

452 Basingstoke Road, Reading RG2 0QE
November 2016

Procter & Gamble Ltd P&G Reading Innovation Centre Flood Risk Assessment



**Flood Risk Assessment
&
Government SUDS Guidance (March 2015) Planning Report
&
Preliminary Drainage Strategy & Calculations**
(undertaken by ARUP to be commensurate with scale and stage of scheme)

Procter & Gamble Ltd
P&G Reading Innovation Centre

at:

452 Basingstoke Road Reading RG2 0QE

18 November 2016

ARK Environmental Consultancy Ltd

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1.0 Scope

This report contains the details of an FRA & SUDS Strategy for Planning carried out by Ark Environmental Consulting Limited ("ARK Ltd") for the Procter & Gamble Ltd P&G Reading Innovation Centre at 452 Basingstoke Road Reading RG2 0QE, henceforth referred to as "the site" in this report.

This report has been prepared for ARUP and must not be relied upon by any other party without the explicit written permission of ARK Ltd.

All parties to this report do not intend any of the terms of the Contracts (Right of Third Parties Act 1999) to apply to this report.

Please note this report does not purport to provide definitive legal advice nor can it be used to demonstrate that the site will never flood in the future.

The Executive Summary contains an overview of key findings and conclusions. However, no reliance should be placed on the Executive Summary until the whole of the report has been read.

Other sections of the report may contain information which puts into context the findings noted within the Executive Summary.

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Executive Summary

The proposed development is categorised as "Less Vulnerable" in accordance with the NPPF; it is therefore an appropriate type of development within Flood Zone 1.

The proposed scheme incorporates suitable drainage, flood resilient and resistant measures including:

- Being located in an area of Flood Zone 1
- Resilient building construction techniques
- New drainage strategy incorporating SUDS
- SUDS options have been sized appropriately and can be incorporated within the scheme
- Reduces flood risk overall with on-site surface water storage betterment
- New climate change allowances have been accommodated

The site is within a low probability area of flooding; based on the likely flooding risk, it is considered that the proposed development could be constructed and operated safely in flood risk terms without increasing flood risk elsewhere, in fact creating a betterment and is therefore appropriate development in accordance with the NPPF/NPPG 2015.

2.0 Purpose of the Report

The report provides the following information:

- An assessment of the flood risk posed to the site based on flood information and mapping provide by the EA and Strategic Flood Risk Assessment (SFRA);
- An assessment of the proposed development in terms of surface water run-off; and
- Proposals for measures to mitigate the flood risks posed to and from the development where appropriate

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- A review of the drainage strategy and calculations undertaken by ARUP
 - Standard recommended proposals for measures to mitigate the surface water risks posed to and from the development where appropriate.

2.1 March 2015 SUDS Guidance

Additional information provided in this report is considered commensurate with the stage and design of the scheme, compliant with the March 2015 SUDS guidance.

The report and Drainage Strategy undertaken by ARUP:

- confirms the likely greenfield runoff rate to restrict the scheme post development
- provides calculations of the appropriate storm storage required to meet this greenfield rate and address climate change
- recommend the SUDS techniques and sizes feasible in order to meet the storage volume required and where feasible reduce flood risk overall

3.0 Overview of British Legislation

3.1 National Planning Policy

Note: where the report references NPPF this also covers PPG 2015.

The National Planning Policy Framework (NPPF) and PPG 2015 supercede all Planning Policy Statements (PPS's) and remaining Planning Policy Guidance (PPG's). Flood risk is retained as a key development consideration and is incorporated within Section 10: "Meeting the challenge of climate change, flooding and coastal change":

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere."

3.2 Local Policy

Local Authorities consider flood risk including drainage requirements through relevant environmental and climate change policies which enforce the requirements of the NPPF. The Strategic Flood Risk Assessment (SFRA) and Preliminary Flood Risk Assessments are a key source of flood risk specific information for the area.

The SFRA/PFRA/SWMP/LFRMS provide a more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF and how they can reduce flood risk overall from surface water sources through appropriate drainage designs incorporating SUDS.

3.3 Report Information Sources

The information source used to undertake this FRA has been collected from the following sources:

- EA Data
- British Geological Survey Website
- EA Website
- Reading SFRA Level 1 & 2 (2008 & 2009)
- Reading and Surrey CC Joint Preliminary (Surface Water) Flood Risk Assessment (2011)
- Reading Local Flood Risk Management Strategy (2015)
- Reading Website;
- Internet mapping and searches

4.0 Site Status and Environmental Setting

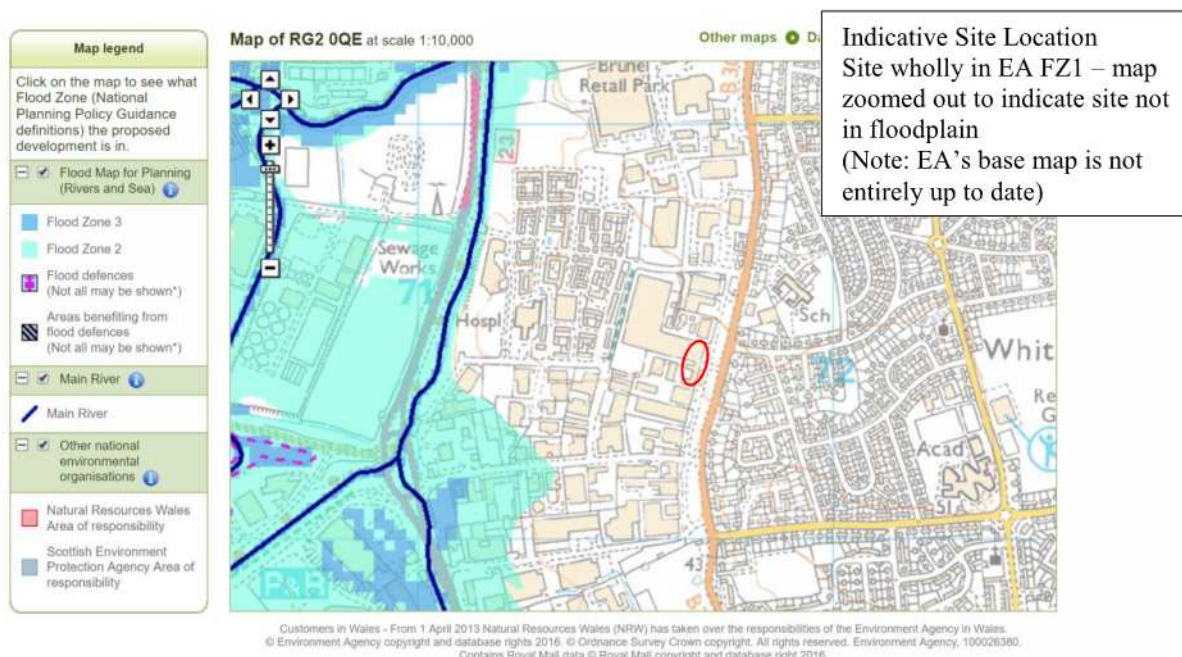
4.1 Site Location and Status

The site is c. 1.5 hectares and comprises existing industrial / commercial buildings and ancillary uses including parking, outbuildings and soft landscaping. The site location plan can be seen in Appendix A. The site is wholly in FZ1; access / egress to Basingstoke Road is in FZ1 and unrestricted FZ1.

4.2 Existing drainage / SUDS & Geology

The site currently drains surface water and foul to sewers; the grassed non-hard areas are assumed to drain to ground i.e. infiltrate.

Geology is London Clay (as per the ground investigation report undertaken by ESG reference 3894819/PTE dated 21 April 2010 in Appendix C of the DAS) – infiltration is not likely a suitable drainage technique for this type of strata.



5.0 Existing Flood Risk

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site and Access / egress in FZ1 Low Risk	Scheme can reduce flood risk overall by new SUDS with storage on site and restricted discharge SUDS as feasible and practicable Refer to DAS and ARUP Drainage Strategy Proposed development is new build which can incorporate suitable mitigation measures.
Groundwater	SFRA indicates site not in potential elevated future groundwater risk area	The proposed development will not increase the risk of groundwater flooding; Low Risk
Artificial Sources	No artificial sources within 250m	Low Risk
Surface Water / Sewer Flooding	Site is not located within / adjacent a surface water risk zone / CDA or Local Flood Risk Zone Site is in general surface water risk area Condition, depth and location of surrounding infrastructure uncertain	Scheme can reduce flood risk overall by new SUDS with storage on site and restricted discharge: storage based on also new climate change allowances: 40% SUDS as feasible and practicable Refer to DAS and ARUP Drainage Strategy If required: external landscaping mitigation to encourage floodwaters away from access / egress points Development will have new connections to sewers, gravity drainage where feasible and non-return valves Drainage strategy to ensure development will not increase the peak flow or volume of discharge from the site: Low Risk No further surface water mitigation required
Climate Change	Included in the flood modelling extents Site not within climate change flood extent area	Development will not significantly increase the peak flow and volume of discharge from the site Low risk posed to and from the development

Reading Council Flood Risk Documents

Key documents: The 2015 Flood Risk Management Plan for Reading indicates that the site is not within a designated Local Flood Risk Zone; the nearest is the Stockton Road LFRZ which is to the west of the site and is the large residential area.

The SFRA's and PFRA do not indicate any other sources of flooding posed to the site and no site specific data or mapping were available at the time of writing.

6.0 Assessment of Proposed Development

6.1 Proposed Development

The proposed development can be seen in Appendix B.

The proposed development comprises:

- Redevelopment of the site to
 - Innovation Centre Building / Offices
 - Multi-Storey Car Park
 - Ancillary Buildings (substation, etc)
 - New Car Park Areas
 - New formal SUDS with underground storage (under car park areas)

6.2 Response to Standard LLFA Drainage Comments

1. Infiltration is the priority but given likely London Clay geology a soakaway system is not considered practicable; infiltration testing if required will be undertaken as part of detailed design
2. The drainage strategy (ARUP) demonstrates that the site can comply and accommodate climate change, including the new allowances (Feb 2016) and a betterment without infiltration through appropriate SUDS storage and restricted discharge
3. The storage has been sized using appropriate calculations
4. SUDS have been sized, specified and located on a schematic
5. As per industry standard / Building Regs, the detailed design will incorporate appropriate oil interceptors / treatment devices to manage water quality
6. SUDS strategy takes into consideration the FZ1 setting of the site

6.3 Planning SUDS Strategy & Climate Change Accommodation

Foul

The development will retain existing and secure a new connection to adjacent sewers where appropriate for the foul. This will be confirmed during detailed design with the water company.

Surface Water

The drainage strategy undertaken by ARUP (refer to accompanying DAS Page 23 onwards) includes, as the critical element:

“4. Attenuate rainwater by storing in tanks for gradual release – Adopted for 56% of the site/ 100% of the undeveloped / redeveloped site (8,514m² of roof) of which 8,250m² is currently hardstanding with no water attenuation. Hence, a reduction of existing unattenuated discharge direct to the existing surface water sewers of 54% of the affected site.” (Arup, 2016)

“In light of Sustainable Design and Construction SPD (2011) Policy DM1, this application recognises the need for a sustainable and manageable drainage solution to minimise surface water runoff. It has therefore taken into account the full roof area of new buildings and the total footprint area of car parking spaces (equating to 8514m²), which results in a net reduction in surface area (circa. 6400m²) that produces run-off directly discharging into the surface water sewer.” (Arup, 2016)

This meets the 50% reduction and the betterment given the 6400m² of area that as existing discharges unattenuated: as a result of the scheme, this will be attenuated and hence restricted appropriately.

The volume of storage based on ARUP calculations required to meet this is c. 106m³.

DISCHARGE LOCATION / METHOD

New Build Area: On-site SUDS Storage and then Sewer: Restricted discharge from appropriately sized SUDS storage features to sewer.

Irrespective of discharge point:

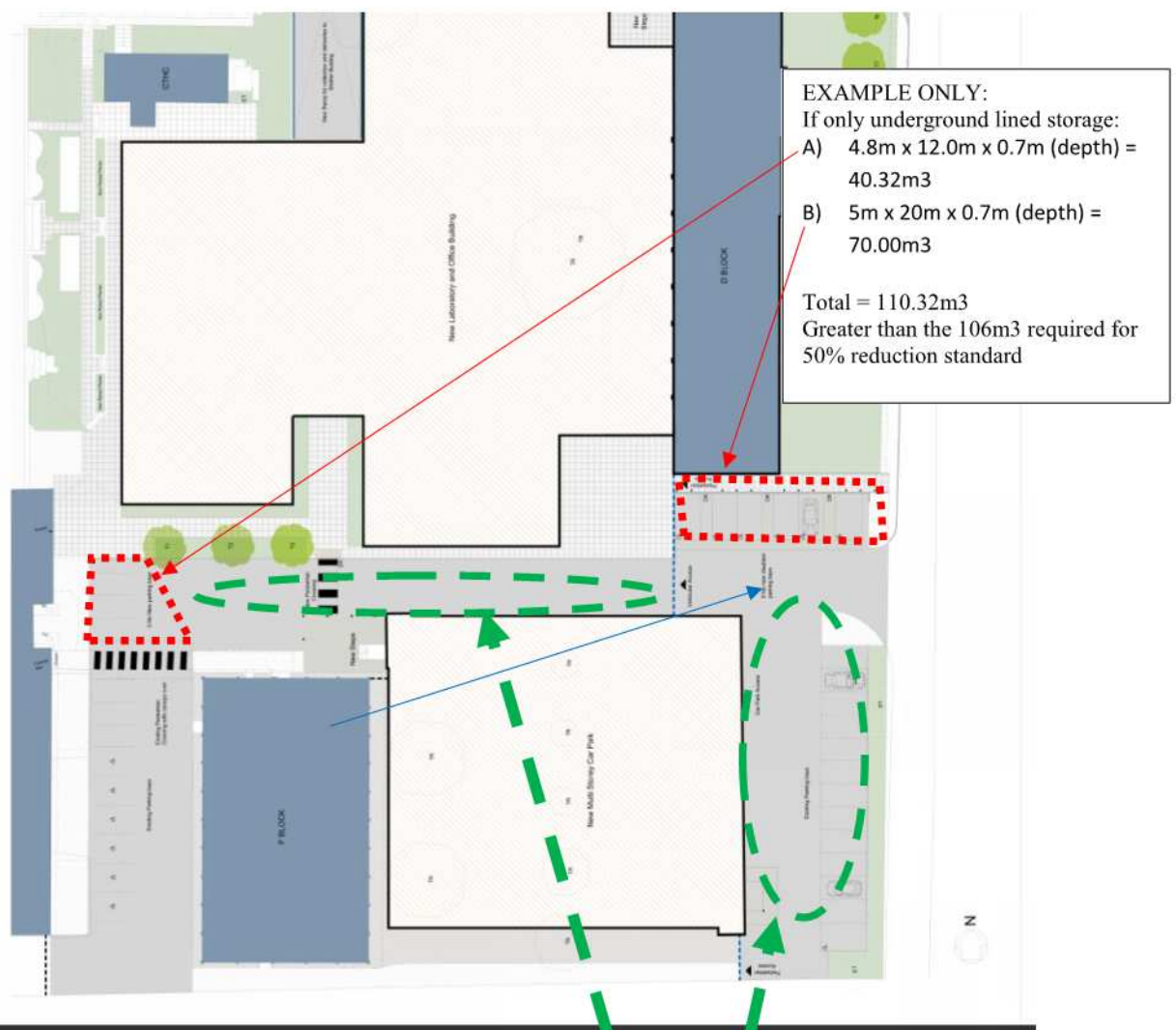
- Separate foul and surface
- Existing discharge rate will be geared towards the greenfield runoff rate

- Capacity to restrict the 1 in 100 year storm including for climate change (new allowances as of Feb 2016)
- The total storage volume needed for a 1 in 100 year storm event plus a 40% new allowance for climate change will be met by underground storage

Water quality: as per industry standard / Building Regs, the detailed design will incorporate appropriate oil interceptors / treatment devices. **Underground storage / tanking has only been recommended because a) surface SUDS are not appropriate at the site and b) the London Clay suggests infiltration is not feasible.**

6.4 Example Location and Size of SUDS schematic: 50% reduction standard

This provides an extract of the landscaped site only to demonstrate the scheme can meet the size of storage required:



Note: it is more likely that a greater depth of attenuation tank is installed to reduce the area required for surface dig, the above example areas are to demonstrate compliance is physically feasible only.

EXAMPLE ONLY TO DEMONSTRATE COMPLIANCE IS FEASIBLE:

Design for exceedance

The large areas of car park above ground are appropriate to be used to ensure no 5mm event leaving the site

This is not considered appropriate or commensurate with the stage and scale of the scheme; this has no bearing on the impacts of the scheme as these, together with manhole cover locations and designs etc will not be able or pragmatic to design until construction stage. Designing and sizing now would be totally abortive.

The appropriate storage amount has been demonstrated and also how this storage can be incorporated and even exceeded within the scheme has been shown.

SUDS elements have been sized and located.

This is appropriate in accordance with the SUDS Guidance and PPG 2015.

6.5 Sustainable Drainage Systems (SUDS)

Concept SUDS Strategy

The following diagram indicates the philosophy behind the proposed SUDS strategy, and is taken from the EA's SUDS guidance:



(Source: Environment Agency, 2009)

The Table below indicates the SUDS Hierarchy Appraisal for the site and proposed development:

Site Specific SUDS Appraisal

SUDS Hierarchy	SUDS Technique	Potential Benefits			Site Specific	
		Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	?	Scheme Specific SUDS Suitability Appraisal and Comment
↑ ↓ Most Sustainable Least Sustainable	Living Roofs	•	•	•	*	Could be Incorporated. Not included in drainage calcs at this stage (Blue, Green and Brown roofs)
	Ponds / Basins	•	•	•	x	Not likely appropriate given site constraints & uses
	Swales	•	•	•	x	Not likely appropriate given site constraints & uses
	Infiltration Techniques	•	•		x	DRAINAGE STRATEGY IS BASED ON STORAGE AND RESTRICTED DISCHARGE AS INFILTRATION IS NOT FEASIBLE GIVEN GROUND INVESTIGATION HAS CONFIRMED LONDON CLAY STRATA
	Permeable Surfaces and Filter Drains	•	•		✓	New & retained grassed areas and permeable paving. Subject to detailed drainage designs / ground conditions
	Tanked Systems	•			✓	Required as part of the drainage strategy, this would be used to ensure 1 in 100 year +cc storage can be achieved on site with 50% reduction as standard.

Key:

Potentially suitable at the site: *

Incorporated in the scheme: ✓

Not suitable / possible at the site: X

6.6 Climate Change – including 2016 revised allowances

The impact of climate change in accordance with the NPPF/PPG 2015 is likely to be an increase in the rainfall intensity in the future, which will increase peak storm flows to sewer. The proposed development will incorporate low flush and reduced water demand showers and toilets, such that the combined flows to sewer are likely to have a negligible impact. It is considered therefore that flows in the future are not likely to have a significant impact, even with an allowance for climate change.

There is unlikely to be an unacceptable impact on the receiving sewers owing to the increase in areas which will be attenuated using underground SUDS.

The 50% reduction and resulting SUDS storage volumes achievable by the scheme are considered appropriate to address the new 40% climate change allowances.

6.7 Flood Resilience

The proposed development will utilize the flood resilient techniques recommended in the NPPF Technical Guidance where appropriate and also the recommendations that have previously been issued by various councils.

These include:

- Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property
- The ground floor will be concrete in order to minimise damage and reduce the turnaround time for returning the property to full operation after a flood event
- Any wood fixings on ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event
- Airbricks will be raised to as high as is feasible and practicable
- The ground floor waterproofing will be extended to an appropriate level above existing ground levels.

6.8 Refuge and Evacuation

Range of Flood Events

The site is in FZ1 and therefore also outside of the flood extent in the unlikely event of a breach in the defences. The evacuation and flood management does not need to consider this fastest type of flood inundation.

Surface water flooding is unlikely to be of a long duration.

It is therefore considered likely that there would be sufficient time to seek refuge and/or evacuate to an area outside of the surface water flooding.

Floodwaters are not likely to reach the entrances given the highway is a preferential pathway.

6.9 Annual Monitoring

It is recommended that occupiers should contact the EA on an annual basis to confirm the flood status of the property.

If the flood status has changed, the evacuation and refuge plan should be reviewed and updated by suitable flood risk consultants as appropriate.

6.10 Flood Risk Vulnerability

The proposal is to retain the site as commercial / industrial use with additional new builds.

According to the NPPF retained Flood Risk Vulnerability Classification, the scheme would be categorised as “Less Vulnerable”.

The NPPF also retained Flood Risk Vulnerability and Flood Zone “Compatibility” Classification: this states that “Less Vulnerable” developments in Flood Zone 1 do not require the Exception Test to be passed.

Based on the data reviewed to date, the flood risk assessment recommends the scheme could be constructed and operated safely in flood risk terms without increasing flood risk elsewhere, in fact reducing flood risk overall given the increase in on site SUDS storage, which is acceptable in accordance with the NPPF / PPG 2015.

7.0 Conclusion

The scheme can address the residual flood risk by design and resilience and offer betterment and flood risk reduction by the SUDS strategy feasible at the site.

The EA website map, SFRA and available data indicate the proposed development site is within EA Flood Zone 1.

The proposed development is categorised as “Less Vulnerable” in accordance with the NPPF; it is therefore an appropriate type of development within Flood Zone 1.

The proposed scheme incorporates suitable flood resilient / resistant measures including:

- Being located in an area of Flood Zone 1
- Resilient building construction techniques
- New drainage strategy incorporating SUDS
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The site is within a low probability area of flooding; based on the likely flooding risk, it is considered that the proposed development could be constructed and operated safely in flood risk terms without increasing flood risk elsewhere, in fact creating a betterment and is therefore appropriate development in accordance with the NPPF/NPPG 2015.

7.1 Recommendations for Further Work

1. Design detailed drainage with underground storage under parking areas

8.0 Appendices

- A. Site Location & Existing Layout
- B. Proposed Development Plans

Appendices A & B

NOTES

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Scale 1:1250
1" = 50m

PLANNING

PD	30.13	based for Planning	AP
Rev	Date	Description	CHK

213 Brooklands Road
Weybridge
Surrey KT13 0RH
T 01932 550100
W www.dhnp.co.uk



Project
P&G Reading
452 Basingstoke Road
Reading RG2 0QE

Drawing
Existing Site Location Plan

Drawn By	SP	Date	10.16
Project Manager	Scale	1:1250	
Project No.	Drawing No.	Stage/Rev	
5504	1001	P / O	

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Scale 1:1250
0 50m

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Rev	Date	Description	Chk

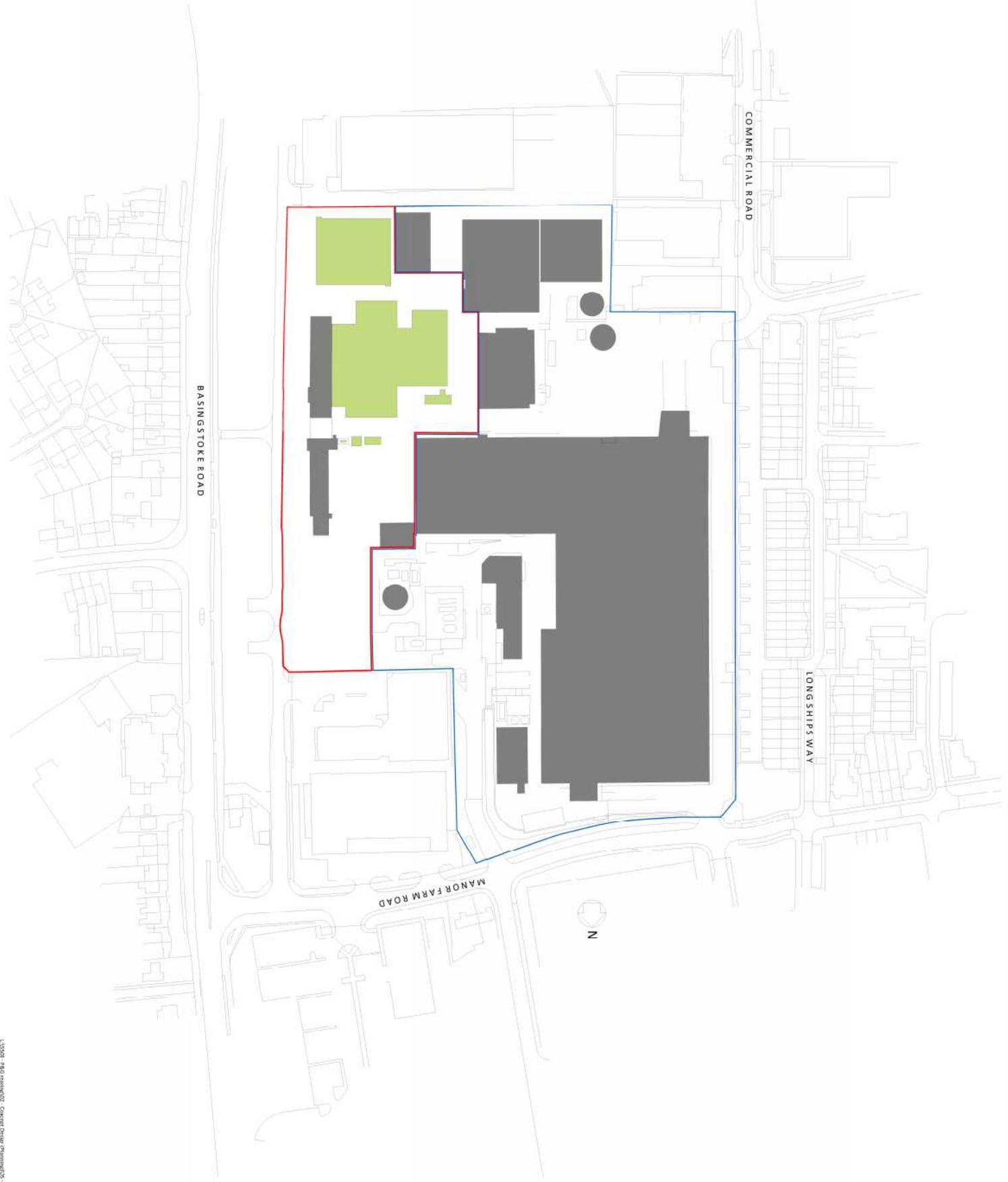
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Weybridge KT13 0RH
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Project
P&G Reading
452 Basingstoke Road
Reading RG2 0QE

Drawing
Proposed Site Location Plan

Drawn By	SP	Date	20.16
Project Manager	Scale	1:1250	
Project No.	Drawing No.	Stage/Rev	
5504	2000	P / 0	



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Project
P&G Reading
452 Basingstoke Road
Reading RG2 0QE

Drawing
Proposed Site Block Plan

Drawn By	SP	Date	20.16
Project Manager	Scale	1:500	
Project No.	Drawing No.	Stage/Rev	
5504	2010	P / 0	

KEY

ET Existing trees to remain

ET Trees to be removed

ET Proposed new street lighting type

ET Existing building / building

ET Grass / Surface

ET Existing buildings

ET Proposed buildings

ET Existing concrete paving to new footpaths

ET Concrete road and footpath edges

ET New 2.1m high Security fencing with
vehicle and pedestrian access gates

ET Hatched yellow line to designate
pedestrian safety zones

ET Access point: Vehicle / pedestrian

ET Tactile paving

ET External locked

ET Pedestrian Barriers

PLANNING

Rev	Date	Description	AP
1	11.11.18	Issue for Planning	Chk

203 Brooklands Road
Surrey KT13 0BH
01877 802000
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Project
P&G Reading
452 Basingstoke Road
Reading
RG2 0QE

Drawing
Proposed Landscape
Plan Sheet 2 of 2

Drawn By	QC	Chk	10.10
Project Manager	SP	1.10.18	
Project No.	Drawing No.	Stage/Rev	
5504	2096	P / O	