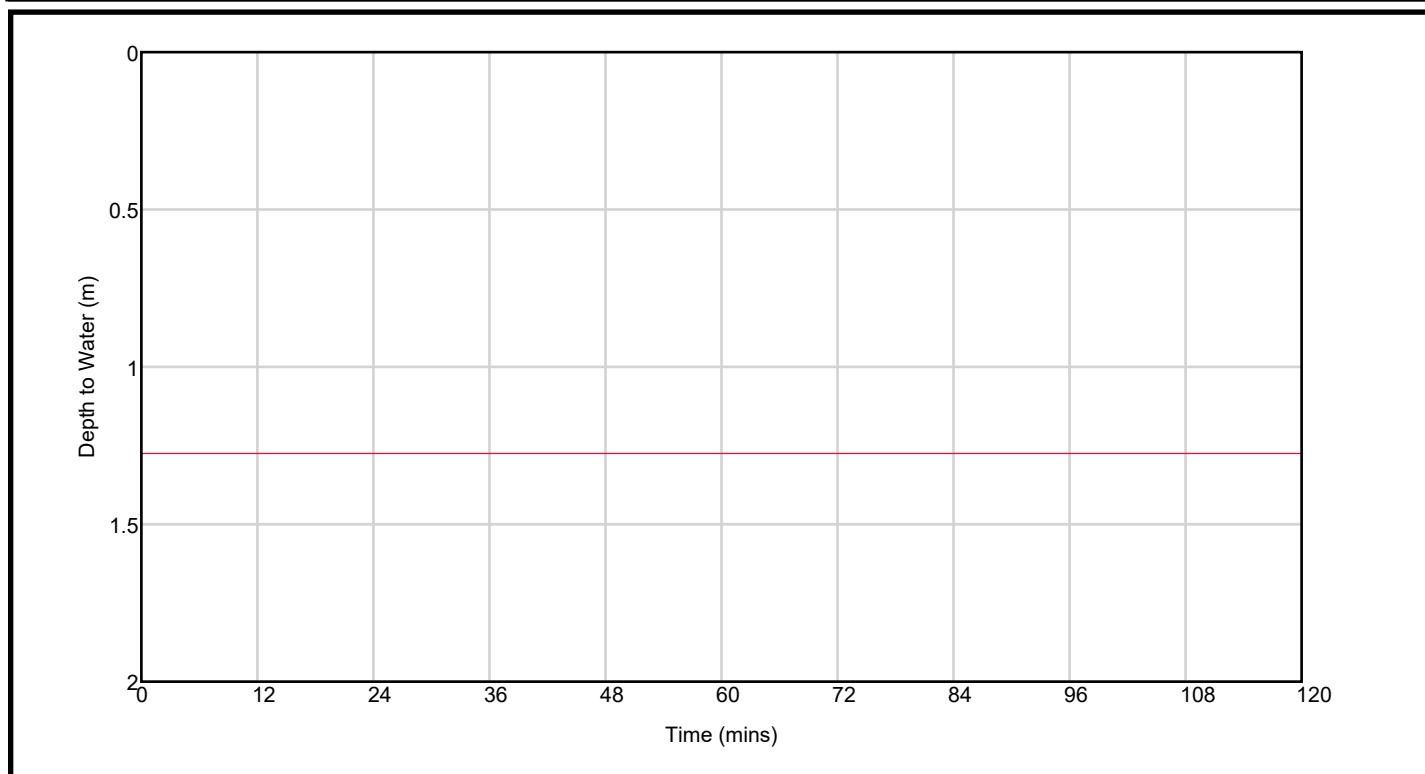
First Fill		Second Fill		Third Fill	
Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)
0.00	1.677	0.00	1.750		
1.00	1.728	1.00	1.795		
2.50	1.785	2.00	1.825		
3.50	1.802	3.00	1.845		
5.00	1.844	5.00	1.885		
6.50	1.878	8.00	1.945		
		10.00	1.980		
T75 (mins)	1.78	T75 (mins)	1.58		
T25 (mins)	8.32*	T25 (mins)	7.63		
Permeability (m/day)	20.29*	Permeability (m/day)	18.82		

* Interpolated data. Insufficient time to complete test.

 Prism.NET www.prismerp.co.uk	Pit Length	1.50m	Backfill	None
	Pit Width	0.60m	Number of Cycles	Two
	Pit Depth	2.00m	Page	One of One

Soakaway Test - TP002

Project Name	Tollgate, Gravesend	Date	15th August 2012
Project Code	BP12954	Technician	Steven Partridge
Test	BRE Special Digest 365	Permeability	Insufficient data.



First Fill		Second Fill		Third Fill	
Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)
0.00	1.275				
1.00	1.275				
2.00	1.275				
3.00	1.275				
5.00	1.275				
10.00	1.275				
20.00	1.275				
30.00	1.275				
40.00	1.275				
60.00	1.275				
90.00	1.275				
120.00	1.275				

 Prism.NET www.prismerp.co.uk	Pit Length	1.50m	Backfill	None
	Pit Width	0.60m	Number of Cycles	One
	Pit Depth	1.60m	Page	One of Two

Soakaway Test - TP002

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Tel: 01296 739400 Email: consultants@subadra.com

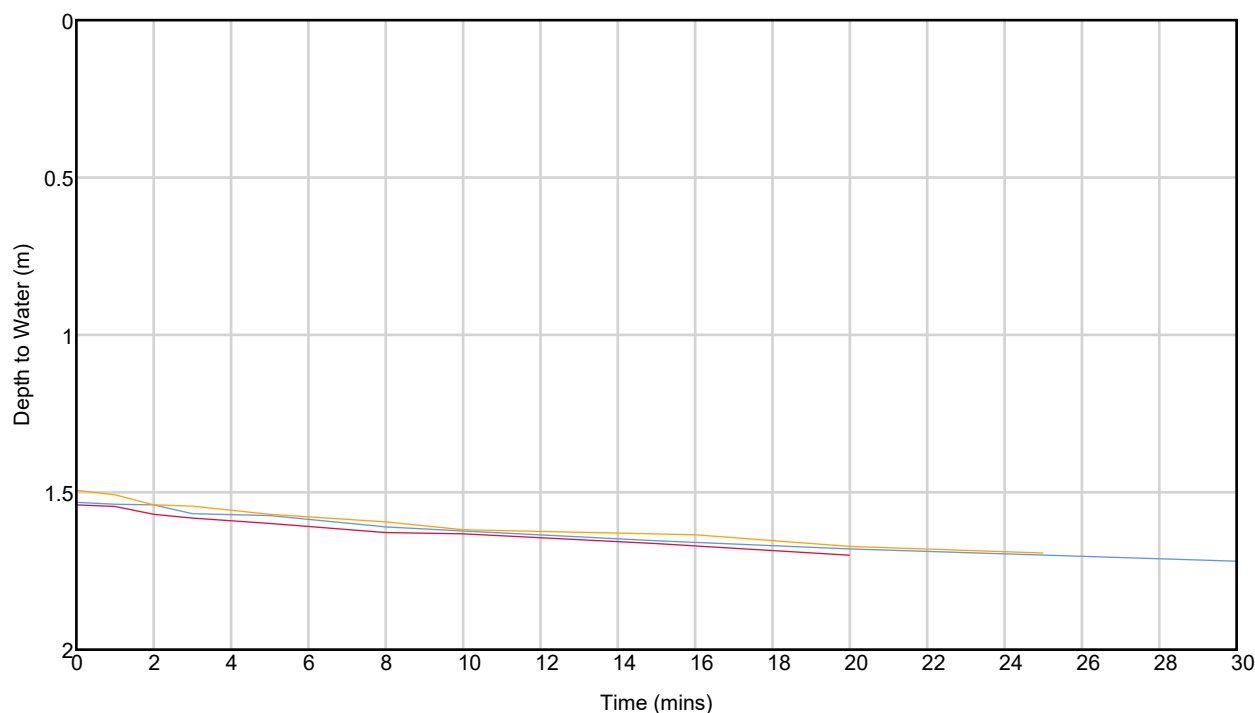
Project Name	Tollgate, Gravesend	Date	15th August 2012
Project Code	BP12954	Technician	Steven Partridge
Test	BRE Special Digest 365	Permeability	Insufficient data.

~~Interpolated data - Insufficient time to complete test~~

 Prism.NET www.prismerp.co.uk	Pit Length	1.50m	Backfill	None
	Pit Width	0.60m	Number of Cycles	One
	Pit Depth	1.60m	Page	Two of Two

Soakaway Test - TP003

Project Name	Tollgate, Gravesend	Date	15th August 2012
Project Code	BP12954	Technician	Steven Partridge
Test	BRE Special Digest 365	Permeability	0.00008082m/sec

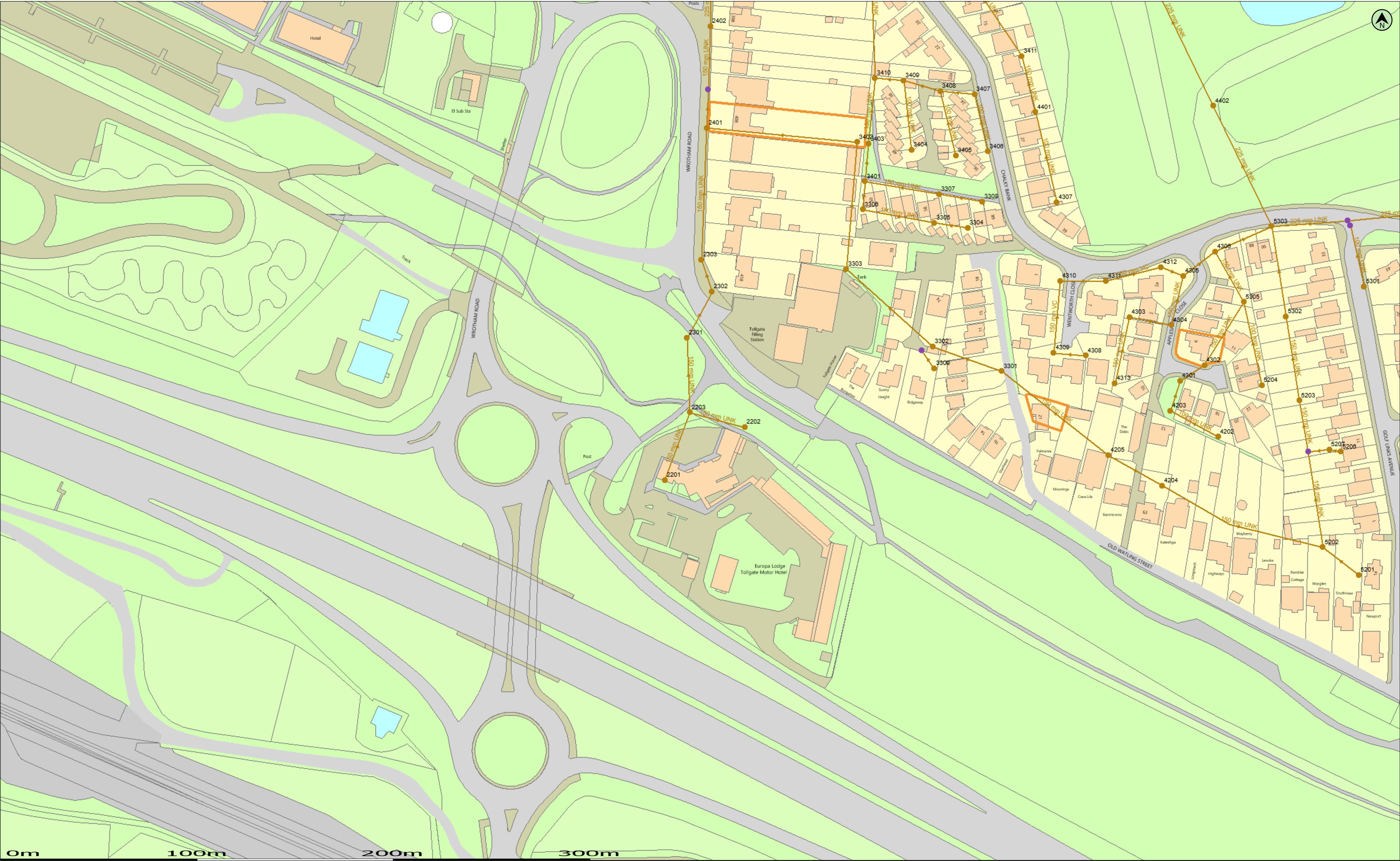


First Fill		Second Fill		Third Fill	
Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)
0.00	1.540	0.00	1.532	0.00	1.494
1.00	1.545	1.00	1.538	1.00	1.508
2.00	1.570	2.00	1.540	2.00	1.540
3.00	1.582	3.00	1.568	3.00	1.544
5.00	1.599	5.00	1.574	5.00	1.570
8.00	1.628	8.00	1.610	8.00	1.594
10.00	1.632	10.00	1.623	10.00	1.619
15.00	1.663	15.00	1.654	16.00	1.635
20.00	1.700	20.00	1.680	20.00	1.672
		30.00	1.719	25.00	1.693
T75 (mins)	2.83	T75 (mins)	5.00	T75 (mins)	3.12
T25 (mins)	14.52	T25 (mins)	15.77	T25 (mins)	17.46
Permeability (m/day)	7.18	Permeability (m/day)	8.07	Permeability (m/day)	6.98

Pit Length	1.50m	Backfill	None
Pit Width	0.60m	Number of Cycles	Three
Pit Depth	1.70m	Page	One of One

APPENDIX D

Public Sewer Record



(c) Crown copyright and database rights 2022 Ordnance Survey 100031673

Date: 09/09/22

Scale: 1:1250

Map Centre: 564231,171276

Data updated: 16/08/22

Our Ref: 947796 - 1

Wastewater Plan A2

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

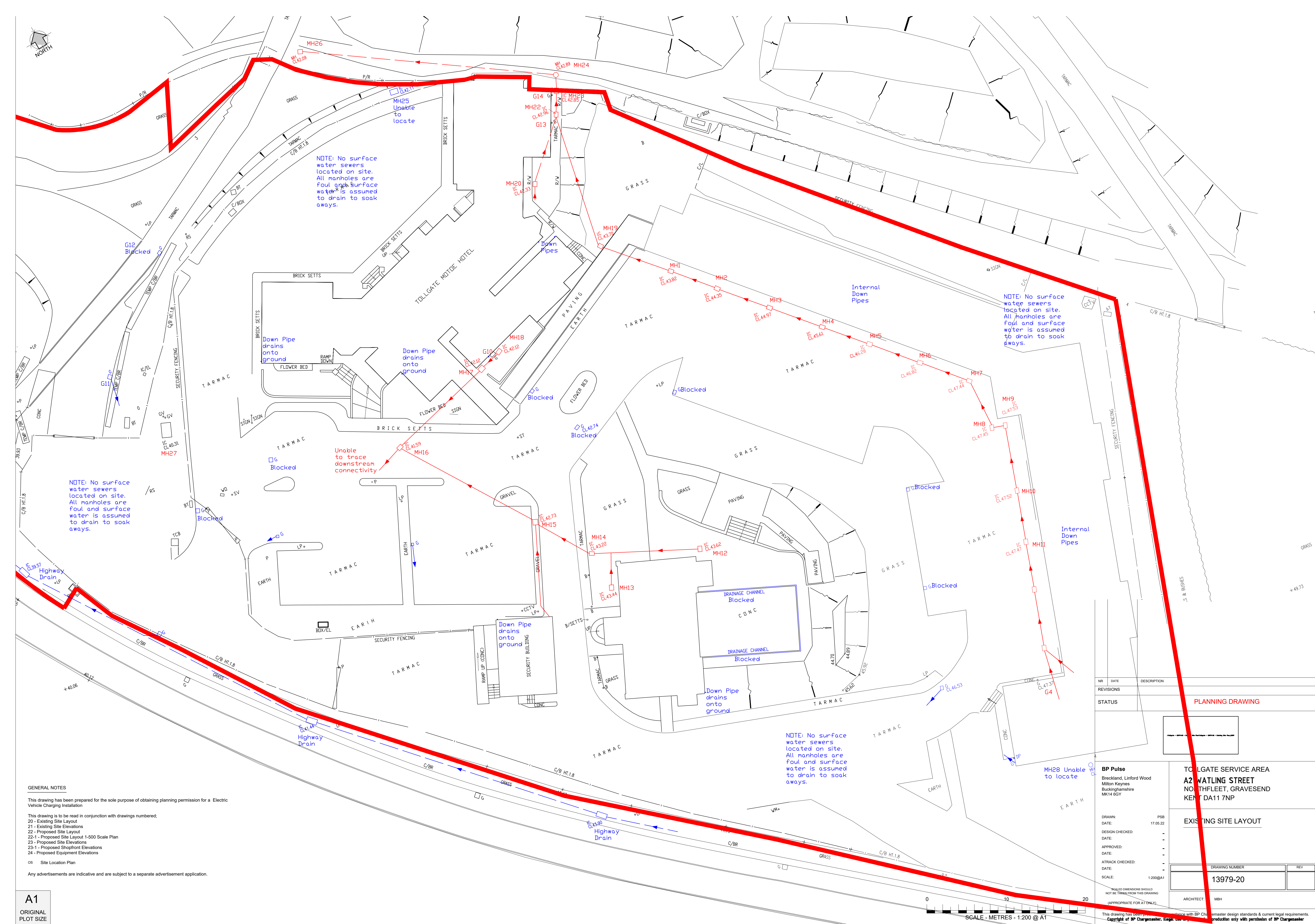
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

info@weetwood.net
5595 Tollgate Hotel



APPENDIX E

Drainage Survey



APPENDIX F

Surface Water Attenuation - Storage Volume Calculation

Weetwood		Page 1
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions		Network 2020.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 564323 171200 TQ 64323 71200
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.000
Maximum Backdrop Height (m)	0.000
Min Design Depth for Optimisation (m)	0.000
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall SHEADWALL-BASIN (pipe S1.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.120	4-8	0.024

Total Area Contributing (ha) = 0.144

Total Pipe Volume (m³) = 4.254

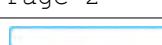
Time Area Diagram at outfall S2.4 - INFIL TANK (pipe S2.004)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.178	4-8	0.033

Total Area Contributing (ha) = 0.211

Total Pipe Volume (m³) = 4.913

©1982-2020 Innovyze

Weetwood		Page 2
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

Time Area Diagram at outfall S4.3 - INFIL TANK (pipe S4.003)

Total Area Contributing (ha) = 0.274

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S1.000	38.957	2.050	19.0	0.070	5.00		0.0 0.600	o	300	Pipe/Conduit		
S1.001	14.201	1.400	10.1	0.051	0.00		0.0 0.600	o	300	Pipe/Conduit		
S1.002	6.030	0.050	120.6	0.023	0.00		0.0 0.600	o	300	Pipe/Conduit		
S1.003	1.000	0.000	0.0	0.000	0.00		0.0 0.600	o	300	Pipe/Conduit		
S2.000	25.320	0.600	42.2	0.036	5.00		0.0 0.600	o	300	Pipe/Conduit		
S3.000	13.180	0.100	131.8	0.049	5.00		0.0 0.600	o	300	Pipe/Conduit		
S2.001	22.000	0.500	44.0	0.030	0.00		0.0 0.600	o	300	Pipe/Conduit		

Network Results Table

Weetwood		Page 3
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.002	3.000	0.050	60.0	0.096	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.003	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.004	1.000	0.000	0.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	5.000	0.150	33.3	0.217	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.001	5.000	0.150	33.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	12.435	0.300	41.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	45.000#	0.850	52.9	0.057	5.00	0.0	0.600	o	300	Pipe/Conduit	
S4.003	1.000	0.000	0.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.002	50.00	5.35	39.800	0.211	0.0	0.0	0.0	2.03	143.7	28.6
S2.003	50.00	5.41	39.650	0.211	0.0	0.0	0.0	1.57	111.1	28.6
S2.004	50.00	5.52	39.600	0.211	0.0	0.0	0.0	0.15	10.5«	28.6
S4.000	50.00	5.03	41.250	0.217	0.0	0.0	0.0	2.73	193.2	29.4
S4.001	50.00	5.06	41.050	0.217	0.0	0.0	0.0	2.73	193.2	29.4
S4.002	50.00	5.15	40.900	0.217	0.0	0.0	0.0	2.45	173.1	29.4
S5.000	50.00	5.35	41.450	0.057	0.0	0.0	0.0	2.17	153.1	7.7
S4.003	50.00	5.46	40.600	0.274	0.0	0.0	0.0	0.15	10.5«	37.1

Weetwood		Page 8
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.070	0.070	0.070
1.001	-	-	100	0.051	0.051	0.051
1.002	-	-	100	0.023	0.023	0.023
1.003	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.036	0.036	0.036
3.000	-	-	100	0.049	0.049	0.049
2.001	-	-	100	0.030	0.030	0.030
2.002	-	-	100	0.096	0.096	0.096
2.003	-	-	100	0.000	0.000	0.000
2.004	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.217	0.217	0.217
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.057	0.057	0.057
4.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.629	0.629	0.629

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

S1.003	SHEADWALL-BASIN	38.750	37.250	0.000	0	0
--------	-----------------	--------	--------	-------	---	---

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

S2.004	S2.4 - INFIL TANK	41.700	39.600	0.000	1500	0
--------	-------------------	--------	--------	-------	------	---

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

S4.003	S4.3 - INFIL TANK	42.700	40.600	0.000	1500	0
--------	-------------------	--------	--------	-------	------	---

Weetwood		Page 10
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

Online Controls for Storm

Pump Manhole: S1.3-DUMMY (BASIN), DS/PN: S1.003, Volume (m³): 0.4

Invert Level (m) 37.250

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

Pump Manhole: S2.4-DUMMY (TANK), DS/PN: S2.004, Volume (m³): 2.4

Invert Level (m) 39.600

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

Pump Manhole: S4.3-DUMMY (TANK), DS/PN: S4.003, Volume (m³): 6.1

Invert Level (m) 40.600

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

Weetwood		Page 12
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

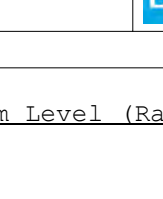
Time Area Diagram for Green Roof at Pipe Number S5.000 (Storm)

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
80 84	0.000127	92 96	0.000070	104 108	0.000038	116 120	0.000021
84 88	0.000104	96 100	0.000057	108 112	0.000031		
88 92	0.000085	100 104	0.000047	112 116	0.000026		

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S1.0	1.696	2.669	0.000	4.365
S1.001	S1.1	2.036	0.919	0.000	2.955
S1.002	S1.2	1.923	0.384	0.000	2.306
S1.003	S1.3-DUMMY (BASIN)	0.000	0.071	84.936	85.007
S2.000	S2.0	1.696	1.705	0.000	3.401
S3.000	S3.0	2.205	0.847	0.000	3.052
S2.001	S2.1	2.375	1.470	0.000	3.845
S2.002	S2.2	2.149	0.148	0.000	2.297
S2.003	S2.3 - B.S.	0.580	0.290	0.000	0.869
S2.004	S2.4-DUMMY (TANK)	2.149	-0.025	159.667	161.791
S4.000	S4.0	1.696	0.290	0.000	1.986
S4.001	S4.1 - F.R.S.	0.481	0.290	0.000	0.770
S4.002	S4.2	2.036	0.794	0.000	2.830
S5.000	S5.0	0.339	3.117	0.000	3.457
S4.003	S4.3-DUMMY (TANK)	2.149	-0.025	121.651	123.775
Total		23.510	12.944	366.253	402.708

Weetwood		Page 13	
Joseph's Well		5595	
Hanover Walk		Wrotham Road, Gravesend	
Leeds, LS3 1AB		Surface Water Calculations	
Date 02/02/2023 17:06		Designed by TB	
File 2023-02-02 5595 R1.MDX		Checked by	
XP Solutions		Network 2020.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	1
Number of Online Controls	3	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 564323 171200 TQ 64323 71200
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 35, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S1.000	S1.0	15 minute 2 year Winter I+0%	42.250	40.792	-0.258	0.000
S1.001	S1.1	15 minute 2 year Winter I+0%	40.500	38.749	-0.251	0.000
S1.002	S1.2	30 minute 2 year Winter I+0%	39.000	37.691	0.091	0.000
S1.003	S1.3-DUMMY (BASIN)	30 minute 2 year Winter I+0%	38.750	37.689	0.139	0.000
S2.000	S2.0	15 minute 2 year Winter I+0%	42.400	40.938	-0.262	0.000
S3.000	S3.0	15 minute 2 year Winter I+0%	42.350	40.464	-0.236	0.000
S2.001	S2.1	15 minute 2 year Winter I+0%	42.400	40.370	-0.230	0.000
S2.002	S2.2	15 minute 2 year Winter I+0%	41.700	39.954	-0.146	0.000
S2.003	S2.3 - B.S.	15 minute 2 year Winter I+0%	41.700	39.804	-0.146	0.000
S2.004	S2.4-DUMMY (TANK)	240 minute 2 year Winter I+0%	41.500	39.744	-0.156	0.000

©1982-2020 Innovyze

Weetwood		Page 16
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions		Network 2020.1

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 1
 Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
 FEH Rainfall Version 2013
 Site Location GB 564323 171200 TQ 64323 71200
 Data Type Point
 Cv (Summer) 0.750
 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status OFF
 DVD Status ON
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 35, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S1.000	S1.0	15 minute 30 year Winter I+35%	42.250	40.829	-0.221	0.000
S1.001	S1.1	15 minute 30 year Winter I+35%	40.500	38.796	-0.204	0.000
S1.002	S1.2	60 minute 30 year Winter I+35%	39.000	38.256	0.656	0.000
S1.003	S1.3-DUMMY (BASIN)	60 minute 30 year Winter I+35%	38.750	38.225	0.675	0.000
S2.000	S2.0	15 minute 30 year Winter I+35%	42.400	40.970	-0.230	0.000
S3.000	S3.0	15 minute 30 year Winter I+35%	42.350	40.518	-0.182	0.000
S2.001	S2.1	15 minute 30 year Winter I+35%	42.400	40.436	-0.164	0.000
S2.002	S2.2	15 minute 30 year Winter I+35%	41.700	40.307	0.207	0.000
S2.003	S2.3 - B.S.	360 minute 30 year Winter I+35%	41.700	40.121	0.171	0.000
S2.004	S2.4-DUMMY (TANK)	360 minute 30 year Winter I+35%	41.500	40.120	0.220	0.000

©1982-2020 Innovyze

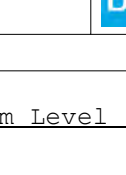


Micro
Drainage

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S4.000	S4.0	15 minute 30 year Winter I+35%	42.750	41.615	0.065	0.000
S4.001	S4.1 - F.R.S.	15 minute 30 year Winter I+35%	42.750	41.400	0.050	0.000
S4.002	S4.2	15 minute 30 year Winter I+35%	42.700	41.111	-0.089	0.000
S5.000	S5.0	30 minute 30 year Winter I+35%	42.650	41.490	-0.260	0.000
S4.003	S4.3-DUMMY (TANK)	120 minute 30 year Winter I+35%	42.500	41.100	0.200	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe	Status
					Flow (l/s)	
S4.000	S4.0	1.16		0.407	112.8	SURCHARGED
S4.001	S4.1 - F.R.S.	1.17		0.313	113.9	SURCHARGED
S4.002	S4.2	0.83		0.356	114.4	OK
S5.000	S5.0	0.04		0.010	6.1	OK
S4.003	S4.3-DUMMY (TANK)	0.00		78.632	0.0	SURCHARGED

Weetwood		Page 19
Joseph's Well	5595	
Hanover Walk	Wrotham Road, Gravesend	
Leeds, LS3 1AB	Surface Water Calculations	
Date 02/02/2023 17:06	Designed by TB	
File 2023-02-02 5595 R1.MDX	Checked by	
XP Solutions	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)

for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	1
Number of Online Controls	3	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 564323 171200 TQ 64323 71200
Data Type	Point
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 35, 45

PN	US/MH Name	Event	US/CL (m)	Water	Surcharged	Flooded
				Level (m)	Depth (m)	Volume (m ³)
S1.000	S1.0	15 minute 100 year Winter I+45%	42.250	40.845	-0.205	0.000
S1.001	S1.1	15 minute 100 year Winter I+45%	40.500	38.816	-0.184	0.000
S1.002	S1.2	60 minute 100 year Winter I+45%	39.000	38.493	0.893	0.000
S1.003	S1.3-DUMMY (BASIN)	60 minute 100 year Winter I+45%	38.750	38.443	0.893	0.000
S2.000	S2.0	480 minute 100 year Winter I+45%	42.400	41.012	-0.188	0.000
S3.000	S3.0	480 minute 100 year Winter I+45%	42.350	41.012	0.312	0.000
S2.001	S2.1	480 minute 100 year Winter I+45%	42.400	41.012	0.412	0.000
S2.002	S2.2	480 minute 100 year Winter I+45%	41.700	41.011	0.911	0.000
S2.003	S2.3 - B.S.	480 minute 100 year Winter I+45%	41.700	41.010	1.060	0.000
S2.004	S2.4-DUMMY (TANK)	480 minute 100 year Winter I+45%	41.500	41.009	1.109	0.000

©1982-2020 Innovyze



Micro
Drainage

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH		Event	US/CL (m)	Water	Surcharged	Flooded
	Name				Level (m)	Depth (m)	Volume (m³)
S4.000	S4.0	15 minute	100 year Winter I+45%	42.750	42.021	0.471	0.000
S4.001	S4.1 - F.R.S.	15 minute	100 year Winter I+45%	42.750	41.637	0.287	0.000
S4.002	S4.2	180 minute	100 year Winter I+45%	42.700	41.402	0.202	0.000
S5.000	S5.0	30 minute	100 year Winter I+45%	42.650	41.498	-0.252	0.000
S4.003	S4.3-DUMMY (TANK)	180 minute	100 year Winter I+45%	42.500	41.397	0.497	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe	Status
					Flow (l/s)	
S4.000	S4.0	1.58		0.867	153.6	SURCHARGED
S4.001	S4.1 - F.R.S.	1.58		0.454	153.3	SURCHARGED
S4.002	S4.2	0.29		0.852	39.1	SURCHARGED
S5.000	S5.0	0.06		0.012	8.7	OK
S4.003	S4.3-DUMMY (TANK)	0.00		125.119	0.0	SURCHARGED

APPENDIX G

Preliminary Surface Water Drainage Layout



NOTES

- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS.
- ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
- ALL LEVELS IN METRES.
- ALL PROPOSED DRAINAGE TO BE MINIMUM 1500 UNLESS NOTED OTHERWISE.
- MINIMUM GRADIENTS UNLESS NOTED OTHERWISE:
5.1. 1500 FOUL WATER = 1:130
5.2. 1500 SURFACE WATER = 1:100
- ALL RAINWATER PIPES MUST BE FITTED WITH A RODDABLE ACCESS ABOVE GROUND.
- ALL PRIVATE DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH PART H OF THE BUILDING REGULATIONS AND BS EN 752 & 12056.
- PRIVATE DRAINAGE TO BE 1500 UPVC PIPES WITH GRP OR UPVC INSPECTION CHAMBERS. SYSTEM DESIGN & CONSTRUCTION TO CONFORM WITH MANUFACTURER'S INSTRUCTIONS & 'GOOD PRACTICE GUIDE'.
- DEVELOPMENT PROPOSALS TAKEN FROM BP PULSE 'PROPOSED SITE LAYOUT' (REF: 13979-22-1 REV B, AUG 2022).
- EXISTING DRAINAGE INFORMATION TAKEN FROM BP PULSE EXISTING SITE LAYOUT (REF: 13979-20, MAY 2022).
- EXISTING DRAINAGE INFORMATION TAKEN FROM SOUTHERN WATER PUBLIC SEWER RECORDS (REF: 947796 - 1, AUG 2022).
- EXISTING LEVEL INFORMATION TAKEN FROM MALCOLM HUGHES LAND SURVEYORS 'TOPOGRAPHICAL SURVEY' DRAWING (REF: 10915-1 REV A, MAR 2013).
- INFILTRATION TESTING RESULTS TAKEN FROM SUBADRA 'INFILTRATION TEST REPORT' (REF: BP12954 CL 007, DEC 2022) AND INDIVIDUAL SOAKAWAY TEST RESULTS (REF: BP12954, AUG 2012).

KEY

- EXISTING FOUL WATER SEWER
- PROPOSED FUEL SPILLAGE SEWER
- PROPOSED SURFACE WATER SEWER
- PROPOSED FUEL AREA CHANNEL DRAIN (TO COLLECT SPILLAGES, ETC.)
- PROPOSED CHANNEL DRAIN
- PROPOSED ABANDONED SEWER
- EXISTING FOUL WATER MANHOLE
- PROPOSED FUEL SPILLAGE MANHOLE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED FILTER DRAIN
- PROPOSED PERMEABLE PAVING
- PROPOSED INFILTRATION BASIN
- PROPOSED GEO-CELLULAR INFILTRATION TANK
- PROPOSED GREEN ROOF
- SEWER EASEMENT
- EXCEEDANCE FLOW ROUTE
- SITE BOUNDARY
- EXISTING GROUND LEVEL
- PROPOSED GROUND LEVEL (BY OTHERS)
- INFILTRATION TEST LOCATION

DRAINAGE SURVEY (PREPARED BY BP PULSE, REF: 13979-20, MAY 2022) STATES NO SURFACE WATER SEWERS ARE PRESENT ON SITE AND IT IS ASSUMED ALL SURFACE WATER RUNOFF DISCHARGES VIA SOAKAWAY. ALL EXISTING PRIVATE DRAINAGE NOT SHOWN ON PLAN TO BE GRUBBED UP.

P1	10.02.23	INITIAL ISSUE	TB	DH
REV	DATE	DESCRIPTION	DRAWN CHECK	
Client BP INTERNATIONAL				
Drawing Status		Date	FEB 2023	
PRELIMINARY		Scale (A0)	1:250	
Project		Drawn	TB	
TOLLGATE SERVICE AREA WATLING STREET GRAVESEND		Checked	DH	
Project No		5595		
Drawing No		104		
Title		PROPOSED SURFACE WATER DRAINAGE LAYOUT	Revision P1	

Delivering client focussed services nationally

Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
River Realignment and Restoration
Water Framework Directive Assessments
Environmental Permit and Land Drainage Applications
Sequential, Justification and Exception Tests
Utility Assessments
Expert Witness and Planning Appeals
Discharge of Planning Conditions

www.weetwood.net