

**FLOOD CONSEQUENCE ASSESSMENT  
& DRAINAGE STRATEGY REPORT**  
*PREMIER INN MERTHYR TYDFIL  
DUFFRYN ROAD  
PENTREBACH  
CF48 4BB*

**PREPARED FOR:**



**JOB NO:** P24-0081  
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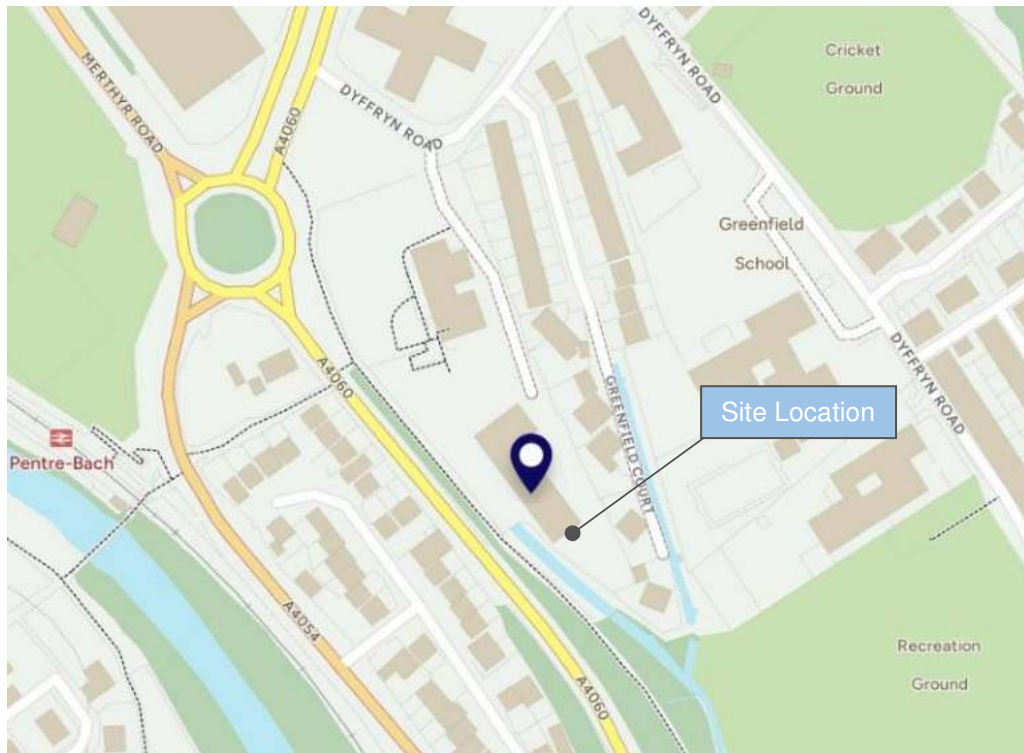
## 1. INTRODUCTION

- 1.1 This report has been prepared on behalf of Premier Inn Hotels Ltd. to accompany an application seeking permission for the construction of an extension of bedrooms to the existing Premier Inn hotel and associated hard and soft landscaping works.
- 1.2 This report assesses flood risk associated with the development proposals, generally following guidance set out in Welsh Government's "Technical Advice Note 15 (TAN15)", which provides guidance to local planning authorities (LPA's), developers, the public and Natural Resources Wales (NRW) on development and flood risk in Wales.
- 1.3 The report also details a strategy for the disposal of foul and surface water runoff from the development generally following guidance set out in the Welsh Government's "Statutory standards for sustainable drainage systems", which provides advice on designing, constructing, and maintaining surface water drainage systems in Wales.
- 1.4 Strategic Flood Consequence Assessment are studies that provide an assessment of the extent and nature of flood risk in the local area, allowing more detailed examination of the likely appropriateness of developing sites. The following reports are available on Merthyr Tydfil County Borough Council (MTCBC) website.
  - Welsh Assembly Government (WAG) Technical Advice Note 15 – Development and Flood Risk (TAN15)
  - Merthyr Tydfil County Borough Council Replacement Local Plan (2016- 2031)
  - Merthyr Tydfil County Borough Council – Merthyr Tydfil Strategic Flood Consequence Assessment June 2018
  - Merthyr Tydfil County Borough Council – Local Flood Risk Management Strategy April 2013

## 2. SITE AND DEVELOPMENT CHARACTERISTICS

### Site Location

- 2.1 The Premier Inn Merthyr Tydfil is located on Duffryn Road, Pentrebach as shown on *Figure 1*, below.



*Figure 1: Site Location*

- 2.2 The site is centred on Ordnance Survey grid reference SO 06187 03793 and co-ordinates X: 306187; Y: 203793. The site's post code is CF48 4BB.

### Site Description

- 2.3 The site comprises of the Premier Inn Merthyr Tydfil hotel, Pentrebach House Table restaurant and its adjoining parking and circulation area.
- 2.4 Vehicular access is gained from the A4060.

### Topography

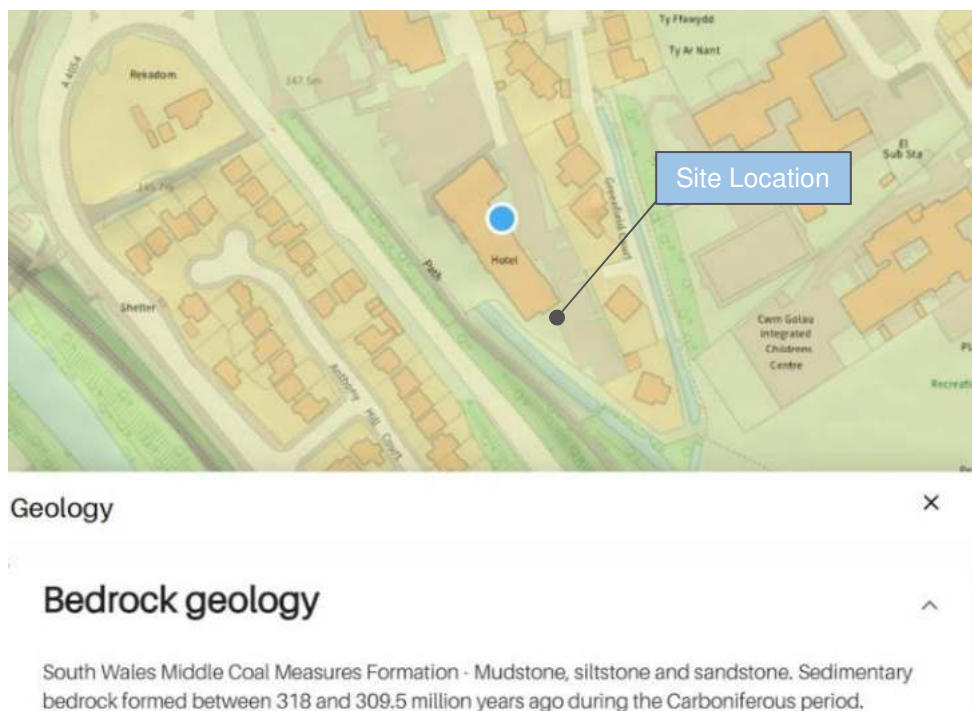
- 2.5 The topographical survey included in *Appendix A*, shows that the site, is relatively flat with levels around the existing hotel building typically between 145.50mAOD and 145.90mAOD. The existing ground floor level of the hotel is shown to be 145.90mAOD.

### Existing Ground Conditions

- 2.6 A site investigation was completed in 2019 by Enzygo and the ground conditions were noted to comprise of Made Ground over soft Alluvium becoming medium dense to dense sand and gravel below 3m bgl.

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- 2.7 The site investigation undertaken confirms the published geology and identifies the following strata:
- Made Ground – 0.5 to 1.0m thick strata of asphalt over dense black / grey mudstone gravel with occasional limestone and tarmac fragments between 0.5 – 1.0m thick.
  - Alluvium – 1.4 to 1.7m thick strata of soft brown and grey very silty clay with occasional gravel.
  - Alluvium – >1.1m thick strata of medium dense, becoming dense with depth brown sand and gravel.
- 2.8 Groundwater was encountered during subsequent monitoring in December 2018 and January 2019 at depths of at least 2.0m below ground.
- 2.9 The site investigation states that the site is shown to be at risk of groundwater flooding at surface from the superficial deposits. This is likely from fluvial flooding.
- 2.10 The site investigation conducted a preliminary soakaway test which gave a soil infiltration value of  $1 \times 10^{-3}$  m/s within the alluvium but it is considered that the soil infiltration rate is representative of the deeper sand and gravel soils, which are below groundwater depth. Based on the clayey nature of the shallow Alluvium and shallow groundwater within the underlying sand and gravels it is not considered that soakaway drainage is feasible.
- 2.11 *Figure 2* below shows mapping obtained from the British Geological Society (BGS) which identifies the bedrock geology beneath the site to comprise of South Wales Middle Coal Measures Formation – comprising of mudstone, siltstone and sandstones.



*Figure 2: BGS Geology Viewer*

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## Existing Drainage Arrangements

- 2.12 Figure 3 below shows an extract from sewer records provided by Welsh Water. A copy of the Welsh Water records are included in *Appendix B*.

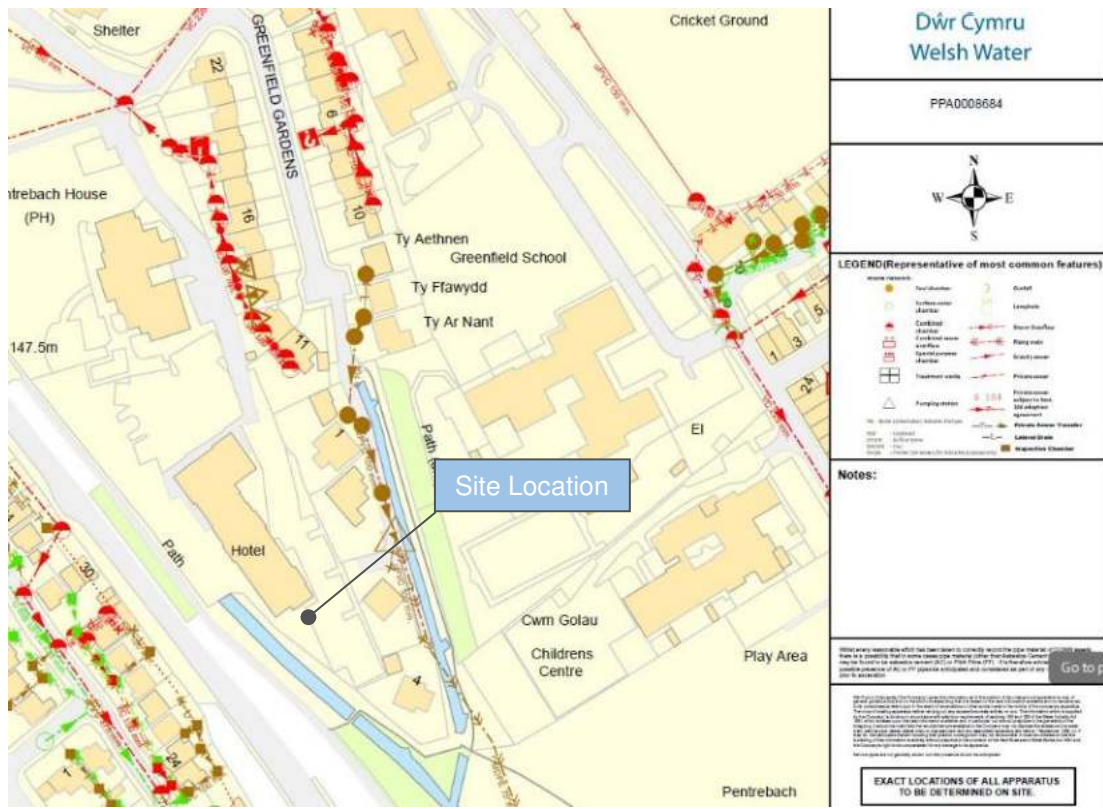


Figure 3: Welsh Water sewer records

- 2.13 The topographical survey of the site in *Appendix A* shows that foul water flows are discharged to a Welsh Water combined sewer to the north of the site. Foul water flows from the existing restaurant building are discharged to the sewer via gravity with flows from the existing hotel pumped along a rising main from a package pumping station located on the east side of the hotel building.
- 2.14 There are two existing surface water outfalls into a watercourse / ditch running along the western boundary of the site. It is understood that the ditch discharges into the River Taff approximately 450m to the south of the site.
- 2.15 Surface water from the existing hotel building is collected by rainwater gutters which discharge below ground via rainwater down pipes. Runoff from the parking areas is collected by a network of trapped gullies and drainage channels. Surface water runoff is discharged off site via a traditional network of below ground pipework to one of the two outfalls into the existing watercourse / ditch to the west of the hotel.

## Development Proposals

- 2.16 It is proposed to construct a new extension extending south from the western end of the existing hotel building. A site plan and floor plans showing the development proposals are included in *Appendix C*.

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### 3. FLOOD RISK PLANNING POLICY & GUIDANCE

- 3.1 The Welsh Assembly Government (WAG) published Technical Advice Note 15 – Development and Flood Risk (TAN15) (WAG, 2004) in 2004. The note requires flood risk to be considered within the strategic planning undertaken by Local Planning Authorities (LPA's) and recommends that land allocated for development should be in areas with the lowest risk of flooding. Only where it can be justified that flood risks to proposed site users is manageable should development be allocated. This approach is referred to as the application of the justification test and is used to establish land allocations for development with respect to flood risk.
- 3.2 The Welsh Government is due to implement a revised TAN15. This will be supported by the Flood Map for Planning, which shows how climate change will affect flood risk extents over the next century. The map shows the potential extent of flooding assuming no defences are in place.
- 3.3 The Flood Map for Planning has no official status until the Welsh Government implements the revised TAN15. However, it represents the best available information on flood risk and Natural Resources Wales will continue to use this to inform planning advice.
- 3.4 Local Planning Authorities were asked to review their Strategic Flood Consequences Assessments in line with the draft TAN15 published in September 2021 and the Flood Map for Planning.
- 3.5 A Written Statement from the Welsh Government published in November 2021 advises that the existing TAN 15, published in 2004, and the Development Advice Map will continue in the meantime as the framework for assessing flood risk in the planning system.
- 3.6 On a similar basis to TAN 15, Strategic Policy EnW4: Environmental Protection of Merthyr Tydfil's Replacement Local Development Plan (2016-2031) advises that new developments will be expected to avoid unnecessary flood risk and meet the requirements of TAN 15. No highly vulnerable development will be permitted within Development Advice Map (DAM) Zone C2. Development will only be permitted in areas at risk of flooding where it can be demonstrated that the site can comply with the justification and assessment requirements set out in TAN 15.
- 3.7 To define the various flood zones and inform the justification test, TAN15 utilises development advice maps (DAMS), whereby flood zones are designated according to the flood risk posed to them, as shown in *Figure 3*.

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| Description of Zone                                                                                             |    | Use within the precautionary framework                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Considered to be at little or no risk of fluvial or tidal/coastal flooding.                                     | A  | Used to indicate that justification test is not applicable and no need to consider flood risk further.                                                                                                                                                                           |
| Areas known to have been flooded in the past evidenced by sedimentary deposits.                                 | B  | Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. |
| Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)      | C  | Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.                                                                                             |
| Areas of the floodplain which are developed and served by significant infrastructure, including flood defences. | C1 | Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.                                                                                                                                          |
| Areas of the floodplain without significant flood defence infrastructure.                                       | C2 | Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.                                |

*Figure 1: TAN 15 Flood Zones*

- 3.8 As particular flooding consequences may not be acceptable for certain development types, the precautionary framework TAN15 identifies the vulnerability of different land uses of flooding. Thus, development types have been sub-divided into three categories, as shown in *Figure 4* below.

| Development category          | Types                                                                                                                                                                                                                                                   |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Emergency services            | hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood                                                                  |
| Highly vulnerable development | all residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites |
| Less vulnerable development   | General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites                                     |

*Figure 2: TAN 15 Development Categories*

3.9 TAN15 advises that new development should be directed away from Zone C and towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of an issue. Highly vulnerable development and Emergency Services development in Zone C2 should not be permitted, while all other new development should only be permitted within Zones C1 and C2 if determined by the planning authority to be justified in that location. Development, including transport infrastructure, will only be justified if it can be demonstrated that:-

- i. Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,
- ii. Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

- iii. It concurs with the aims of PPW and meets the definition of previously developed land; and,
- iv. The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.

3.10 Where development meets the justification test, it is assessed to be justified in the knowledge that known flooding problems could occur, e.g. the development is located within Zone C, or in areas of Zone B, where local conditions present known flooding problems. In these cases, a Flood Consequence Assessment (FCA) would be required to ensure that the development remains safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and,
- Minimal disruption of natural heritage (Planning Policy Wales, 2004)

3.11 Therefore, before deciding whether a development can take place, a site-specific FCA is required to examine the likely flood sources, the consequence to any receptors (e.g. development) of those floods and any potential mitigation that could reduce the risk of occurrence or the consequence of a flood event. An appropriate FCA should draw upon the generic guidance and information presented within the local planning authorities Strategic Flood Consequence Assessments but be tailored to suit the specific development site and local conditions that persist.

3.12 SFCA's are studies that provide an assessment of the extent and nature of flood risk in the local area, allowing more detailed examination of the likely appropriateness of developing sites. The following reports are available on Merthyr Tydfil's County Borough Council's website:

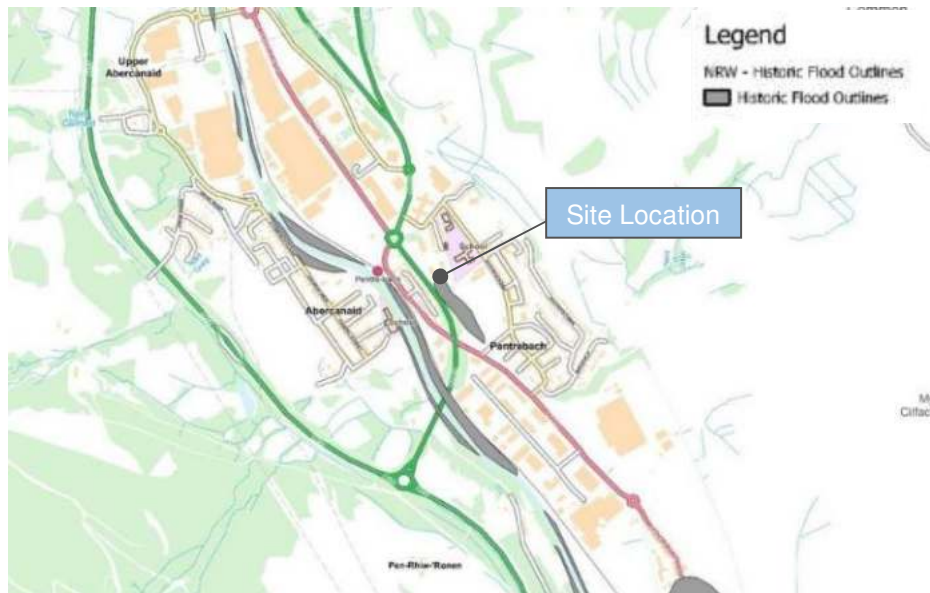
- Merthyr Tydfil County Borough Council Replacement Local Plan (2016- 2031)
- Merthyr Tydfil County Borough Council – Merthyr Tydfil Strategic Flood Consequence Assessment June 2018
- Merthyr Tydfil County Borough Council – Local Flood Risk Management Strategy April 2013

3.13 The following section of this report reviews flood risk associated with sources of flooding identified within these reports.

## 4. SOURCES OF FLOODING

### Historic Flooding

- 4.1 The MTCBC's Strategic Flood Consequence Assessment states that there are some localised historic flood extents throughout the Hoover site along both the left and right banks of the River Taff as a result of the December 1979 event. These remain close to the riverbanks and do not exceed beyond 20m of the main river.
- 4.2 There are no Natural Resource Wales records of flooding along the Nant Graig or Nant Canaid. The MTCBC data records past flooding due to canal overload during October 2010 at Upper Abercanaid. There are also two areas of flooding within the west of the Hoover Site that were caused by the flooding of ordinary watercourses during 1899.
- 4.3 *Figure 4* below shows the historic flood map for the site. It shows that the south end of the existing development may have experienced some historic flooding likely associated with the adjacent drainage ditch to the south west.



*Figure 4: Historic Flood Map for Abercanaid MTCBC FCA*

### Fluvial Flooding

- 4.4 The flood zone map shown in *Figure 5* has been taken from the Natural Resources Wales website and shows the southern end of the site to be located partially in Zone C2 with the remainder of the site in Zone B. Zone C2 is considered to be an area of the floodplain without significant flood defence infrastructure. Zone B is an area known to have flooded in the past evidenced by sedimentary deposits. This is evidenced by the historic flooding map in *Figure 4* above.
- 4.5 While the southern end of the site is shown to be located in Zone C2, the levels along the south western boundary of the site are between 145.53 and 145.84mAOD. The water level recorded on the topographical survey for the watercourse is 143.35mAOD. On this basis, water levels in the watercourse would need to rise by 2.2m just to enter the site boundary. Therefore, it is considered that the extent of NRW mapping is unlikely to be accurate and the site should be considered to lie wholly within Zone B.

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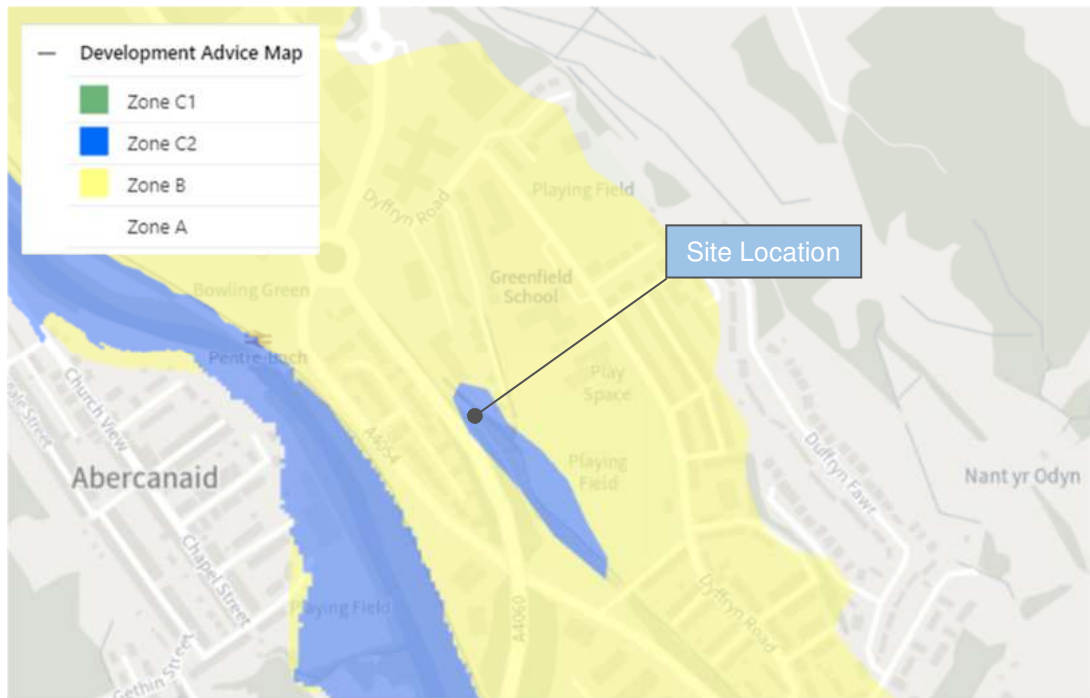


Figure 5: WAG Development Advice Map

- 4.6 The Natural Resources Wales detailed Flood Map for Planning for Rivers is shown in Figure 6 below. It shows the site and the surrounding area to not be at risk of flooding from Rivers.

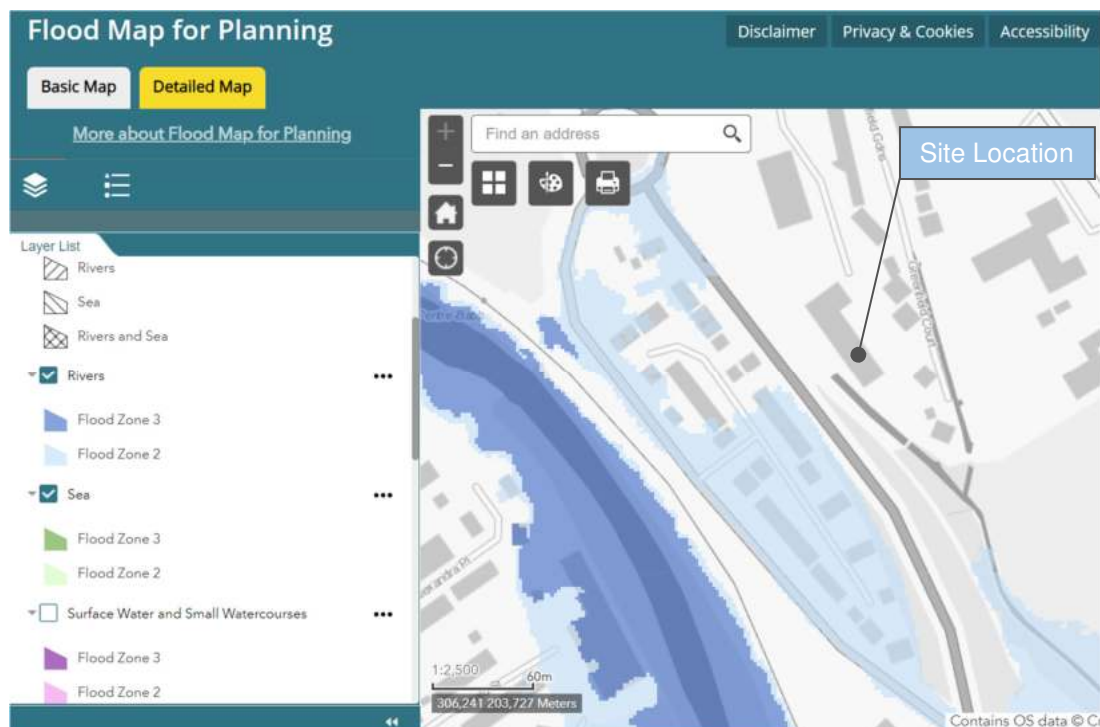


Figure 6: NRW Risk of Fluvial / Tidal Flooding Map

- 4.7 However, it is noted that the drainage ditch to the south west of the site boundary would likely fall under the 'surface water and small watercourses' flood extents and the risk of flooding from this source is discussed below.

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## Surface Water Flooding

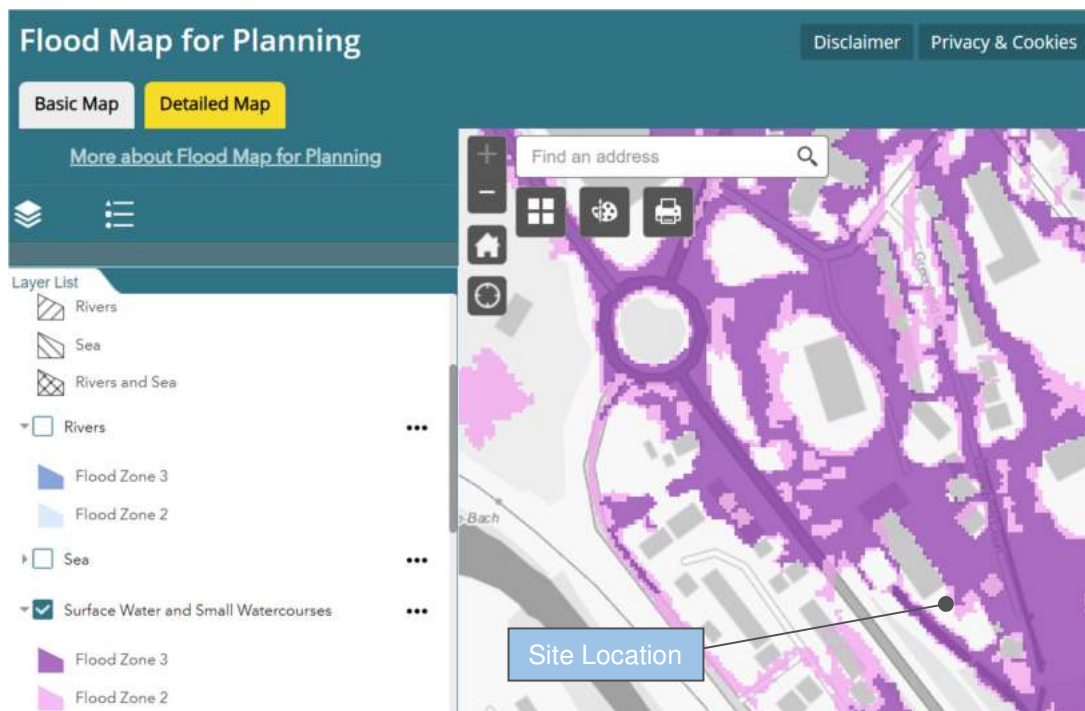
- 4.8 The SFCA states that surface water flooding occurs as a result of direct rainfall accumulating in an area that is unable to drain away.
- 4.9 *Figure 7* shows the Natural Resources Wales Detailed Flood Map for Planning (FMfP), with the location of the site identified. The Flood Zones within the FMfP shows the undefended risk of flooding from Surface Water & Small Watercourses.

Flood Zone 3 displays the extent of flooding from:

- rivers with a 1% (1 in 100) chance or greater of happening in any given year, including an allowance for climate change.
- the sea with a 0.5% (1 in 200) chance or greater of happening in any given year, including an allowance for climate change.
- Surface water & small watercourses with a 1% (1 in 100) chance or greater of happening in any given year, including an allowance for climate change.

Flood Zone 2 displays the extent of flooding from:

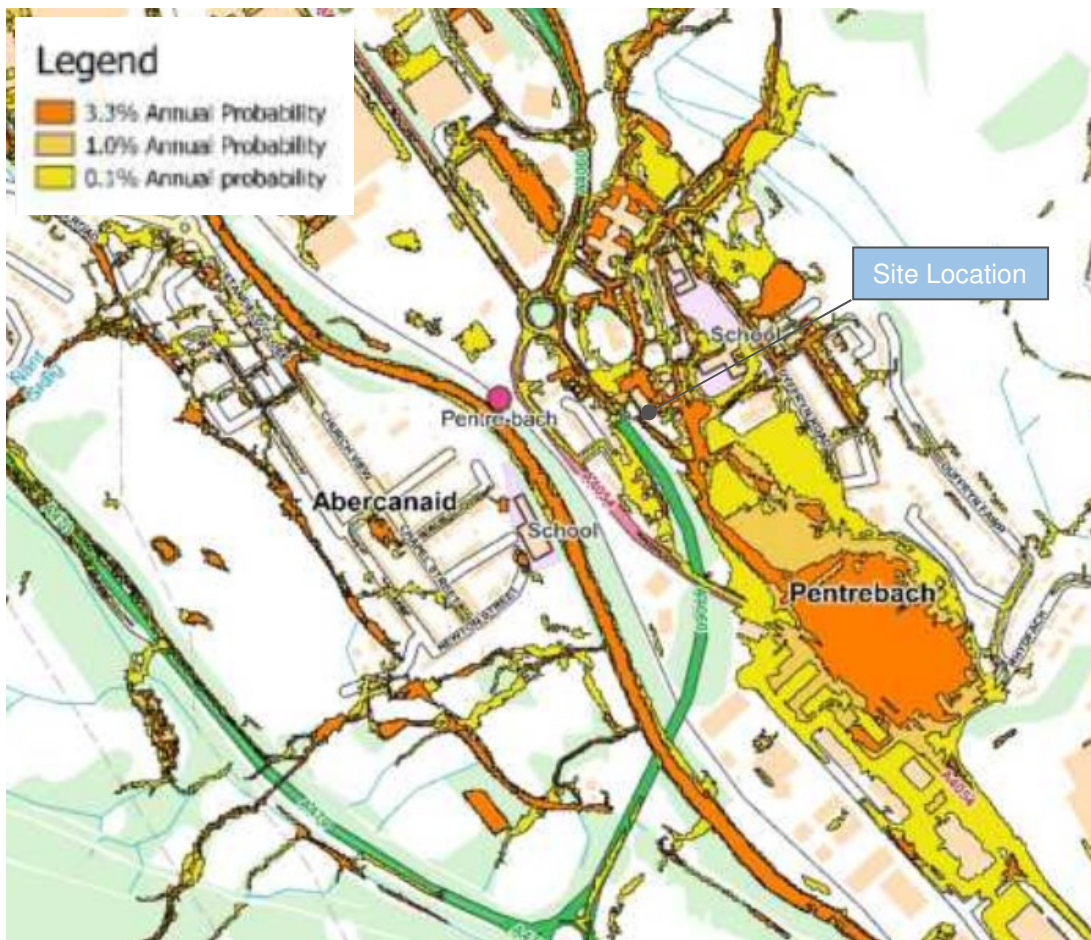
- Rivers with less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance of happening in any given year, including an allowance for climate change.
- the Sea with less than 0.5% (1 in 200) but greater than or equal to 0.1% (1 in 1,000) chance of flooding in any given year, including an allowance for climate change.
- Surface water & small watercourses with less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance of happening in any given year, including an allowance for climate change.



*Figure 7: NRW Detailed Flood Map for Planning - Surface Water & Small Watercourses*

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- 4.10 It shows areas of the site to be at high risk of surface water flooding. However, the area of the proposed extension is shown to lie outside of the extents of the flooding shown. An area of high risk is shown along the route of the drainage ditch / watercourse to the south west of the site boundary. This is anticipated to represent the flood extents more accurately in comparison to the more generalised Development Advice Map in *Figure 5*. This provides further evidence that the site is actually located in Zone B.
- 4.11 The SFCA states that large amounts of surface water flooding are predicted at Pentreback near Abercanaid as shown in *Figure 8*, with a large area of the village flooded during the 3.3% AEP event, as well as Duffryn Road that borders Greenfield Special School. Throughout the upper Abercanaid area, surface water flooding affects large parts of the Hoover site (north west), with water ponding in the 3.3% AEP event due to a topographic depression where the existing factory sits. Some flooding is also predicted along the A4054 in this area during the 3.3% AEP event.



*Figure 8: Surface Water Flood Map for Abercanaid MTCBC SFCA*

- 4.12 The SFCA advises that surface water risk seems predominantly a result of existing topographic depressions rather than overland flow routes though the site as shown in *Figure 8*. Therefore, this risk should be mitigated against through development as the topography will be altered from its existing state, ensuring that depressions are not created where surface water can pond.

- 4.13 To ensure the development will not increase the risk of surface water flooding the extension will be located outside of the high risk surface water flood zones. Therefore, it not anticipated that the development would cause any increase in flood risk elsewhere, provided that the extension is constructed to match existing general levels closely, it would not cause any obstruction to flood flows. Additionally, attenuation and restriction of runoff rates would be provided. Sustainable Drainage Systems (SuDS) will also be provided for the site which will be able to minimise the rate of discharge, volume and environmental impact of surface water runoff.

#### Groundwater Flooding

- 4.14 The FCA advises that groundwater flooding occurs as a result of high water tables in the soil, and typically occurs in low-lying areas with permeable soils and bedrock.
- 4.15 The FCA states that downstream of the Abercanaid and Hoover site, the soils are mostly free draining with localised areas of slowly draining acid soils. The bedrock is made up of sedimentary mudstone and siltstone, which is considered as moderately permeable.
- 4.16 The FCA states that it is unlikely that groundwater flooding will be the dominant flooding mechanism.
- 4.17 An intrusive site investigation has confirmed groundwater levels to be approximately 2m below ground level, the majority of the site is covered by hardstanding and there is no basement development proposed which would normally be at a higher risk from groundwater flooding. On this basis, the development is considered to be at a low probability of flooding from this source, although appropriate sump / pump techniques may need to be used to de-water excavations during construction.

#### Sewer Flooding

- 4.18 The FCA advises that sewer flooding occurs because if an existing drainage system having insufficient capacity to drain rainfall, consequently causing the release of water at manholes. Sewer flooding can also occur should there be a fault/ failure at an existing drainage system.
- 4.19 The FCA states that the responsible authority for sewer flooding at the study area is Welsh Water. Welsh Water has confirmed that there are no records of sewer flooding or capacity issues within the vicinity of the site. Therefore, the site is not at risk of flooding from this source and no measures are deemed necessary to mitigate the risk of sewer flooding.

#### Flooding from Artificial Sources

- 4.20 Flooding from artificial sources, is most likely to result from burst water mains or from infrastructure failure in an artificial watercourse or water body, i.e., canals or other water features such as reservoirs. These systems are maintained, improved, and regularly inspected by relevant authorities so flood risk from these sources is generally considered to be low.
- 4.21 Flood maps associated with large reservoirs that hold over 25,000 cubic meters of water are available on the NRW website. The maps help to identify areas that could potentially be affected by reservoir flooding and display a realistic worst-case scenario of the largest area that may be flooded if a reservoir were to fail and release the water it holds. *Figure 9* below shows a Reservoir Flood Map taken from the NRW's website.

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The map shows the site and surrounding area to be within an area at risk of reservoir flooding.



Figure 9: NRW Reservoir Flood Map

- 4.22 The FCA states that areas such as Upper Abercanaid and Abercanaid and within the Hoover site and large parts of the A4054 road network are shown to be inundated during a reservoir flood event. Depths are largely greater than 2m and affect exiting development on both sides of the River Taff, including industrial and residential areas. Flood velocities are higher throughout Upper Abercanaid at greater than 2m/s, however, are shown to reduce at Abercanaid, with velocities ranging from 0.5m/s to 2m/s, dropping to 0.0m/s-0.5m/s further west.
- 4.23 It should be noted that reservoir flooding is a rare event with a very low probability of occurrence. Current reservoir regulation, which has been further enhanced by the Flood and Water Management Act (2010), ensures that all reservoirs are properly maintained and monitored in order to detect and repair any problem.
- 4.24 As there are no canals that could reasonably affect the site, no further assessment of flood risk is required in relation to canal flooding and no measures are deemed necessary to manage flood risk from this source.
- 4.25 Flood patterns associated with burst water mains would typically be similar to surface water flood patterns and would generally be limited to existing roads where water main infrastructure is normally located. The floor level of the extension should be raised above proposed road levels to protect it from potential flooding caused by burst water mains.

## 5. JUSTIFYING THE LOCATION OF THE DEVELOPMENT

- 5.1 The WAG Development Advice Map in *Figure 5* shows the site to be located in Flood Zone C2, which is deemed to be an area of the floodplain which is developed without significant flood defence infrastructure. However, as discussed in *Paragraphs 4.5* and *4.10*, and as illustrated in the extracts from the risk of river / tidal flooding, and surface water flood risk maps in *Figures 6* and *7* respectively, the proposed extension lies within land shown to be at a low risk of flooding from these sources. Therefore, the Flood Zone C2 classification may not be accurate, and a Zone B classification is more appropriate. TAN15 advises that it is suitable for all forms of development to take place within Zone B.

## 6. DRAINAGE STRATEGY

### Surface Water Drainage Policy & Guidance

- 6.1 National and local drainage policies on surface water drainage require development to use Sustainable Drainage Systems (SuDS) to minimise the rate of discharge, volume, and environmental impact of surface water runoff. SuDS are a collective approach to managing surface water that takes account of water quantity (flooding), water quality (pollution) biodiversity (wildlife and plants) and amenity. They mimic nature and typically manage rainfall close to where it falls. They are also used to transport (convey) surface water, slow runoff down (attenuate) before it enters watercourses. They provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground, evaporate from surface water's or transpire from vegetation (known as evapotranspiration).
- 6.2 Strategic Policy EnW4: Environmental Protection of Merthyr Tydfil's Replacement Local Development Plan (2016-2031) advises that development proposals will be required to incorporate measures to improve water quality where opportunities exist. It also notes that all new developments of more than 1 dwelling house, or where construction is 100m<sup>2</sup> or more, will require SuDS for surface water that meets the statutory sustainable drainage standards set by Welsh Government. Approval from the SuDS Approval Body (SAB) will be required before construction takes place. In accordance with Standard S3 (Water Quality), treatment for surface water run-off should be provided in order to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers. Under the standards, the aim should be to ensure the SuDS effectively manage sediment and other pollutants, ensuring discharges from the systems are of an acceptable quality and will not cause a pollution risk.
- 6.3 The Flood and Water Management Act 2010 (Schedule 3), which came into effect in Wales on 7 January 2019 requires all construction work in Wales with drainage implications, of 100m<sup>2</sup> or more to have SuDS to manage on-site surface water. The SuDS must be designed and constructed in accordance with the Welsh Government Standards for Sustainable Drainage. The current standards are reviewed under the following headings with an assessment provided of how the development could be designed to meet the associated requirements.

### Standard S1 - Surface Water Runoff Destination

- 6.4 The suggested procedures for managing surface water runoff from new developments in Wales are set out in the February 2015 Welsh Government Consultation Document “*Interim non-statutory standards for sustainable drainage (SUDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems*”.
- 6.5 Standard S1 of the Consultation Document sets out a hierarchy for the disposal of surface water runoff. The methods of disposal are summarised in *Table 1* below with an assessment of each method’s suitability also provided.

*Table 1: Surface Water Runoff Destination Assessment*

| Surface Water Runoff Destination                                                                                         | Assessment                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 1: Consider collection of surface water runoff for re-use                                                          | The existing hotel is not currently served by a rainwater harvesting system. Therefore, since the proposed development comprises a small extension adjoining the existing hotel building, it is not considered appropriate to retrofit a system to the existing hotel or incorporate a new system for the extension. Therefore, it is not considered appropriate to use rainwater harvesting for the disposal of roof water runoff.  |
| Level 2: Consider disposal of surface water runoff to ground by infiltration.                                            | As reported in <i>Section 2</i> of this report, the site is underlain by made ground overlying cohesive materials comprising clays associated with alluvial deposits. Furthermore, groundwater was encountered at shallow depths during subsequent monitoring. Therefore, it is not considered appropriate to utilise infiltration drainage techniques for the disposal of surface water runoff.                                     |
| Level 3: Consider discharge of surface water runoff to a surface water body.                                             | The site is drained by an existing surface water drainage network comprising of below ground pipework, which discharges to a surface water drainage ditch to the south-west of the site. Surface water flows from the new development could be discharged to the existing system, however flows would need to be managed so as not to cause an increase in surface water flood risk both on the site and elsewhere in the catchment. |
| Level 4: Consider discharge of surface water runoff to a surface water sewer, highway drain, or another drainage system. | It has been established that it would be appropriate to discharge surface water runoff to the site’s existing surface water drainage system. Therefore, it is not necessary to consider the discharge of surface water runoff to a surface water sewer.                                                                                                                                                                              |
| Level 5: Consider discharge of surface water runoff to a combined sewer.                                                 | It has been established that it would be appropriate to discharge surface water runoff to the site’s existing surface water drainage system, therefore, it is not necessary to consider the discharge of surface water runoff to a combined sewer.                                                                                                                                                                                   |

## Standard S2 - Surface water runoff hydraulic control

- 6.6 Standard S2 of the Consultation Document advises that consideration should be given to the use of Sustainable Drainage Systems (SuDS) to prevent any discharge of surface water from new development for rainfall events less than 5mm in depth and prevent runoff from the first 5mm of rainfall for larger events. The SuDS considered to achieve this requirement are listed in *Table 2* below with an assessment of each methods suitability also provided.

*Table 2: Assessment of SuDS Methods considered to prevent any discharge of surface water for rainfall events less than 5mm in depth and prevent runoff from the first 5mm of rainfall for larger events.*

| System                             | Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Green Roofs                        | The roof of the extension will match the pitched roof profile of the existing hotel. Therefore, the use of green roofs is not considered appropriate for the management of surface water runoff.                                                                                                                                                                                                                                                                 |
| Rainwater Harvesting               | The existing hotel is not currently served by a rainwater harvesting system. Therefore, since the proposed development comprises a small extension adjoining the existing hotel building, it is not considered appropriate to retrofit a system to the existing hotel or incorporate a new system for the extension. Therefore, it is not considered appropriate to use rainwater harvesting for the disposal of roof water runoff.                              |
| Soakaway / Infiltration Systems    | As reported in <i>Section 2</i> of this report, the site is underlain by made ground overlying cohesive materials comprising clays associated with alluvial deposits. Furthermore, groundwater was encountered at shallow depths during subsequent monitoring. Therefore, it is not considered appropriate to utilise infiltration drainage techniques for the disposal of surface water runoff.                                                                 |
| Infiltration Trenches              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Permeable Pavements                | No new car parking spaces are proposed. The underlying ground conditions have also been established to be unsuitable for infiltration drainage techniques. Therefore, it would not be appropriate to incorporate permeable paving.                                                                                                                                                                                                                               |
| Swales                             | A new area of landscaping will be created to the south of the proposed extension as part of the development. This area will be suitable to incorporate a shallow detention basin to manage surface water runoff generated by the extension roof. In addition, there are additional landscaping areas around the proposed extension where it will be possible to incorporate rain gardens for further treatment of surface water runoff from the building's roof. |
| Detention Basins                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Bio Retention Areas & Rain Gardens |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Ponds                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

- 6.7 In *Table 1*, it was established that it would be appropriate to discharge surface water runoff to the site's existing surface water drainage system, but flows would need to be managed so as not to cause an increase in surface water flood risk both on the site and elsewhere within the catchment. The Consultation Document sets out requirements for managing runoff from previously developed sites. It advises that where there is sufficient detail to enable an accurate simulation model to be built to represent the drainage system and contributing areas, the accepted discharge rate should usually be the greenfield 1:100 year peak runoff rate, but where this is not possible, betterment should be a reduction to less than 70% of the existing peak system discharge rate and lower wherever practicable.

- 6.8 The development comprises a small extension to the existing hotel building, therefore, substantial alterations to the site's existing surface water drainage system could not be justified and it would not be considered practicable to limit flows from the existing site to the greenfield 1 in 100 year peak runoff rate but it should be possible to achieve a reduction of the existing 1 in 100 year discharge rate as part of the surface water drainage scheme for the new extension.
- 6.9 Greenfield runoff rates and volumes have been estimated using the ReFH2 Rural Runoff method in the MicroDrainage Software Package. The design results are included in *Appendix D* and are based on the drained area for the outfall serving the new extension of 0.142 Ha as shown on the drained areas plan in *Appendix E*. The calculated rates and volumes for a variety of storm events up to the 1 in 100 year return period are summarised in *Table 2*.

*Table 2: Estimated Runoff Rates & Volumes*

| Return Period (Year) | Greenfield             |                                     | Brownfield             |                                     |                        |                                     |
|----------------------|------------------------|-------------------------------------|------------------------|-------------------------------------|------------------------|-------------------------------------|
|                      |                        |                                     | Pre-development        |                                     | Post-development       |                                     |
|                      | Peak Runoff Rate (l/s) | 6hr Runoff Volume (m <sup>3</sup> ) | Peak Runoff Rate (l/s) | 6hr Runoff Volume (m <sup>3</sup> ) | Peak Runoff Rate (l/s) | 6hr Runoff Volume (m <sup>3</sup> ) |
| 2                    | 2.2                    | 27.8                                | 11.4                   | 62.8                                | 10.1                   | 55.7                                |
| 30                   | 5.0                    | 55.1                                | 19.0                   | 104.7                               | 16.9                   | 92.9                                |
| 100                  | 6.3                    | 68.6                                | 22.8                   | 125.5                               | 20.2                   | 111.4                               |
| 100+40%              | N/A                    | N/A                                 | N/A                    | N/A                                 | 28.3                   | 155.9                               |

- 6.10 *Table 2* also shows the estimated brownfield runoff rates and volumes in the pre (0.160 Ha) and post-development (0.142 Ha) situations, which have been established using the Modified Rational Method Formula based on rainfall profiles generated using the FEH rainfall model within the MicroDrainage Software Package. The Modified Rational Method calculations and rainfall profiles are included in *Appendix F*. The runoff rate and volume in the post-development climate change situation were calculated to be greater than those in pre-development situation even though the drained area is reduced as a result of the development.
- 6.11 The runoff rates and volumes in the post-development situation are shown to be greater than runoff rates and volumes in the greenfield situation for all return periods as a result of the proposed building and hardstanding areas totalling 0.142 Ha.
- 6.12 To achieve a reduction of the existing 1 in 100 year discharge rate it is proposed to introduce a flow control chamber to the existing surface water drainage system with a new underground attenuation tank and detention basin, provided upstream, which would provide the dual function of draining runoff from the extension as well as storing and attenuating excess runoff associated with extreme storm events. The network of pipework is shown on the proposed drainage layout plan included in *Appendix G*.

- 6.13 Roof water from the proposed extension will be captured by a combination of rainwater gutters and downpipes that would discharge directly into rain gardens or filter drains upstream of a connection to a detention basin. The basin would allow runoff to pass through the base into the geocellular attenuation tank.
- 6.14 The below ground attenuation tank and detention basin are the maximum practicable size to permit continued vehicular access to the car park spaces to the north of the extension as well as allowing the existing trees to be retained along the western boundary of the site. The Hydro-Brake flow control device has been designed to limit flows to a maximum practicable discharge rate of 15.9 l/s to prevent an increase in the risk of surface water flooding on the site.
- 6.15 The surface water drainage network shown on the proposed drainage layout plan included in *Appendix G* has been simulated for the 1 in 2 year, 1 in 30 year and 1 in 100 year storm return periods. The simulation results are included in *Appendix H*, while *Table 3* below summarises the analysed peak discharge rates for each storm event and compares these to the peak discharge rates determined in the existing situation.

*Table 3: Comparison of Discharge Rates & Volumes*

| Return Period | Peak Discharge Rates (l/s) |                  | Post Development Peak Discharge Rate as % of Pre-Development Peak Discharge Rate |
|---------------|----------------------------|------------------|----------------------------------------------------------------------------------|
|               | Pre-Development            | Post Development |                                                                                  |
| 2             | 11.4                       | 7.0              | 61.4%                                                                            |
| 30            | 19.0                       | 9.6              | 50.5%                                                                            |
| 100           | 22.8                       | 13.6             | 60.2%                                                                            |
| 100+40%       | 22.8                       | 15.8             | 69.3%                                                                            |

- 6.16 The above table confirms that the surface water drainage scheme would comply with Standard S2 of the Consultation Document as a reduction to less than 70% of the existing peak system discharge rate would be achieved.
- 6.17 The simulation results included in *Appendix H* confirm that there would be no surface water flooding during any of the modelled events up to and including a 1 in 100 year event with a 40% allowance for climate change.
- 6.18 In the event of exceedance of the SuDS infiltration systems capacity, the detention basin would be designed with 300mm freeboard, which would provide approximately 23m<sup>3</sup> of additional storage capacity. Any residual surface water channelled off-site over the western boundary towards the drainage ditch as shown on the proposed drainage layout plan included in *Appendix G*. The finished floor level of the extension is raised above surrounding car park levels so there would no risk of the building being affected by such overland flows.

### Standard S3 - Water Quality

- 6.19 Standard S3 advises that treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers. Where possible, surface water runoff should be managed using interception, sedimentation, and treatment components close to its source, which could be fulfilled by filter drains, rain gardens and a detention basin as part of the SuDS management train, as illustrated in *Figure 10* below.

| SuDS component                                                 | Interception <sup>(1)</sup> | Close to source/Primary Treatment | Secondary Treatment: | Tertiary Treatment: |
|----------------------------------------------------------------|-----------------------------|-----------------------------------|----------------------|---------------------|
| Rainwater harvesting                                           | Y                           |                                   |                      |                     |
| Filter strip                                                   | Y                           | Y                                 |                      |                     |
| Swale                                                          | Y                           | Y                                 | Y                    |                     |
| Filter trench                                                  | Y                           |                                   | Y                    |                     |
| Permeable pavement                                             | Y                           | Y                                 |                      |                     |
| Bioretention                                                   | Y                           | Y                                 | Y                    |                     |
| Green roof                                                     | Y                           | Y                                 |                      |                     |
| Detention basin                                                | Y                           | Y                                 | Y                    |                     |
| Pond                                                           |                             | Y <sup>(2)</sup>                  | Y                    | Y                   |
| Wetland                                                        |                             | Y <sup>(2)</sup>                  | Y                    | Y                   |
| Infiltration system (soakaways/trenches/blankets/basins)       | Y                           | Y                                 | Y                    | Y                   |
| Proprietary treatment systems, including catchpits and gullies |                             | Y <sup>(3)</sup>                  | Y <sup>(3)</sup>     | Y <sup>(3)</sup>    |

*Figure 3: Indicative suitability of SuDS components within a management train*

- 6.20 The Standard sets out requirements for treatment of runoff from different land use types and identifies surface water runoff from non-residential roofs to be a low pollution hazard level as shown in *Figure 11* below.

| Land Use                                                                                                                                                                                                                                                 | Pollution Hazard Level | Requirements for discharge to surface waters, including coasts and estuaries                                                                                             | Requirements for discharge to groundwater                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residential roofs                                                                                                                                                                                                                                        | Very Low               | Removal of gross solids and sediments only                                                                                                                               |                                                                                                                                                                                                                                             |
| Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, homezones, general access roads), non-residential car parking with infrequent change (eg schools, offices)                       | Low                    | Simple Index Approach (1)<br>Note: Additional measures may be required for discharges to protected resources (2)                                                         |                                                                                                                                                                                                                                             |
| Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways                                                                                | Medium                 | Simple Index Approach (1)<br>Note: Additional measures may be required for discharges to protected resources (2)                                                         | Simple Index Approach (1)<br>Note: Additional measures may be required for discharges to protected resources (2)<br>Risk Screening (3) must be undertaken first to determine whether consultation with Natural Resources Wales is required. |
| Trunk roads and motorways                                                                                                                                                                                                                                | High                   | Follow the guidance and risk assessment process set out in HD45/09 (Highways Agency, 2014)                                                                               |                                                                                                                                                                                                                                             |
| Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, manufactured, stored, or | High                   | Discharges may require an environmental licence or permit. Secure pre-permitting advice first from Natural Resources Wales. Risk assessment is likely to be required.(4) |                                                                                                                                                                                                                                             |

*Figure 4: Treatment requirements and design strategies for discharges of surface water runoff to surface waters, from different land use types.*

- 6.21 *Figure 11* identifies it to be suitable to use the Simple Index Approach set out in the CIRIA C753 SuDS Manual 2015 for the assessment of appropriate levels of treatment to surface water runoff using SuDS for residential development.
- 6.22 *Table 4* below identifies that the proposed SuDS components would have a total pollution mitigation index equal to or exceeding the recommended pollution hazard index using the Simple Index Approach thus confirming the SuDS components could provide suitable treatment to surface water runoff from the development.

*Table 4: Pollution Mitigation Assessment*

| Use             | Pollution Hazard Index |            |             | SUDS Component     | Mitigation Index |             |            |
|-----------------|------------------------|------------|-------------|--------------------|------------------|-------------|------------|
|                 | TSS                    | Metals     | TPH         |                    | TSS              | Metals      | TPH        |
| Commercial Roof | 0.3                    | 0.2        | 0.05        | Rain Garden        | 0.5              | 0.6         | 0.6        |
|                 |                        |            |             | Filter Drain       | 0.4              | 0.4         | 0.4        |
|                 |                        |            |             | Detention Basin    | 0.25             | 0.25        | 0.3        |
| <b>Total</b>    | <b>0.3</b>             | <b>0.2</b> | <b>0.05</b> | <b>Total (min)</b> | <b>0.65</b>      | <b>0.65</b> | <b>0.7</b> |

- 6.23 In line with CIRIA C753 guidance, the mitigation indices for the detention basin have been halved as a result of reduced inflow concentrations within the surface water runoff passing through rain gardens and filter drains upstream.

#### Standards S4 & S5 - Amenity & Biodiversity

- 6.24 Standard S4 advises that the design of the surface water management system should maximise amenity benefits, while Standard S5 advises that the design of the surface water management systems should maximise biodiversity benefits.
- 6.25 The proposed development could maximise the opportunity for biodiversity and amenity benefits through the creation of new areas of landscaping, as well as using SuDS for managing surface water runoff from the development in the form of a detention basin and rain gardens.

#### Standard S6 – Design of drainage for Construction, Operation and Maintenance and Structural Integrity

- 6.26 Standard S6 deals with designing robust surface water drainage systems so they can be easily and safely constructed, maintained, and operated, taking account of the need to minimise negative impacts on the environment and natural resources.
- 6.27 The detailed SuDS design would be subject to an approval process, which would be overseen by Merthyr Tydfil County Borough Council acting as the SuDS Approval Body (SAB) and development would not be allowed to commence until SAB approval was in place, which would ensure the requirements of Standard S6 are fulfilled.

## 7. FOUL WATER DRAINAGE STRATEGY

- 7.1 This section of the report outlines an approach for the disposal and management of foul water runoff from the development.
- 7.2 As reported in *Section 2* of this report, foul water generated by the existing hotel is drained by a traditional network of below ground pipework which discharges to a Welsh Water combined sewer to the north of the development via a private foul water pumping station located to the east of the hotel building.
- 7.3 A foul water drainage strategy has been developed for the scheme and is shown on the drainage strategy drawing included in *Appendix G*. In summary, the extension would be provided with a new foul water drainage system comprising of a traditional gravity network of below ground pipework. This would discharge to the existing 150mm dia. private foul water drainage network on site upstream of the private pumping station. The existing pumping station will be upgraded to ensure that it provides sufficient storage volume in the event of a blockage or failure of the pumps.
- 7.4 It is anticipated that the peak flow rate will not be increased as a result of the development subject to a detailed survey to be undertaken following receipt of any planning permission. Should it be deemed necessary to upgrade it following a survey of the pumping station, Welsh Water will be consulted to ensure there are no detrimental impacts on their public sewer network resulting from any additional flows.
- 7.5 On occupation of the development, it is recommended that the as-built drainage system is maintained by Premier Inn Hotels Ltd.'s appointed management company in accordance with the regime set out in the table below.

*Table 3: Below Ground Drainage System - Operation and Maintenance Requirements*

| Maintenance schedule | Required action                                                                                                                                                      | Frequency                                                                                                             |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Regular maintenance  | Remove all litter and debris from external hard landscaped areas and adjacent landscaping, which may pose a risk to the performance of the system.                   | Monthly.                                                                                                              |
|                      | Remove build-up of sediment / silt in catchpits and dispose of oils / petrol residues using safe standard practices.                                                 | As required.                                                                                                          |
|                      | Stabilise and mow adjacent landscaped areas and remove weeds.                                                                                                        |                                                                                                                       |
| Remedial actions     | Repair or rehabilitate inlet and outlets to ensure they are in good condition and operating as designed.                                                             |                                                                                                                       |
|                      | Remediate any landscaping, which has raised to within 50mm of the level of adjacent hard landscaping.                                                                |                                                                                                                       |
| Monitoring           | Check of all inlets / outlets for blockages or evidence of physical damage with any necessary remedial action or clearance carried out if required.                  | On a monthly basis for the first 3 months of operation, thereafter every 6 months & following severe rainfall events. |
|                      | Inspect all surfaces for ponding, or silt accumulation. Record areas where water is ponding for more than 48 hours and carry out any remedial work deemed necessary. | After severe storms.                                                                                                  |

## 8. SUMMARY & CONCLUSIONS

- 8.1 Natural Resources Wales's (NRW's) Development Advice Map shows the site to be located in Flood Zone C2, which is deemed to be an area of the floodplain which is developed without significant flood defence infrastructure. However, it has been established that following a review of other mapping data available from NRW, including the Flood Map for Planning, and the topographical survey that the proposed extension is actually located in an area that should be classified as Zone B to match the remainder of the site. TAN15 advises that it is suitable for all forms of development to take place within Zone B.
- 8.2 The proposed extension is also shown to lie within an area of the development at a low risk of surface water flooding and is considered to be at low risk of flooding from all other sources in the SFCA. However, new development can increase the volume and rate at which surface water runoff is discharged from a site when compared to the existing situation, which can cause an increase in flood risk both on the site and elsewhere within the catchment.
- 8.3 The development comprises a small extension to the existing building. Given the scale of development proposed, substantial alterations to the site's existing surface water drainage system could not be justified and it would not be considered practicable to limit flows from the existing site to the greenfield 1 in 100 year peak runoff rate. Therefore, it is proposed to introduce a flow control chamber to the existing surface water drainage system with a new detention basin and below ground attenuation tank provided upstream, which would provide the dual function of draining runoff from the extension as well as storing and attenuating excess runoff associated with extreme storm events.
- 8.4 Roof water from the proposed extension will be captured by a combination of rainwater gutters and downpipes that would discharge directly into rain gardens or filter drains upstream of a connection to a detention basin. The basin would allow runoff to pass through the base into the geocellular attenuation tank.
- 8.5 The surface water drainage proposals would reduce peak discharge rates from the site to less than 70% of the existing peak system discharge rate. In the event that the capacity of the surface water drainage network was exceeded, surface water would be channelled off-site in a westerly direction towards the drainage ditch. The finished floor level of the extension is raised above surrounding car park levels so there would be no risk of buildings being affected by such overland flows.
- 8.6 The proposed surface water drainage scheme can be easily and safely constructed, maintained and operated ensuring the site and areas downstream would not be affected by surface water runoff during construction as well as ensuring there would be no significant reduction in its performance over the lifetime of the development.
- 8.7 The proposed extension would be provided with a new foul water drainage system comprising of a traditional gravity network of below ground pipework that would discharge to the existing private foul water network serving the hotel. The existing hotel is served by a private foul water pumping station that will be upgraded to accommodate the additional flows generated by the proposed extension.
- 8.8 In terms of flood risk and drainage strategy, it is concluded that the development can be occupied and operated safely and that there will be no increase in the level of flood risk to the site or neighbouring sites thus fulfilling the aims of national and local planning policy.

|         |          |           |        |             |            |         |
|---------|----------|-----------|--------|-------------|------------|---------|
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| AUTHOR: | GH       | OFFICE:   | HENLEY | CHECKED BY: | AR         |         |

**APPENDIX A**  
TOPOGRAPHICAL SURVEY



**APPENDIX B**  
WELSH WATER SEWER RECORDS



**APPENDIX C**  
PROPOSED SITE PLAN & FLOOR PLANS



Dashed line indicates  
existing trees to be removed

**Notes:**

Proposed Parking: 92

Proposed Hotel: GEA - 2482m<sup>2</sup>  
GIA - 2328m<sup>2</sup>

Paving:  
Buff Concrete paver

| Rev | Date | Description | By | Chk |
|-----|------|-------------|----|-----|
|-----|------|-------------|----|-----|



1 Brooklands Yard Southover High Street Lewes East Sussex BN7 1HU  
Tel. 01273 479434 www.axiomarchitects.co.uk

**Client**  
**WHITBREAD GROUP PLC**

**Project**  
MERTHYR TYDFIL PREMIER INN  
DUFFRYN ROAD, PENTREBACH  
CF48 8BB

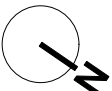
**Drawing**  
**PROPOSED SITE PLAN**

| Scale | Date     | Drawn | Checked |
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| 1:600 | 29/04/24 | CF    | PM      |

| Drawing No. | Revision |
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**6153-PL 011**

Status  
**PLANNING**



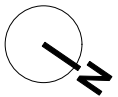


1 Ground Floor Plan  
Scale: 1:250



2 First Floor Plan  
Scale: 1:250

0 5 10 15 M



| Rev | Date | Description | By | Chk |
|-----|------|-------------|----|-----|
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Tel. 01273 479434 www.axiomarchitects.co.uk

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DUFFRYN ROAD, PENTREBACH  
CF48 8BB

Drawing

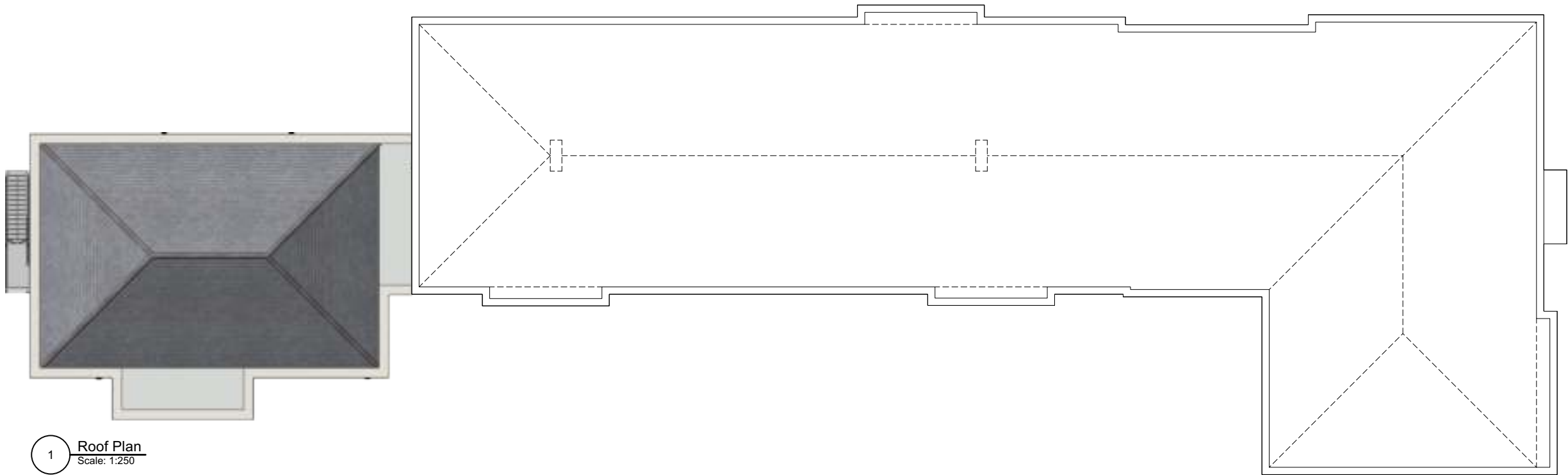
PROPOSED FLOOR PLANS

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|-------|----------|-------|---------|
| 1:250 | 29/04/24 | CF    | PM      |

| Drawing No. | Revision |
|-------------|----------|
|-------------|----------|

6153-PL 110

Status  
PLANNING



1 Roof Plan  
Scale: 1:250

| Rev | Date | Description | By | Chk |
|-----|------|-------------|----|-----|
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Drawing

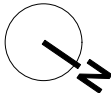
PROPOSED ROOF PLAN

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| Drawing No. | Revision |
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6153-PL 111

Status  
PLANNING



**APPENDIX D**  
GREENFIELD RUNOFF RATES & VOLUMES

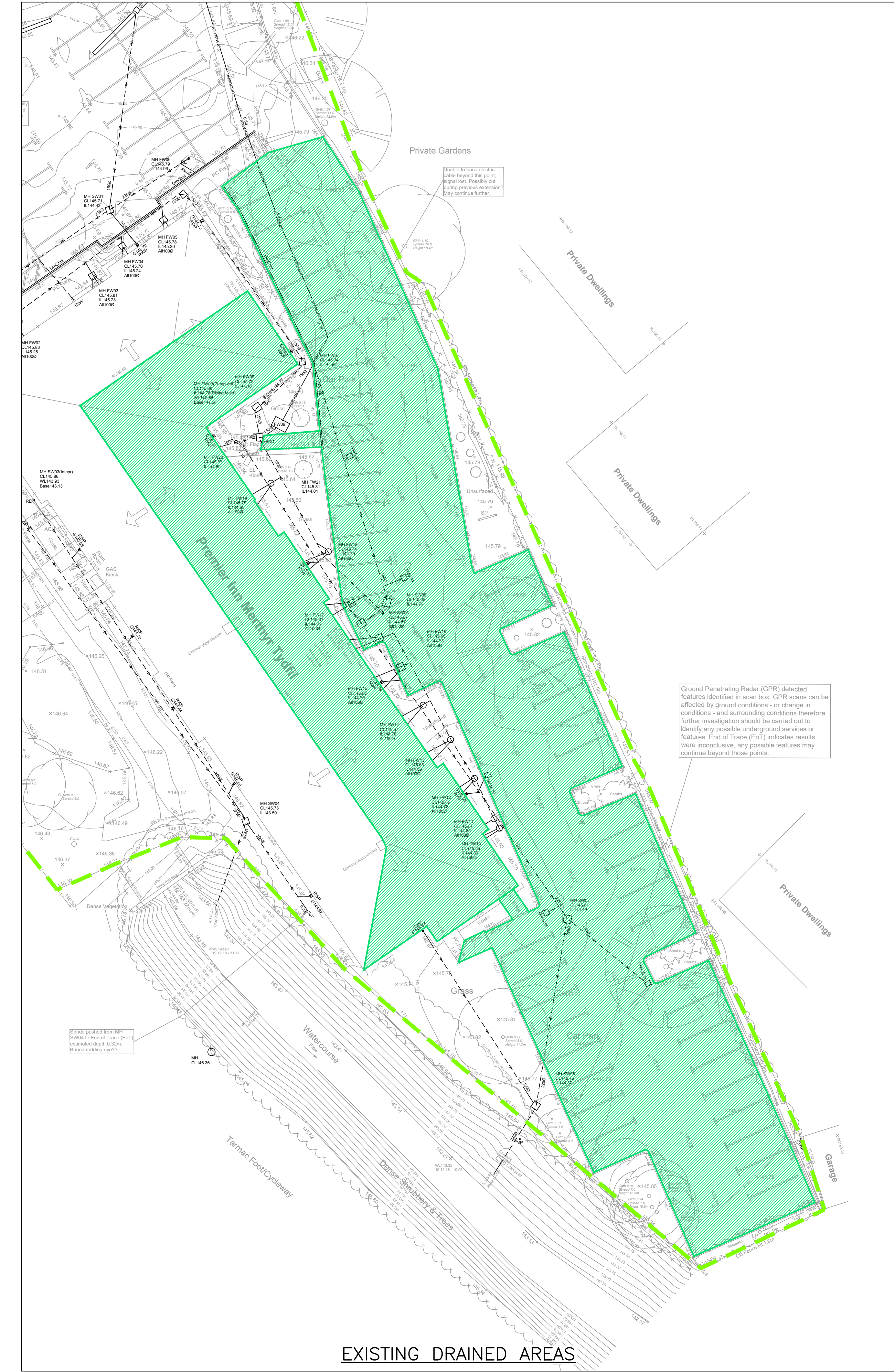
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| Simpson Associates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           | Page 1                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           |  |
| Date 08/05/2024 16:14<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Designed by Louis.LeBellego<br>Checked by |                                                                                     |
| Micro Drainage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Source Control 2019.1                     |                                                                                     |
| <div>ReFH2 Rural Runoff Peak Flows</div> <div><div>Input</div><div><div>Return Period (Years)</div><div>100</div></div><div><div>FEH Rainfall Version</div><div>2013</div></div><div><div>Site Location</div><div>GB 306202 203750 SO 06202 03750</div></div><div><div>Data Type</div><div>Point</div></div><div><div>Season</div><div>Summer</div></div><div><div>Country</div><div>England/Wales/Northern Ireland</div></div><div><div>Area (ha)</div><div>0.142</div></div><div><div>SAAR (mm)</div><div>1518</div></div><div><div>BFIHOST</div><div>0.351</div></div><div><div>FARL</div><div>0.000</div></div><div><div>SPRHOST</div><div>0.000</div></div><div><div>URBEXT (2000)</div><div>0.0000</div></div></div> <div><div>Results</div><div><div><div>Return Period</div><div>Rural</div><div>Urban</div></div><div><div>(Years)</div><div>(l/s)</div><div>(l/s)</div></div></div><div><div>User</div><div>6.3</div><div>6.3</div></div><div><div>Q1</div><div>1.9</div><div>1.9</div></div><div><div>Q2</div><div>2.2</div><div>2.2</div></div><div><div>Q5</div><div>3.2</div><div>3.2</div></div><div><div>Q10</div><div>3.9</div><div>3.9</div></div><div><div>Q30</div><div>5.0</div><div>5.0</div></div><div><div>Q50</div><div>5.5</div><div>5.5</div></div><div><div>Q75</div><div>6.0</div><div>6.0</div></div><div><div>Q100</div><div>6.3</div><div>6.3</div></div><div><div>Q200</div><div>7.3</div><div>7.3</div></div><div><div>Q1000</div><div>10.9</div><div>10.9</div></div></div> |                                           |                                                                                     |
| ©1982-2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                                                                                     |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                           |                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           | Page 1                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           |  |
| Date 08/05/2024 16:16<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Designed by Louis.LeBellego<br>Checked by |                                                                                     |
| Micro Drainage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                           | Source Control 2019.1                                                               |
| <div>ReFH2 Greenfield Runoff Volume</div> <div>Input</div> <div><div>Return Period (Years)</div><div>Storm Duration (min)</div><div>FEH Rainfall Version</div><div>Site Location</div><div>Data Type</div><div>Season</div><div>Country</div><div>Area (ha)</div><div>SAAR (mm)</div><div>BFIHOST</div><div>FARL</div><div>SPRHOST</div><div>URBEXT (2000)</div></div> <div><div>2</div><div>360</div><div>2013</div><div>GB 306202 203750 SO 06202 03750</div><div>Point</div><div>Summer</div><div>England/Wales/Northern Ireland</div><div>0.142</div><div>1518</div><div>0.351</div><div>0.000</div><div>0.000</div><div>0.0000</div></div> <div>Results</div> <div><div>Percentage Runoff (%)</div><div>Greenfield Runoff Volume (m³)</div></div> <div><div>58.02</div><div>27.806</div></div> |                                           |                                                                                     |
| ©1982-2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |                                                                                     |

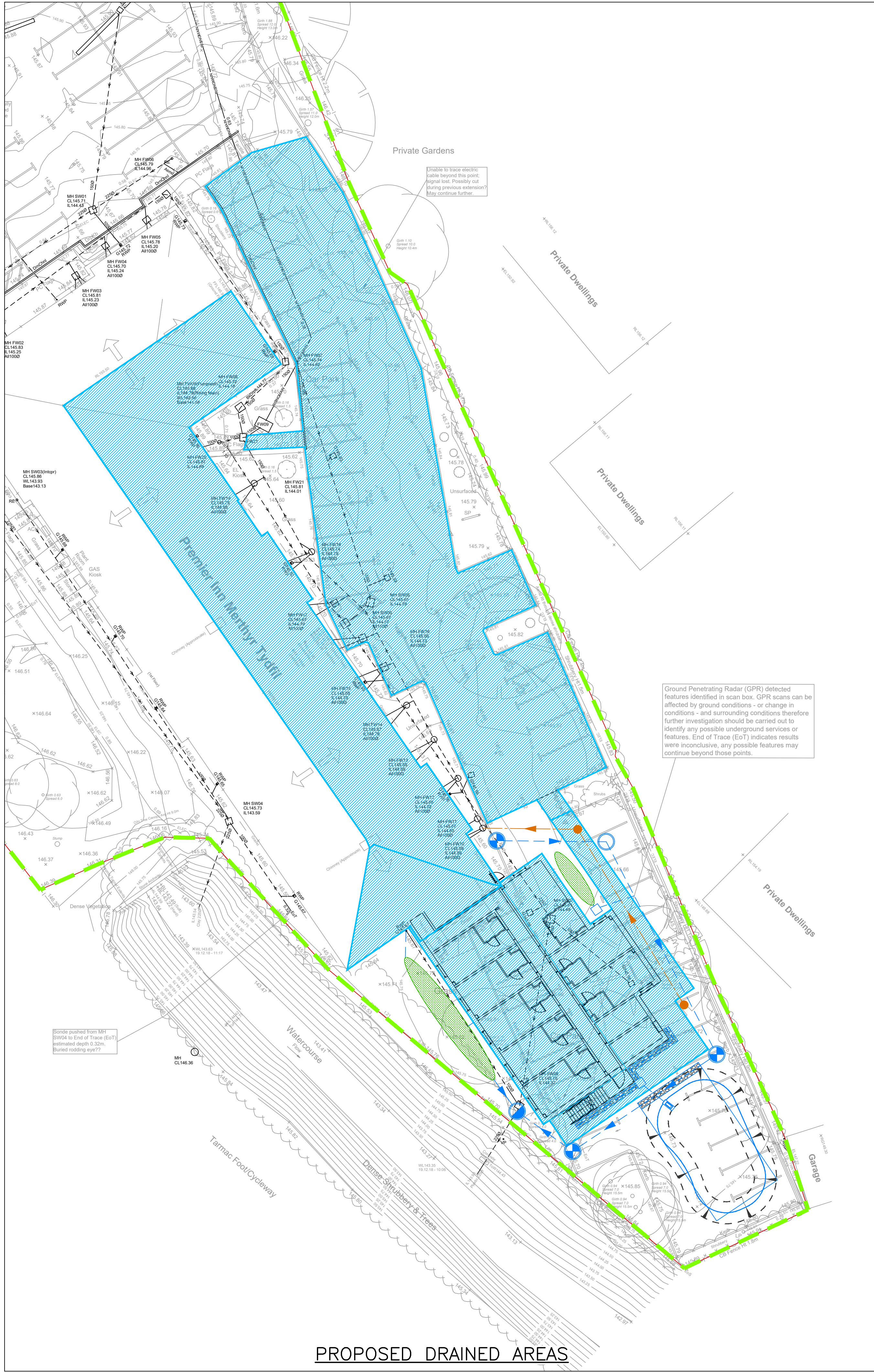
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|-----------------------|----|----------------------|-----|----------------------|------|---------------|---------------------------------|-----------|-------|--------|--------|---------|--------------------------------|-----------|-------|-----------|------|---------|-------|------|-------|---------|-------|---------------|--------|-----------------------|-------|-------------------------------|--------|
| Simpson Associates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           | Page 1                                                                              |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |  |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Date 08/05/2024 16:15<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Designed by Louis.LeBellego<br>Checked by |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Micro Drainage Source Control 2019.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| <div>ReFH2 Greenfield Runoff Volume</div> <div>Input</div> <table><tr><td>Return Period (Years)</td><td>30</td></tr><tr><td>Storm Duration (min)</td><td>360</td></tr><tr><td>FEH Rainfall Version</td><td>2013</td></tr><tr><td>Site Location</td><td>GB 306202 203750 SO 06202 03750</td></tr><tr><td>Data Type</td><td>Point</td></tr><tr><td>Season</td><td>Summer</td></tr><tr><td>Country</td><td>England/Wales/Northern Ireland</td></tr><tr><td>Area (ha)</td><td>0.142</td></tr><tr><td>SAAR (mm)</td><td>1518</td></tr><tr><td>BFIHOST</td><td>0.351</td></tr><tr><td>FARL</td><td>0.000</td></tr><tr><td>SPRHOST</td><td>0.000</td></tr><tr><td>URBEXT (2000)</td><td>0.0000</td></tr></table> <div>Results</div> <table><tr><td>Percentage Runoff (%)</td><td>63.47</td></tr><tr><td>Greenfield Runoff Volume (m³)</td><td>55.125</td></tr></table> |                                           |                                                                                     | Return Period (Years) | 30 | Storm Duration (min) | 360 | FEH Rainfall Version | 2013 | Site Location | GB 306202 203750 SO 06202 03750 | Data Type | Point | Season | Summer | Country | England/Wales/Northern Ireland | Area (ha) | 0.142 | SAAR (mm) | 1518 | BFIHOST | 0.351 | FARL | 0.000 | SPRHOST | 0.000 | URBEXT (2000) | 0.0000 | Percentage Runoff (%) | 63.47 | Greenfield Runoff Volume (m³) | 55.125 |
| Return Period (Years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 30                                        |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Storm Duration (min)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 360                                       |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| FEH Rainfall Version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2013                                      |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Site Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | GB 306202 203750 SO 06202 03750           |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Data Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Point                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Season                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Summer                                    |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Country                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | England/Wales/Northern Ireland            |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.142                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1518                                      |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| BFIHOST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.351                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| FARL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.000                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| SPRHOST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.000                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| URBEXT (2000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0.0000                                    |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Percentage Runoff (%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 63.47                                     |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Greenfield Runoff Volume (m³)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 55.125                                    |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| ©1982-2019 Innovyze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           |                                                                                     |                       |    |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                           |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|-----------------------|-----|----------------------|-----|----------------------|------|---------------|---------------------------------|-----------|-------|--------|--------|---------|--------------------------------|-----------|-------|-----------|------|---------|-------|------|-------|---------|-------|---------------|--------|-----------------------|-------|-------------------------------|--------|
| Simpson Associates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                           | Page 1                                                                              |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                           |  |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Date 08/05/2024 16:15<br>File                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Designed by Louis.LeBellego<br>Checked by |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Micro Drainage Source Control 2019.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| <div>ReFH2 Greenfield Runoff Volume</div> <div>Input</div> <table><tr><td>Return Period (Years)</td><td>100</td></tr><tr><td>Storm Duration (min)</td><td>360</td></tr><tr><td>FEH Rainfall Version</td><td>2013</td></tr><tr><td>Site Location</td><td>GB 306202 203750 SO 06202 03750</td></tr><tr><td>Data Type</td><td>Point</td></tr><tr><td>Season</td><td>Summer</td></tr><tr><td>Country</td><td>England/Wales/Northern Ireland</td></tr><tr><td>Area (ha)</td><td>0.142</td></tr><tr><td>SAAR (mm)</td><td>1518</td></tr><tr><td>BFIHOST</td><td>0.351</td></tr><tr><td>FARL</td><td>0.000</td></tr><tr><td>SPRHOST</td><td>0.000</td></tr><tr><td>URBEXT (2000)</td><td>0.0000</td></tr></table> <div>Results</div> <table><tr><td>Percentage Runoff (%)</td><td>65.88</td></tr><tr><td>Greenfield Runoff Volume (m³)</td><td>68.555</td></tr></table> |                                           |                                                                                     | Return Period (Years) | 100 | Storm Duration (min) | 360 | FEH Rainfall Version | 2013 | Site Location | GB 306202 203750 SO 06202 03750 | Data Type | Point | Season | Summer | Country | England/Wales/Northern Ireland | Area (ha) | 0.142 | SAAR (mm) | 1518 | BFIHOST | 0.351 | FARL | 0.000 | SPRHOST | 0.000 | URBEXT (2000) | 0.0000 | Percentage Runoff (%) | 65.88 | Greenfield Runoff Volume (m³) | 68.555 |
| Return Period (Years)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 100                                       |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Storm Duration (min)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 360                                       |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| FEH Rainfall Version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2013                                      |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Site Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GB 306202 203750 SO 06202 03750           |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Data Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Point                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Season                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Summer                                    |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Country                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | England/Wales/Northern Ireland            |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Area (ha)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.142                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| SAAR (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1518                                      |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| BFIHOST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.351                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| FARL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.000                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| SPRHOST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.000                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| URBEXT (2000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.0000                                    |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Percentage Runoff (%)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 65.88                                     |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
| Greenfield Runoff Volume (m³)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 68.555                                    |                                                                                     |                       |     |                      |     |                      |      |               |                                 |           |       |        |        |         |                                |           |       |           |      |         |       |      |       |         |       |               |        |                       |       |                               |        |
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**APPENDIX E**  
DRAINED AREA PLAN

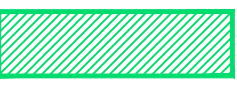


EXISTING DRAINED AREAS



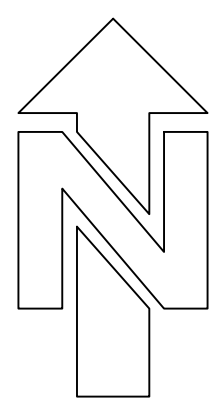
PROPOSED DRAINED AREAS

**DRAINED AREAS LEGEND**

 Extent of existing impermeable drained areas = 1,600m<sup>2</sup>

 Extent of new impermeable drained areas = 1,420m<sup>2</sup>

Reduction of impermeable drained areas = 180m<sup>2</sup>



|    |                                          |     |          |
|----|------------------------------------------|-----|----------|
| P1 | ISSUED TO ACCOMPANY PLANNING APPLICATION | GPH | 13.05.24 |
| MK | REVISION                                 | BY  | DATE     |

**DRAWING STATUS**

**PRELIMINARY**

**DRAWING TITLE**

**DRAINAGE AREAS PLAN**

**PROJECT**

**MERTHYR TYDFIL  
PREMIER INN  
DUFFRYN ROAD  
PENTREBACK, CF48 4BB**

 **simpson | tws**

8 Friday Street  
Henley-on-Thames  
Oxfordshire, RG9 1AH  
T: 01491 576 221  
E: mail@simpsoneng.com  
W: www.simpsoneng.com



London, Henley-on-Thames and Gloucester

|       |     |      |    |        |            |      |          |
|-------|-----|------|----|--------|------------|------|----------|
| Drawn | GPH | Chkd | AR | Scales | 1:200 @ A1 | Date | MAY 2024 |
|-------|-----|------|----|--------|------------|------|----------|

**PLANNING**

|                |                |          |    |
|----------------|----------------|----------|----|
| Drawing Number | P24-0081-SK100 | Revision | P1 |
|----------------|----------------|----------|----|

**APPENDIX F**  
**BROWNFIELD RUNOFF RATES & VOLUMES**

**P24-0081 - PI Merthyr Tydfil - Modified Rational Method Runoff Calculations (Pre Development)**

Peak Runoff Rate =  $2.78 \times \text{Volume Runoff Coefficient (Cv)} \times \text{Area (A)} \times \text{Peak Rainfall Intensity (I}_{\text{peak}})$

Runoff Volume =  $2.78 \times \text{Volume Runoff Coefficient (Cv)} \times \text{Area (A)} \times \text{Peak Rainfall Intensity (I}_{\text{avg}}) \times \text{Storm Duration}$

| Return<br>Period | Cv   | I <sub>(peak)</sub><br>(mm) | I <sub>(ave)</sub> (mm) | A (Ha) | Peak<br>Runoff<br>Rate (l/s) | Runoff<br>Volume<br>(m <sup>3</sup> ) | Rainfall<br>Data |
|------------------|------|-----------------------------|-------------------------|--------|------------------------------|---------------------------------------|------------------|
| 2                | 1.00 | 25.648                      | 6.543                   | 0.160  | 11.4                         | 62.8                                  | FEH              |
| 30               | 1.00 | 42.752                      | 10.906                  | 0.160  | 19.0                         | 104.7                                 | FEH              |
| 100              | 1.00 | 51.245                      | 13.073                  | 0.160  | 22.8                         | 125.5                                 | FEH              |

**P24-0081 - PI Merthyr Tydfil - Modified Rational Method Runoff Calculations (Post Development)**

Peak Runoff Rate =  $2.78 \times \text{Volume Runoff Coefficient (Cv)} \times \text{Area (A)} \times \text{Peak Rainfall Intensity (I}_{\text{peak}})$

Runoff Volume =  $2.78 \times \text{Volume Runoff Coefficient (Cv)} \times \text{Area (A)} \times \text{Peak Rainfall Intensity (I}_{\text{avg}}) \times \text{Storm Duration}$

| Return<br>Period | Cv   | I <sub>(peak)</sub><br>(mm) | I <sub>(ave)</sub> (mm) | A (Ha) | Peak<br>Runoff<br>Rate (l/s) | Runoff<br>Volume<br>(m <sup>3</sup> ) | Rainfall<br>Data |
|------------------|------|-----------------------------|-------------------------|--------|------------------------------|---------------------------------------|------------------|
| 2                | 1.00 | 25.648                      | 6.543                   | 0.142  | 10.1                         | 55.7                                  | FEH              |
| 30               | 1.00 | 42.752                      | 10.906                  | 0.142  | 16.9                         | 92.9                                  | FEH              |
| 100              | 1.00 | 51.245                      | 13.073                  | 0.142  | 20.2                         | 111.4                                 | FEH              |
| 100+40           | 1.00 | 71.743                      | 18.302                  | 0.142  | 28.3                         | 155.9                                 | FEH              |



Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version

2013

Site Location

GB 306202 203750 SO 06202 03750

Data Type

Point

Peak Intensity (mm/hr)

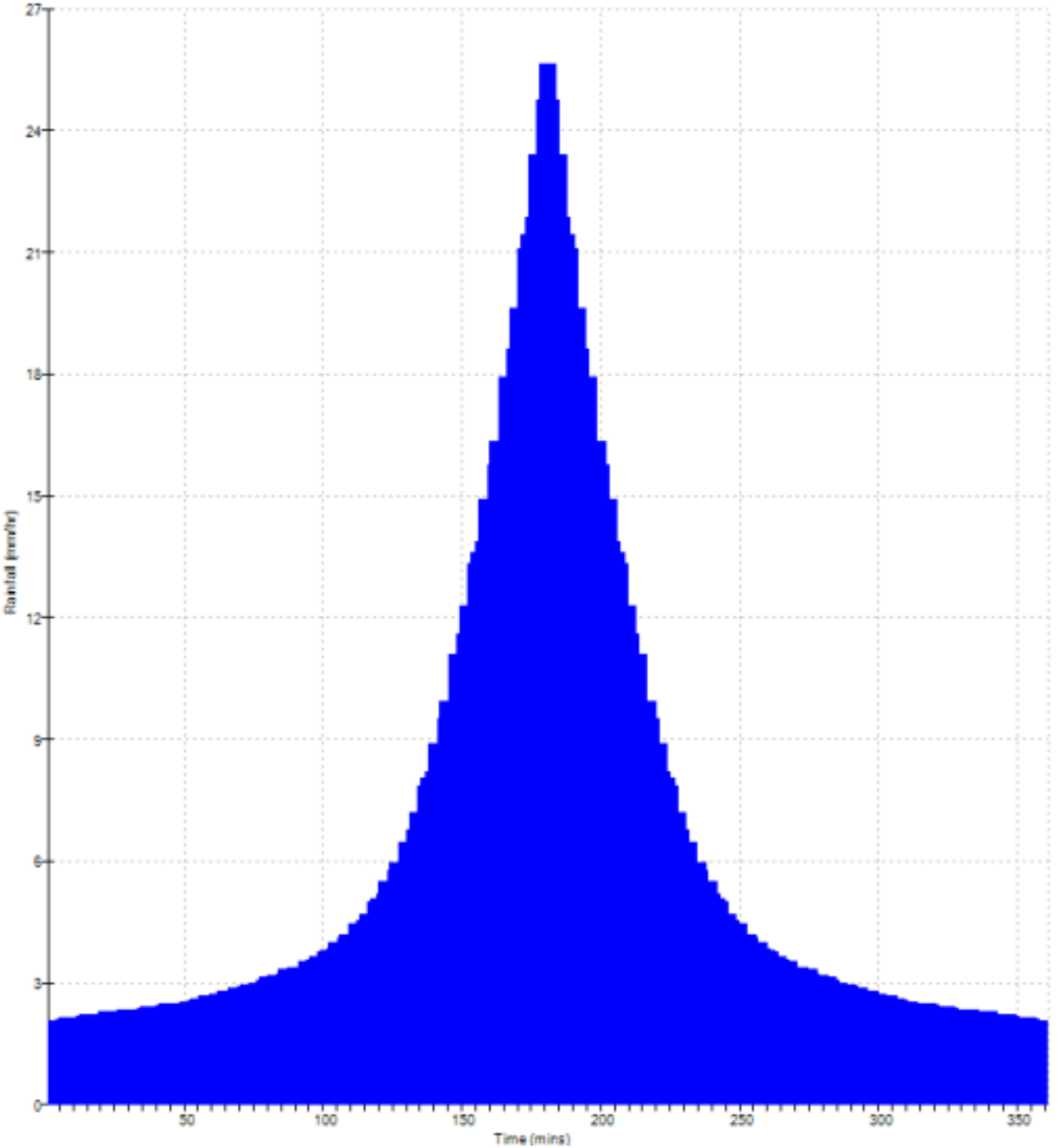
25.648

Ave. Intensity (mm/hr)

6.543

Return Period (years)

2.0



Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version

2013

Site Location

GB 306202 203750 SO 06202 03750

Data Type

Point

Peak Intensity (mm/hr)

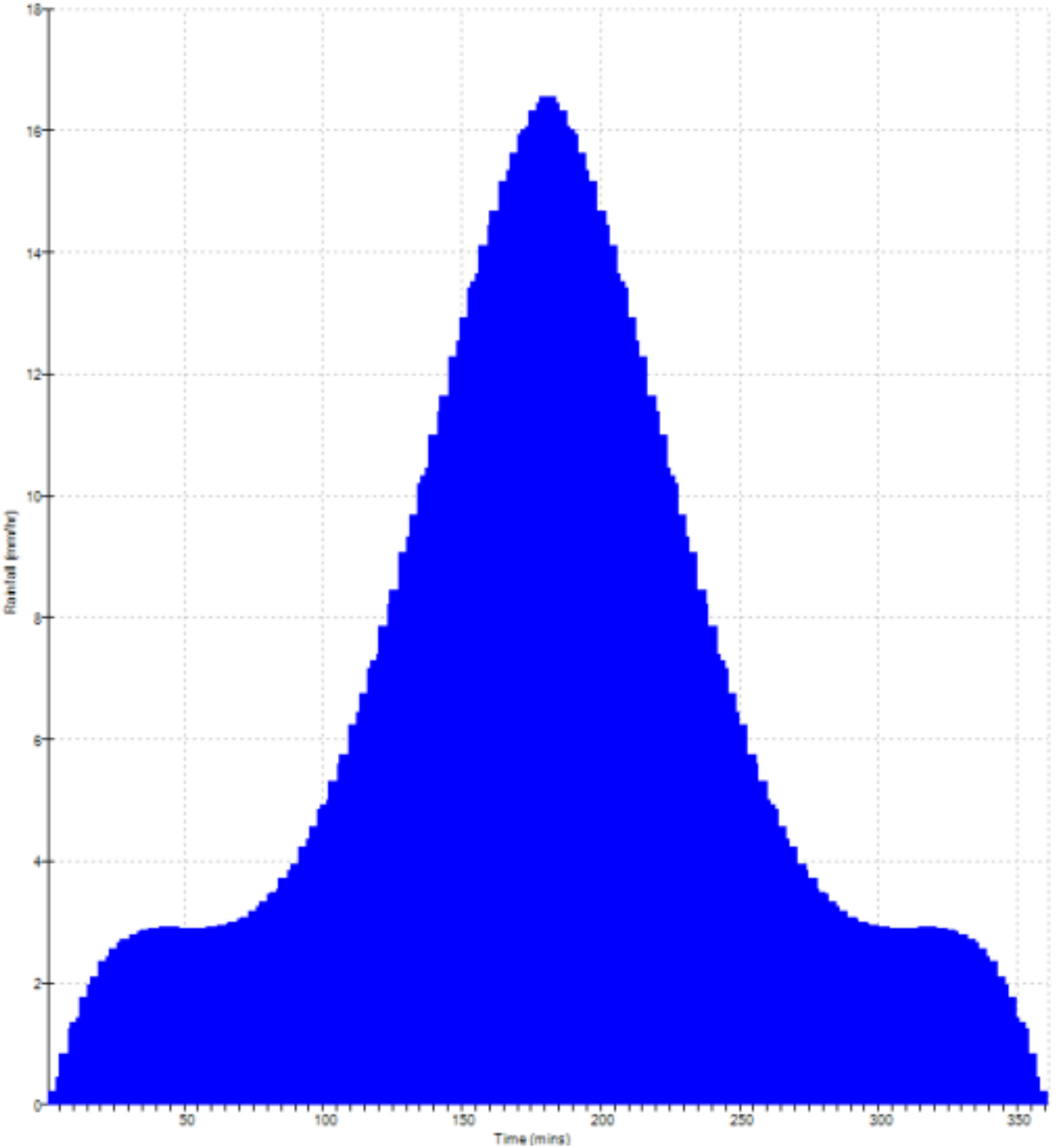
16.548

Ave. Intensity (mm/hr)

6.543

Return Period (years)

2.0



Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version

2013

Site Location

GB 306202 203750 SO 06202 03750

Data Type

Point

Peak Intensity (mm/hr)

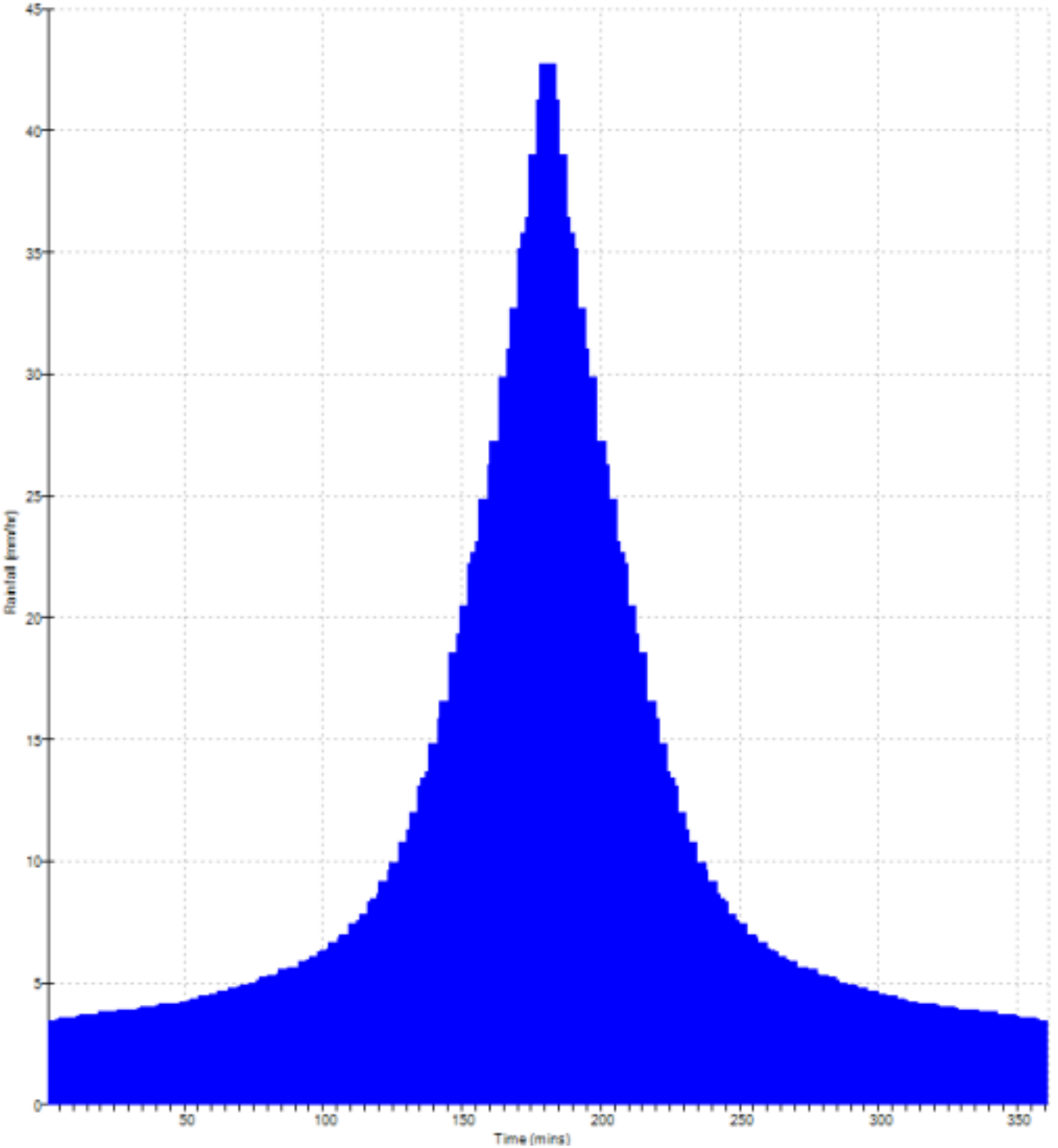
42.752

Ave. Intensity (mm/hr)

10.906

Return Period (years)

30.0



Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version

2013

Site Location

GB 306202 203750 SO 06202 03750

Data Type

Point

Peak Intensity (mm/hr)

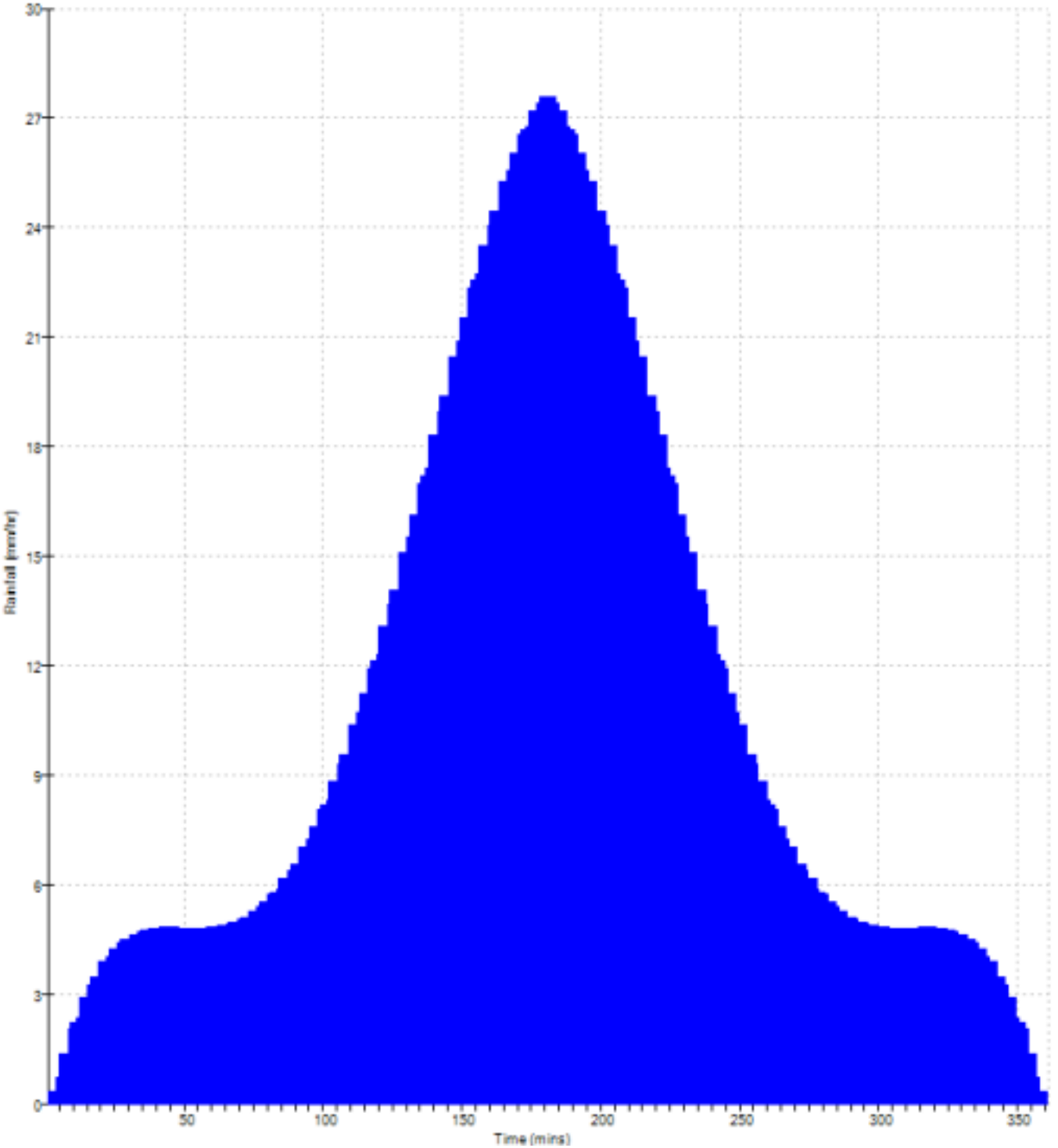
27.583

Ave. Intensity (mm/hr)

10.906

Return Period (years)

30.0

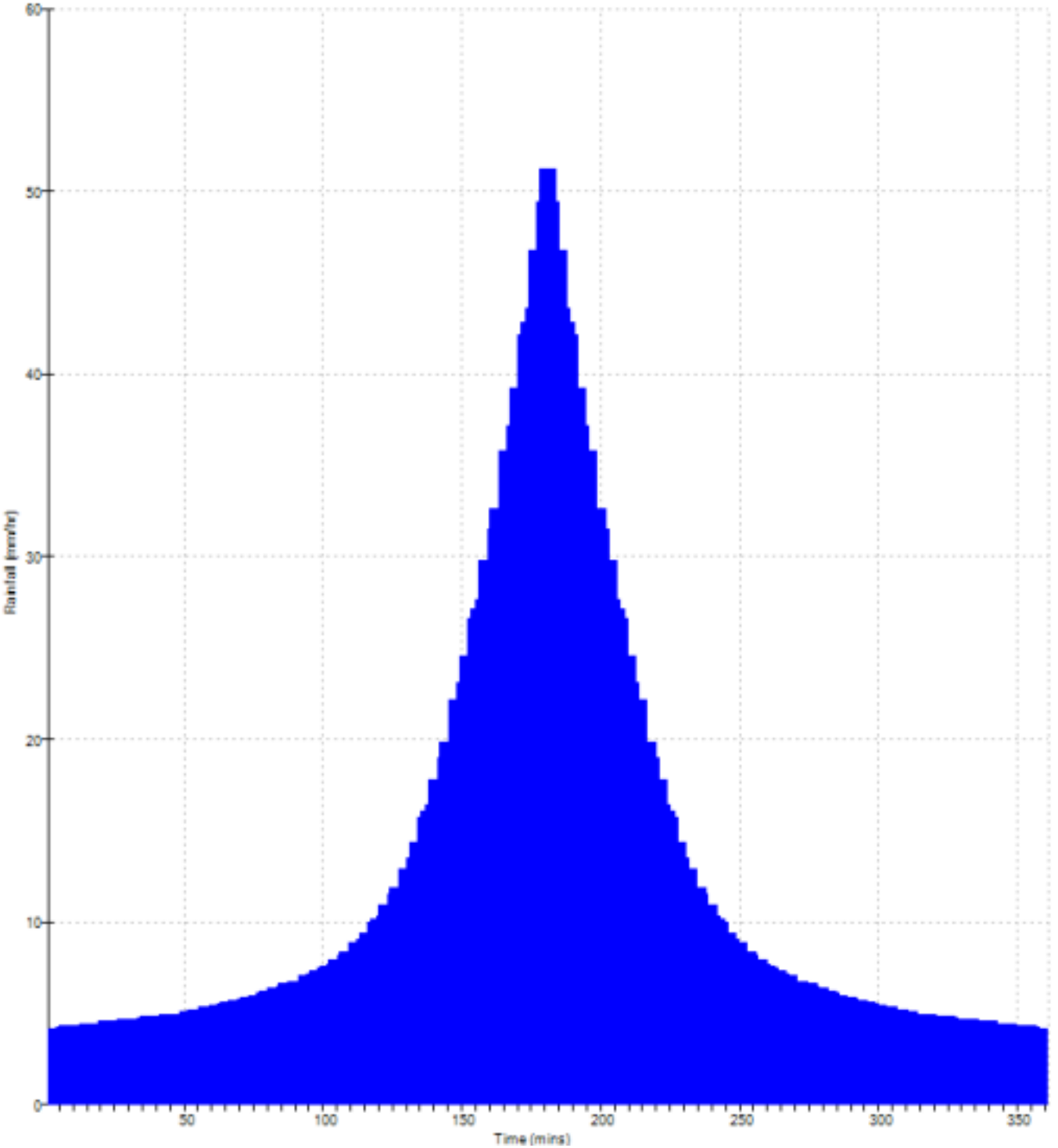


Rainfall profile

Storm duration (mins) 360

FEH Data

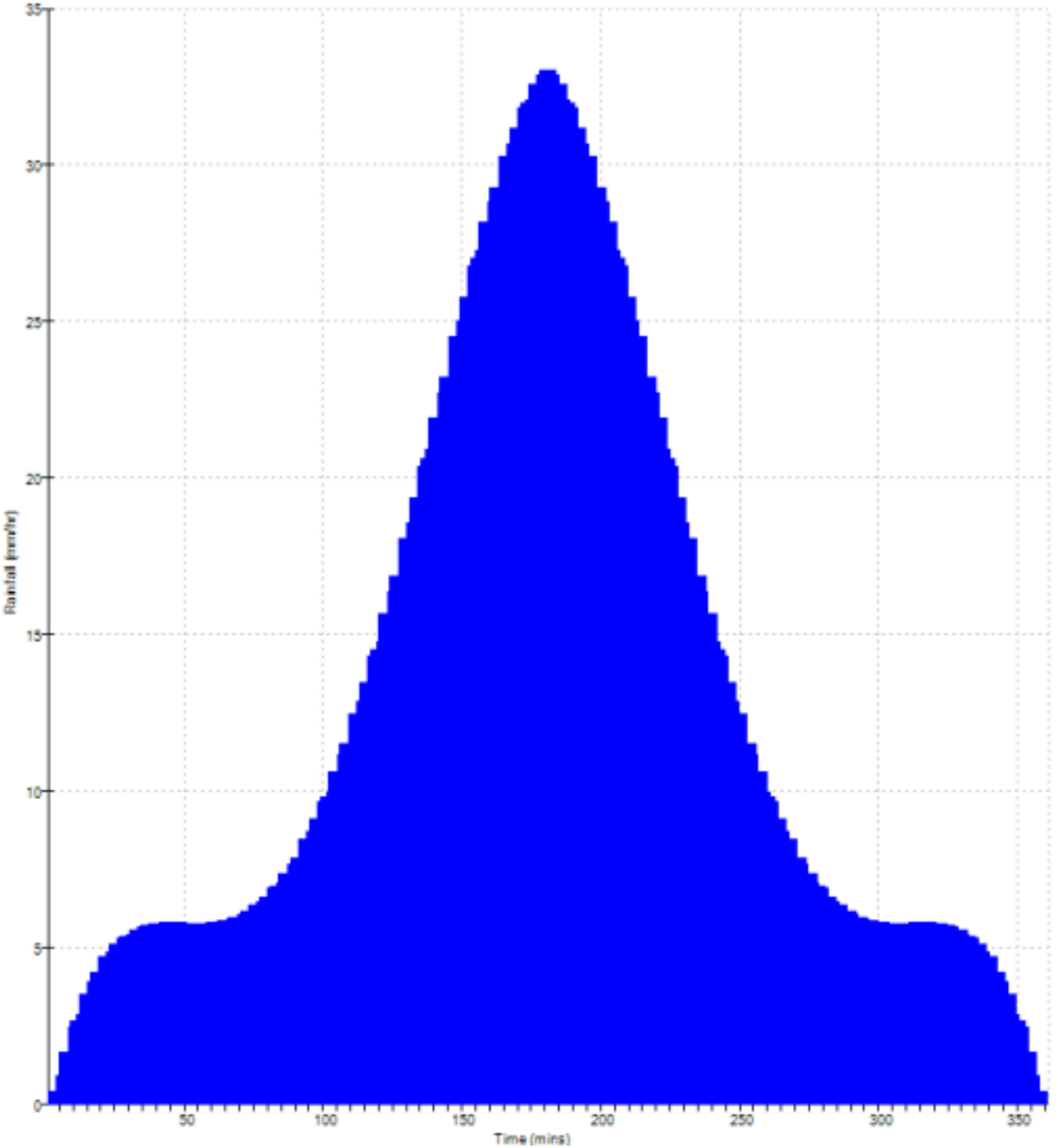
|                        |                                 |
|------------------------|---------------------------------|
| FEH Rainfall Version   | 2013                            |
| Site Location          | GB 306202 203750 SO 06202 03750 |
| Data Type              | Point                           |
| Peak Intensity (mm/hr) | 51.245                          |
| Ave. Intensity (mm/hr) | 13.073                          |
| Return Period (years)  | 100.0                           |



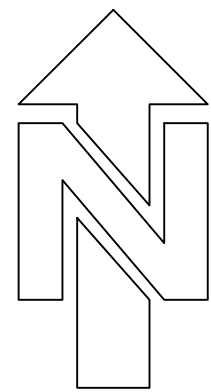
Rainfall profile

Storm duration (mins) 360

|                        |                                 |
|------------------------|---------------------------------|
| FEH Data               |                                 |
| FEH Rainfall Version   | 2013                            |
| Site Location          | GB 306202 203750 SO 06202 03750 |
| Data Type              | Point                           |
| Peak Intensity (mm/hr) | 33.062                          |
| Ave. Intensity (mm/hr) | 13.073                          |
| Return Period (years)  | 100.0                           |



**APPENDIX G**  
DRAINAGE STRATEGY PLAN



|                                         |             |                      |                  |
|-----------------------------------------|-------------|----------------------|------------------|
| London, Henley-on-Thames and Gloucester |             |                      |                  |
| Drawn<br>GPH                            | Ch'kd<br>AR | Scales<br>1:200 @ A1 | Date<br>MAY 2024 |
| Purpose of issue                        |             |                      |                  |
| PLANNING                                |             |                      |                  |
| Drawing Number                          |             |                      | Revision         |
| P24-0081-SK101                          |             |                      | P1               |

**APPENDIX H**  
MICRODRAINAGE RESULTS

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 1                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:37                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### 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 306202 203750 SO 06202 03750 |
| Data Type                             | Point                           |
| Maximum Rainfall (mm/hr)              | 50                              |
| Maximum Time of Concentration (mins)  | 30                              |
| Foul Sewage (l/s/ha)                  | 0.000                           |
| Volumetric Runoff Coeff.              | 1.000                           |
| PIMP (%)                              | 100                             |
| Add Flow / Climate Change (%)         | 0                               |
| Minimum Backdrop Height (m)           | 0.200                           |
| Maximum Backdrop Height (m)           | 1.500                           |
| Min Design Depth for Optimisation (m) | 1.200                           |
| 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

| Time<br>(mins) | Area<br>(ha) | Time<br>(mins) | Area<br>(ha) |
|----------------|--------------|----------------|--------------|
| 0-4            | 0.100        | 4-8            | 0.042        |

Total Area Contributing (ha) = 0.142

Total Pipe Volume (m³) = 3.427

#### Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|---------------------------------------------------------------------------------------|
| 1.000 | 8.354         | 0.030       | 278.5          | 0.104          | 5.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.001 | 19.016        | 0.080       | 237.7          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.002 | 7.012         | 0.030       | 233.7          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.003 | 5.986         | 0.020       | 299.3          | 0.017          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.004 | 4.400         | 0.020       | 220.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 2.000 | 2.613         | 0.670       | 3.9            | 0.021          | 5.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |

#### Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 45.81           | 5.15           | 144.510      | 0.104            | 0.0                  | 0.0           | 0.0               | 0.94         | 66.2         | 17.2          |
| 1.001 | 44.87           | 5.46           | 144.480      | 0.104            | 0.0                  | 0.0           | 0.0               | 1.02         | 71.8         | 17.2          |
| 1.002 | 44.55           | 5.57           | 144.400      | 0.104            | 0.0                  | 0.0           | 0.0               | 1.02         | 72.4         | 17.2          |
| 1.003 | 44.24           | 5.69           | 144.370      | 0.121            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.9         | 19.3          |
| 1.004 | 44.04           | 5.75           | 144.350      | 0.121            | 0.0                  | 0.0           | 0.0               | 1.06         | 74.6         | 19.3          |
| 2.000 | 46.25           | 5.01           | 145.150      | 0.021            | 0.0                  | 0.0           | 0.0               | 5.14         | 90.8         | 3.5           |

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                      |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|-------------------------------------------------------------------------------------|
| 1.005 | 5.446         | 0.400       | 13.6           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.005 | 43.97           | 5.78           | 144.330      | 0.142            | 0.0                  | 0.0           | 0.0               | 3.57         | 141.8        | 22.5          |

| Manhole Schedules for Storm |           |              |               |                    |       |                           |               |       |                           |               |               |
|-----------------------------|-----------|--------------|---------------|--------------------|-------|---------------------------|---------------|-------|---------------------------|---------------|---------------|
| MH Name                     | MH CL (m) | MH Depth (m) | MH Connection | MH Diam., L*W (mm) | PN    | Pipe Out Invert Level (m) | Diameter (mm) | PN    | Pipes In Invert Level (m) | Diameter (mm) | Backdrop (mm) |
| Catchpit                    | 145.600   | 1.090        | Open Manhole  | 1200               | 1.000 | 144.510                   | 300           |       |                           |               |               |
| 2                           | 145.650   | 1.170        | Open Manhole  | 1200               | 1.001 | 144.480                   | 300           | 1.000 | 144.480                   | 300           |               |
| 3                           | 145.700   | 1.300        | Open Manhole  | 1200               | 1.002 | 144.400                   | 300           | 1.001 | 144.400                   | 300           |               |
| Basin / Tank                | 145.750   | 1.380        | Open Manhole  | 1200               | 1.003 | 144.370                   | 300           | 1.002 | 144.370                   | 300           |               |
| 5                           | 145.750   | 1.400        | Open Manhole  | 1200               | 1.004 | 144.350                   | 300           | 1.003 | 144.350                   | 300           |               |
| Rain Garden                 | 145.750   | 0.600        | Open Manhole  | 1200               | 2.000 | 145.150                   | 150           |       |                           |               |               |
| Flow Control                | 145.600   | 1.270        | Open Manhole  | 1200               | 1.005 | 144.330                   | 225           | 1.004 | 144.330                   | 300           |               |
|                             |           |              |               |                    |       |                           |               | 2.000 | 144.480                   | 150           |               |
|                             | 144.430   | 0.500        | Open Manhole  | 0                  |       | OUTFALL                   |               | 1.005 | 143.930                   | 225           |               |

No coordinates have been specified, layout information cannot be produced.

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 4                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:37                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

#### PIPELINE SCHEDULES for Storm

##### Upstream Manhole

| PN    | Hyd<br>Sect | Diam<br>(mm) | MH<br>Name   | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|-------|-------------|--------------|--------------|----------------|----------------|----------------|------------------|-----------------------|
| 1.000 | o           | 300          | Catchpit     | 145.600        | 144.510        | 0.790          | Open Manhole     | 1200                  |
| 1.001 | o           | 300          | 2            | 145.650        | 144.480        | 0.870          | Open Manhole     | 1200                  |
| 1.002 | o           | 300          | 3            | 145.700        | 144.400        | 1.000          | Open Manhole     | 1200                  |
| 1.003 | o           | 300          | Basin / Tank | 145.750        | 144.370        | 1.080          | Open Manhole     | 1200                  |
| 1.004 | o           | 300          | 5            | 145.750        | 144.350        | 1.100          | Open Manhole     | 1200                  |
| 2.000 | o           | 150          | Rain Garden  | 145.750        | 145.150        | 0.450          | Open Manhole     | 1200                  |
| 1.005 | o           | 225          | Flow Control | 145.600        | 144.330        | 1.045          | Open Manhole     | 1200                  |

##### Downstream Manhole

| PN    | Length<br>(m) | Slope<br>(1:X) | MH<br>Name   | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|-------|---------------|----------------|--------------|----------------|----------------|----------------|------------------|-----------------------|
| 1.000 | 8.354         | 278.5          | 2            | 145.650        | 144.480        | 0.870          | Open Manhole     | 1200                  |
| 1.001 | 19.016        | 237.7          | 3            | 145.700        | 144.400        | 1.000          | Open Manhole     | 1200                  |
| 1.002 | 7.012         | 233.7          | Basin / Tank | 145.750        | 144.370        | 1.080          | Open Manhole     | 1200                  |
| 1.003 | 5.986         | 299.3          | 5            | 145.750        | 144.350        | 1.100          | Open Manhole     | 1200                  |
| 1.004 | 4.400         | 220.0          | Flow Control | 145.600        | 144.330        | 0.970          | Open Manhole     | 1200                  |
| 2.000 | 2.613         | 3.9            | Flow Control | 145.600        | 144.480        | 0.970          | Open Manhole     | 1200                  |
| 1.005 | 5.446         | 13.6           |              | 144.430        | 143.930        | 0.275          | Open Manhole     | 0                     |

#### Free Flowing Outfall Details for Storm

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

|       |  |         |         |       |   |   |
|-------|--|---------|---------|-------|---|---|
| 1.005 |  | 144.430 | 143.930 | 0.000 | 0 | 0 |
|-------|--|---------|---------|-------|---|---|

#### Simulation Criteria for Storm

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Volumetric Runoff Coeff         | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Areal Reduction Factor          | 1.000 | MADD Factor * 10m³/ha Storage       | 2.000 |
| Hot Start (mins)                | 0     | Inlet Coefficient                   | 0.800 |
| Hot Start Level (mm)            | 0     | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins)                     | 60    |
| Foul Sewage per hectare (l/s)   | 0.000 | Output Interval (mins)              | 1     |

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

#### Synthetic Rainfall Details

|                                               |             |                 |       |
|-----------------------------------------------|-------------|-----------------|-------|
| Rainfall Model                                | FEH         | Summer Storms   | Yes   |
| Return Period (years)                         | 2           | Winter Storms   | Yes   |
| FEH Rainfall Version                          | 2013        | Cv (Summer)     | 1.000 |
| Site Location GB 306202 203750 SO 06202 03750 |             | Cv (Winter)     | 0.840 |
| Data Type                                     | Point Storm | Duration (mins) | 30    |

Online Controls for Storm

Hydro-Brake® Optimum Manhole: Flow Control, DS/PN: 1.005, Volume (m³): 1.7

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SCU-0122-1590-1120-1590 |
| Design Head (m)                   | 1.120                      |
| Design Flow (l/s)                 | 15.9                       |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Linear discharge profile   |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 122                        |
| Invert Level (m)                  | 144.330                    |
| Minimum Outlet Pipe Diameter (mm) | 150                        |
| Suggested Manhole Diameter (mm)   | 1200                       |

| Control Points            | Head (m) | Flow (l/s) | Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|---------------------------|----------|------------|
| Design Point (Calculated) | 1.120    | 15.9       | Kick-Flo®                 | 0.182    | 6.8        |
| Flush-Flo™                | 0.147    | 6.9        | Mean Flow over Head Range | -        | 10.7       |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 4.8        | 0.800     | 13.6       | 2.000     | 21.0       | 4.000     | 29.3       | 7.000     | 38.4       |
| 0.200     | 7.1        | 1.000     | 15.1       | 2.200     | 22.0       | 4.500     | 31.0       | 7.500     | 39.7       |
| 0.300     | 8.5        | 1.200     | 16.4       | 2.400     | 22.9       | 5.000     | 32.6       | 8.000     | 40.9       |
| 0.400     | 9.8        | 1.400     | 17.7       | 2.600     | 23.8       | 5.500     | 34.1       | 8.500     | 42.2       |
| 0.500     | 10.9       | 1.600     | 18.8       | 3.000     | 25.5       | 6.000     | 35.6       | 9.000     | 43.4       |
| 0.600     | 11.8       | 1.800     | 19.9       | 3.500     | 27.4       | 6.500     | 37.0       | 9.500     | 44.5       |

Storage Structures for Storm

Complex Manhole: Basin / Tank, DS/PN: 1.003

Cellular Storage

Invert Level (m) 144.370 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|-----------|-----------|----------------|-----------|-----------|----------------|-----------|-----------|----------------|
| 0.000     | 66.0      | 66.0           | 0.400     | 66.0      | 79.6           | 0.401     | 0.0       | 79.6           |

Tank or Pond

| Invert Level (m) 145.150 |           |           |           |
|--------------------------|-----------|-----------|-----------|
| Depth (m)                | Area (m²) | Depth (m) | Area (m²) |
| 0.000                    | 38.2      | 0.600     | 92.7      |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 7                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:37                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

## 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 \* 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH Name   | Storm      | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) | Surcharged Depth (m) |
|-------|--------------|------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|----------------------|
| 1.000 | Catchpit     | 15 Summer  | 2             | +0%            | 100/30 Summer   |                 |                    |               | 144.633         | -0.177               |
| 1.001 | 2            | 15 Summer  | 2             | +0%            | 100/30 Summer   |                 |                    |               | 144.588         | -0.192               |
| 1.002 | 3            | 180 Summer | 2             | +0%            | 30/60 Summer    |                 |                    |               | 144.531         | -0.169               |
| 1.003 | Basin / Tank | 180 Summer | 2             | +0%            | 30/60 Summer    |                 |                    |               | 144.528         | -0.142               |
| 1.004 | 5            | 180 Summer | 2             | +0%            | 30/30 Summer    |                 |                    |               | 144.538         | -0.112               |
| 2.000 | Rain Garden  | 15 Summer  | 2             | +0%            |                 |                 |                    |               | 145.176         | -0.124               |
| 1.005 | Flow Control | 120 Summer | 2             | +0%            | 30/15 Summer    |                 |                    |               | 144.538         | -0.017               |

| PN    | US/MH Name   | Flooded     |                   | Pipe       |        | Level Exceeded |
|-------|--------------|-------------|-------------------|------------|--------|----------------|
|       |              | Volume (m³) | Flow / Cap. (l/s) | Flow (l/s) | Status |                |
| 1.000 | Catchpit     | 0.000       | 0.35              | 17.3       | OK     |                |
| 1.001 | 2            | 0.000       | 0.28              | 17.3       | OK     |                |
| 1.002 | 3            | 0.000       | 0.19              | 9.8        | OK     |                |
| 1.003 | Basin / Tank | 0.000       | 0.15              | 6.5        | OK     |                |
| 1.004 | 5            | 0.000       | 0.14              | 6.5        | OK     |                |
| 2.000 | Rain Garden  | 0.000       | 0.07              | 3.5        | OK     |                |
| 1.005 | Flow Control | 0.000       | 0.08              | 7.0        | OK     |                |

|                                                    |                      |                                                                                     |
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| Simpson Associates                                 |                      | Page 8                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:37                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Storm      | Return<br>Period | Climate<br>Change | First (X)<br>Surcharge | First (Y)<br>Flood | First (Z)<br>Overflow | Overflow<br>Act. | Water<br>Level<br>(m) | Surcharged<br>Depth<br>(m) |
|-------|---------------|------------|------------------|-------------------|------------------------|--------------------|-----------------------|------------------|-----------------------|----------------------------|
| 1.000 | Catchpit      | 60 Summer  | 30               | +0%               | 100/30 Summer          |                    |                       |                  | 144.761               | -0.049                     |
| 1.001 | 2             | 120 Summer | 30               | +0%               | 100/30 Summer          |                    |                       |                  | 144.751               | -0.029                     |
| 1.002 | 3             | 120 Summer | 30               | +0%               | 30/60 Summer           |                    |                       |                  | 144.737               | 0.037                      |
| 1.003 | Basin / Tank  | 120 Summer | 30               | +0%               | 30/60 Summer           |                    |                       |                  | 144.734               | 0.064                      |
| 1.004 | 5             | 120 Summer | 30               | +0%               | 30/30 Summer           |                    |                       |                  | 144.759               | 0.109                      |
| 2.000 | Rain Garden   | 15 Summer  | 30               | +0%               |                        |                    |                       |                  | 145.189               | -0.111                     |
| 1.005 | Flow Control  | 120 Summer | 30               | +0%               | 30/15 Summer           |                    |                       |                  | 144.764               | 0.209                      |

| PN    | US/MH<br>Name | Flooded        |                      | Pipe          |  | Status     | Level<br>Exceeded |
|-------|---------------|----------------|----------------------|---------------|--|------------|-------------------|
|       |               | Volume<br>(m³) | Flow /<br>Cap. (l/s) | Flow<br>(l/s) |  |            |                   |
| 1.000 | Catchpit      | 0.000          | 0.63                 | 31.7          |  | OK         |                   |
| 1.001 | 2             | 0.000          | 0.35                 | 21.6          |  | OK         |                   |
| 1.002 | 3             | 0.000          | 0.38                 | 19.8          |  | SURCHARGED |                   |
| 1.003 | Basin / Tank  | 0.000          | 0.21                 | 9.2           |  | SURCHARGED |                   |
| 1.004 | 5             | 0.000          | 0.19                 | 8.9           |  | SURCHARGED |                   |
| 2.000 | Rain Garden   | 0.000          | 0.15                 | 7.7           |  | OK         |                   |
| 1.005 | Flow Control  | 0.000          | 0.11                 | 9.6           |  | SURCHARGED |                   |

|                                                    |                      |                                                                                     |
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| Simpson Associates                                 |                      | Page 9                                                                              |
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| Date 09/05/2024 12:37                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### 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 \* 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH Name   | Storm      | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) | Surcharged Depth (m) |
|-------|--------------|------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|----------------------|
| 1.000 | Catchpit     | 120 Summer | 100           | +0%            | 100/30 Summer   |                 |                    |               | 145.189         | 0.379                |
| 1.001 | 2            | 120 Summer | 100           | +0%            | 100/30 Summer   |                 |                    |               | 145.182         | 0.402                |
| 1.002 | 3            | 120 Summer | 100           | +0%            | 30/60 Summer    |                 |                    |               | 145.171         | 0.471                |
| 1.003 | Basin / Tank | 120 Summer | 100           | +0%            | 30/60 Summer    |                 |                    |               | 145.167         | 0.497                |
| 1.004 | 5            | 60 Winter  | 100           | +0%            | 30/30 Summer    |                 |                    |               | 145.166         | 0.516                |
| 2.000 | Rain Garden  | 30 Summer  | 100           | +0%            |                 |                 |                    |               | 145.194         | -0.106               |
| 1.005 | Flow Control | 60 Winter  | 100           | +0%            | 30/15 Summer    |                 |                    |               | 145.166         | 0.611                |

| PN    | US/MH Name   | Flooded     |                   | Pipe       |            | Status | Level Exceeded |
|-------|--------------|-------------|-------------------|------------|------------|--------|----------------|
|       |              | Volume (m³) | Flow / Cap. (l/s) | Flow (l/s) |            |        |                |
| 1.000 | Catchpit     | 0.000       | 0.52              | 25.9       | SURCHARGED |        |                |
| 1.001 | 2            | 0.000       | 0.40              | 24.9       | SURCHARGED |        |                |
| 1.002 | 3            | 0.000       | 0.46              | 24.0       | SURCHARGED |        |                |
| 1.003 | Basin / Tank | 0.000       | 0.32              | 14.0       | SURCHARGED |        |                |
| 1.004 | 5            | 0.000       | 0.25              | 11.8       | SURCHARGED |        |                |
| 2.000 | Rain Garden  | 0.000       | 0.19              | 9.8        | OK         |        |                |
| 1.005 | Flow Control | 0.000       | 0.15              | 13.6       | SURCHARGED |        |                |

|                                                    |                      |                                                                                     |
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| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 2 year Summer I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                         | US/CL<br>(m) | Surcharged Flooded |                |  | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status |
|-------|---------------|-------------------------------|--------------|--------------------|----------------|--|---------------------|-----------------------|-----------------------|--------|
|       |               |                               |              | Depth<br>(m)       | Volume<br>(m³) |  |                     |                       |                       |        |
| 1.000 | Catchpit      | 360 minute 2 year Summer I+0% | 145.600      | -0.223             | 0.000          |  | 0.081               | 40.869                | 7.4                   | OK     |
| 1.001 | 2             | 360 minute 2 year Summer I+0% | 145.650      | -0.230             | 0.000          |  | 0.132               | 40.764                | 7.4                   | OK     |
| 1.002 | 3             | 360 minute 2 year Summer I+0% | 145.700      | -0.193             | 0.000          |  | 0.314               | 40.810                | 7.3                   | OK     |
| 1.003 | Basin / Tank  | 360 minute 2 year Summer I+0% | 145.750      | -0.165             | 0.000          |  | 8.731               | 47.528                | 6.4                   | OK     |
| 1.004 | 5             | 360 minute 2 year Summer I+0% | 145.750      | -0.135             | 0.000          |  | 0.323               | 47.518                | 6.3                   | OK     |
| 2.000 | Rain Garden   | 360 minute 2 year Summer I+0% | 145.750      | -0.133             | 0.000          |  | 0.013               | 8.253                 | 1.5                   | OK     |
| 1.005 | Flow Control  | 360 minute 2 year Summer I+0% | 145.600      | -0.040             | 0.000          |  | 0.317               | 55.762                | 6.9                   | OK     |

|                                                    |                      |                                                                                     |
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| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 30 year Summer I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                          | US/CL<br>(m) | Surcharged Flooded |                |  | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) |
|-------|---------------|--------------------------------|--------------|--------------------|----------------|--|---------------------|-----------------------|-----------------------|
|       |               |                                |              | Depth<br>(m)       | Volume<br>(m³) |  |                     |                       |                       |
| 1.000 | Catchpit      | 360 minute 30 year Summer I+0% | 145.600      | -0.127             | 0.000          |  | 0.190               | 68.089                | 12.2                  |
| 1.001 | 2             | 360 minute 30 year Summer I+0% | 145.650      | -0.101             | 0.000          |  | 0.503               | 67.988                | 11.9                  |
| 1.002 | 3             | 360 minute 30 year Summer I+0% | 145.700      | -0.028             | 0.000          |  | 1.299               | 68.030                | 11.3                  |
| 1.003 | Basin / Tank  | 360 minute 30 year Summer I+0% | 145.750      | -0.001             | 0.000          |  | 19.445              | 79.217                | 7.9                   |
| 1.004 | 5             | 360 minute 30 year Summer I+0% | 145.750      | 0.017              | 0.000          |  | 0.674               | 79.196                | 7.9                   |
| 2.000 | Rain Garden   | 360 minute 30 year Summer I+0% | 145.750      | -0.129             | 0.000          |  | 0.018               | 13.750                | 2.5                   |
| 1.005 | Flow Control  | 360 minute 30 year Summer I+0% | 145.600      | 0.111              | 0.000          |  | 0.596               | 92.904                | 8.9                   |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | OK         |
| 1.001 | 2             | OK         |
| 1.002 | 3             | OK         |
| 1.003 | Basin / Tank  | OK         |
| 1.004 | 5             | SURCHARGED |
| 2.000 | Rain Garden   | OK         |
| 1.005 | Flow Control  | SURCHARGED |

|                                                    |                      |                                                                                     |
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| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 100 year Summer I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                           | US/CL<br>(m)                    | Surcharged Flooded |                |                                  | Pipe<br>Flow<br>(l/s) |        |
|-------|---------------|---------------------------------|---------------------------------|--------------------|----------------|----------------------------------|-----------------------|--------|
|       |               |                                 |                                 | Depth<br>(m)       | Volume<br>(m³) | Maximum<br>Discharge<br>Vol (m³) |                       |        |
| 1.000 | Catchpit      | 360 minute 100 year Summer I+0% | 145.600                         | -0.018             | 0.000          | 0.313                            | 81.602                | 14.3   |
| 1.001 | 2             | 360 minute 100 year Summer I+0% | 145.650                         | 0.000              | 0.000          | 0.801                            | 81.499                | 13.8   |
| 1.002 | 3             | 360 minute 100 year Summer I+0% | 145.700                         | 0.070              | 0.000          | 1.634                            | 81.534                | 13.0   |
| 1.003 | Basin / Tank  | 360 minute 100 year Summer I+0% | 145.750                         | 0.097              | 0.000          | 25.719                           | 94.923                | 9.7    |
| 1.004 |               | 5                               | 360 minute 100 year Summer I+0% | 145.750            | 0.145          | 0.000                            | 0.836                 | 94.908 |
| 2.000 | Rain Garden   | 360 minute 100 year Summer I+0% | 145.750                         | -0.127             | 0.000          | 0.021                            | 16.478                | 3.0    |
| 1.005 | Flow Control  | 360 minute 100 year Summer I+0% | 145.600                         | 0.243              | 0.000          | 0.759                            | 111.364               | 9.9    |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | OK         |
| 1.001 | 2             | OK         |
| 1.002 | 3             | SURCHARGED |
| 1.003 | Basin / Tank  | SURCHARGED |
| 1.004 | 5             | SURCHARGED |
| 2.000 | Rain Garden   | OK         |
| 1.005 | Flow Control  | SURCHARGED |

|                                                    |                      |                                                                                     |
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| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 2 year Winter I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                         | US/CL<br>(m) | Surcharged Flooded |                |  | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) | Status |
|-------|---------------|-------------------------------|--------------|--------------------|----------------|--|---------------------|-----------------------|-----------------------|--------|
|       |               |                               |              | Depth<br>(m)       | Volume<br>(m³) |  |                     |                       |                       |        |
| 1.000 | Catchpit      | 360 minute 2 year Winter I+0% | 145.600      | -0.238             | 0.000          |  | 0.065               | 40.832                | 4.8                   | OK     |
| 1.001 | 2             | 360 minute 2 year Winter I+0% | 145.650      | -0.245             | 0.000          |  | 0.102               | 40.823                | 4.8                   | OK     |
| 1.002 | 3             | 360 minute 2 year Winter I+0% | 145.700      | -0.228             | 0.000          |  | 0.200               | 40.829                | 4.8                   | OK     |
| 1.003 | Basin / Tank  | 360 minute 2 year Winter I+0% | 145.750      | -0.208             | 0.000          |  | 5.918               | 47.498                | 5.4                   | OK     |
| 1.004 | 5             | 360 minute 2 year Winter I+0% | 145.750      | -0.194             | 0.000          |  | 0.177               | 47.473                | 5.3                   | OK     |
| 2.000 | Rain Garden   | 360 minute 2 year Winter I+0% | 145.750      | -0.137             | 0.000          |  | 0.010               | 8.244                 | 1.0                   | OK     |
| 1.005 | Flow Control  | 360 minute 2 year Winter I+0% | 145.600      | -0.101             | 0.000          |  | 0.193               | 55.707                | 6.1                   | OK     |

|                                                    |                      |                                                                                     |
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| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
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| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 30 year Winter I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                          | US/CL<br>(m) | Surcharged Flooded |                | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) |
|-------|---------------|--------------------------------|--------------|--------------------|----------------|---------------------|-----------------------|-----------------------|
|       |               |                                |              | Depth<br>(m)       | Volume<br>(m³) |                     |                       |                       |
| 1.000 | Catchpit      | 360 minute 30 year Winter I+0% | 145.600      | -0.199             | 0.000          | 0.109               | 68.095                | 7.9                   |
| 1.001 | 2             | 360 minute 30 year Winter I+0% | 145.650      | -0.175             | 0.000          | 0.267               | 67.992                | 7.9                   |
| 1.002 | 3             | 360 minute 30 year Winter I+0% | 145.700      | -0.101             | 0.000          | 0.872               | 68.037                | 7.6                   |
| 1.003 | Basin / Tank  | 360 minute 30 year Winter I+0% | 145.750      | -0.073             | 0.000          | 14.733              | 79.267                | 7.1                   |
| 1.004 | 5             | 360 minute 30 year Winter I+0% | 145.750      | -0.039             | 0.000          | 0.556               | 79.259                | 7.0                   |
| 2.000 | Rain Garden   | 360 minute 30 year Winter I+0% | 145.750      | -0.133             | 0.000          | 0.014               | 13.750                | 1.6                   |
| 1.005 | Flow Control  | 360 minute 30 year Winter I+0% | 145.600      | 0.056              | 0.000          | 0.508               | 92.999                | 8.0                   |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | OK         |
| 1.001 | 2             | OK         |
| 1.002 | 3             | OK         |
| 1.003 | Basin / Tank  | OK         |
| 1.004 | 5             | OK         |
| 2.000 | Rain Garden   | OK         |
| 1.005 | Flow Control  | SURCHARGED |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 6                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:39                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 100 year Winter I+0% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 2, 30, 100  
 Climate Change (%) 0, 0, 0

| PN    | US/MH<br>Name | Event                           | US/CL<br>(m) | Surcharged Flooded |                |                     | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) |
|-------|---------------|---------------------------------|--------------|--------------------|----------------|---------------------|-----------------------|-----------------------|
|       |               |                                 |              | Depth<br>(m)       | Volume<br>(m³) | Maximum<br>Vol (m³) |                       |                       |
| 1.000 | Catchpit      | 360 minute 100 year Winter I+0% | 145.600      | -0.113             | 0.000          | 0.205               | 81.619                | 9.4                   |
| 1.001 | 2             | 360 minute 100 year Winter I+0% | 145.650      | -0.088             | 0.000          | 0.543               | 81.505                | 9.3                   |
| 1.002 | 3             | 360 minute 100 year Winter I+0% | 145.700      | -0.014             | 0.000          | 1.377               | 81.556                | 8.9                   |
| 1.003 | Basin / Tank  | 360 minute 100 year Winter I+0% | 145.750      | 0.010              | 0.000          | 20.145              | 94.958                | 8.8                   |
| 1.004 | 5             | 360 minute 100 year Winter I+0% | 145.750      | 0.053              | 0.000          | 0.721               | 94.938                | 8.2                   |
| 2.000 | Rain Garden   | 360 minute 100 year Winter I+0% | 145.750      | -0.131             | 0.000          | 0.016               | 16.481                | 1.9                   |
| 1.005 | Flow Control  | 360 minute 100 year Winter I+0% | 145.600      | 0.150              | 0.000          | 0.646               | 111.397               | 9.0                   |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | OK         |
| 1.001 | 2             | OK         |
| 1.002 | 3             | OK         |
| 1.003 | Basin / Tank  | SURCHARGED |
| 1.004 | 5             | SURCHARGED |
| 2.000 | Rain Garden   | OK         |
| 1.005 | Flow Control  | SURCHARGED |

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 306202 203750 SO 06202 03750 |
| Data Type                                  | Point                           |
| Maximum Rainfall (mm/hr)                   | 50                              |
| Maximum Time of Concentration (mins)       | 30                              |
| Foul Sewage (l/s/ha)                       | 0.000                           |
| Volumetric Runoff Coeff.                   | 1.000                           |
| PIMP (%)                                   | 100                             |
| Add Flow / Climate Change (%)              | 0                               |
| Minimum Backdrop Height (m)                | 0.200                           |
| Maximum Backdrop Height (m)                | 1.500                           |
| Min Design Depth for Optimisation (m)      | 1.200                           |
| 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

| Time<br>(mins)                       | Area<br>(ha) | Time<br>(mins) | Area<br>(ha) |
|--------------------------------------|--------------|----------------|--------------|
| 0-4                                  | 0.100        | 4-8            | 0.042        |
| Total Area Contributing (ha) = 0.142 |              |                |              |
| Total Pipe Volume (m³) = 3.427       |              |                |              |

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                        |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|---------------------------------------------------------------------------------------|
| 1.000 | 8.354         | 0.030       | 278.5          | 0.104          | 5.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.001 | 19.016        | 0.080       | 237.7          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.002 | 7.012         | 0.030       | 233.7          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.003 | 5.986         | 0.020       | 299.3          | 0.017          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 1.004 | 4.400         | 0.020       | 220.0          | 0.000          | 0.00           | 0.0                | 0.600     | o           | 300         | Pipe/Conduit |  |
| 2.000 | 2.613         | 0.670       | 3.9            | 0.021          | 5.00           | 0.0                | 0.600     | o           | 150         | Pipe/Conduit |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.000 | 45.81           | 5.15           | 144.510      | 0.104            | 0.0                  | 0.0           | 0.0               | 0.94         | 66.2         | 17.2          |
| 1.001 | 44.87           | 5.46           | 144.480      | 0.104            | 0.0                  | 0.0           | 0.0               | 1.02         | 71.8         | 17.2          |
| 1.002 | 44.55           | 5.57           | 144.400      | 0.104            | 0.0                  | 0.0           | 0.0               | 1.02         | 72.4         | 17.2          |
| 1.003 | 44.24           | 5.69           | 144.370      | 0.121            | 0.0                  | 0.0           | 0.0               | 0.90         | 63.9         | 19.3          |
| 1.004 | 44.04           | 5.75           | 144.350      | 0.121            | 0.0                  | 0.0           | 0.0               | 1.06         | 74.6         | 19.3          |
| 2.000 | 46.25           | 5.01           | 145.150      | 0.021            | 0.0                  | 0.0           | 0.0               | 5.14         | 90.8         | 3.5           |

Network Design Table for Storm

| PN    | Length<br>(m) | Fall<br>(m) | Slope<br>(1:X) | I.Area<br>(ha) | T.E.<br>(mins) | Base<br>Flow (l/s) | k<br>(mm) | HYD<br>SECT | DIA<br>(mm) | Section Type | Auto<br>Design                                                                      |
|-------|---------------|-------------|----------------|----------------|----------------|--------------------|-----------|-------------|-------------|--------------|-------------------------------------------------------------------------------------|
| 1.005 | 5.446         | 0.400       | 13.6           | 0.000          | 0.00           | 0.0                | 0.600     | o           | 225         | Pipe/Conduit |  |

Network Results Table

| PN    | Rain<br>(mm/hr) | T.C.<br>(mins) | US/IL<br>(m) | Σ I.Area<br>(ha) | Σ Base<br>Flow (l/s) | Foul<br>(l/s) | Add Flow<br>(l/s) | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) |
|-------|-----------------|----------------|--------------|------------------|----------------------|---------------|-------------------|--------------|--------------|---------------|
| 1.005 | 43.97           | 5.78           | 144.330      | 0.142            | 0.0                  | 0.0           | 0.0               | 3.57         | 141.8        | 22.5          |

| Manhole Schedules for Storm                                                |           |              |               |                    |       |                           |               |       |                           |               |               |
|----------------------------------------------------------------------------|-----------|--------------|---------------|--------------------|-------|---------------------------|---------------|-------|---------------------------|---------------|---------------|
| MH Name                                                                    | MH CL (m) | MH Depth (m) | MH Connection | MH Diam., L*W (mm) | PN    | Pipe Out Invert Level (m) | Diameter (mm) | PN    | Pipes In Invert Level (m) | Diameter (mm) | Backdrop (mm) |
| Catchpit                                                                   | 145.600   | 1.090        | Open Manhole  | 1200               | 1.000 | 144.510                   | 300           |       |                           |               |               |
| 2                                                                          | 145.650   | 1.170        | Open Manhole  | 1200               | 1.001 | 144.480                   | 300           | 1.000 | 144.480                   | 300           |               |
| 3                                                                          | 145.700   | 1.300        | Open Manhole  | 1200               | 1.002 | 144.400                   | 300           | 1.001 | 144.400                   | 300           |               |
| Basin / Tank                                                               | 145.750   | 1.380        | Open Manhole  | 1200               | 1.003 | 144.370                   | 300           | 1.002 | 144.370                   | 300           |               |
| 5                                                                          | 145.750   | 1.400        | Open Manhole  | 1200               | 1.004 | 144.350                   | 300           | 1.003 | 144.350                   | 300           |               |
| Rain Garden                                                                | 145.750   | 0.600        | Open Manhole  | 1200               | 2.000 | 145.150                   | 150           |       |                           |               |               |
| Flow Control                                                               | 145.600   | 1.270        | Open Manhole  | 1200               | 1.005 | 144.330                   | 225           | 1.004 | 144.330                   | 300           |               |
|                                                                            |           |              |               |                    |       |                           |               | 2.000 | 144.480                   | 150           |               |
|                                                                            | 144.430   | 0.500        | Open Manhole  | 0                  |       | OUTFALL                   |               | 1.005 | 143.930                   | 225           |               |
| No coordinates have been specified, layout information cannot be produced. |           |              |               |                    |       |                           |               |       |                           |               |               |
| ©1982-2019 Innovyze                                                        |           |              |               |                    |       |                           |               |       |                           |               |               |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 4                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:29                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

#### PIPELINE SCHEDULES for Storm

##### Upstream Manhole

| PN    | Hyd<br>Sect | Diam<br>(mm) | MH<br>Name   | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|-------|-------------|--------------|--------------|----------------|----------------|----------------|------------------|-----------------------|
| 1.000 | o           | 300          | Catchpit     | 145.600        | 144.510        | 0.790          | Open Manhole     | 1200                  |
| 1.001 | o           | 300          | 2            | 145.650        | 144.480        | 0.870          | Open Manhole     | 1200                  |
| 1.002 | o           | 300          | 3            | 145.700        | 144.400        | 1.000          | Open Manhole     | 1200                  |
| 1.003 | o           | 300          | Basin / Tank | 145.750        | 144.370        | 1.080          | Open Manhole     | 1200                  |
| 1.004 | o           | 300          | 5            | 145.750        | 144.350        | 1.100          | Open Manhole     | 1200                  |
| 2.000 | o           | 150          | Rain Garden  | 145.750        | 145.150        | 0.450          | Open Manhole     | 1200                  |
| 1.005 | o           | 225          | Flow Control | 145.600        | 144.330        | 1.045          | Open Manhole     | 1200                  |

##### Downstream Manhole

| PN    | Length<br>(m) | Slope<br>(1:X) | MH<br>Name   | C.Level<br>(m) | I.Level<br>(m) | D.Depth<br>(m) | MH<br>Connection | MH DIAM., L*W<br>(mm) |
|-------|---------------|----------------|--------------|----------------|----------------|----------------|------------------|-----------------------|
| 1.000 | 8.354         | 278.5          | 2            | 145.650        | 144.480        | 0.870          | Open Manhole     | 1200                  |
| 1.001 | 19.016        | 237.7          | 3            | 145.700        | 144.400        | 1.000          | Open Manhole     | 1200                  |
| 1.002 | 7.012         | 233.7          | Basin / Tank | 145.750        | 144.370        | 1.080          | Open Manhole     | 1200                  |
| 1.003 | 5.986         | 299.3          | 5            | 145.750        | 144.350        | 1.100          | Open Manhole     | 1200                  |
| 1.004 | 4.400         | 220.0          | Flow Control | 145.600        | 144.330        | 0.970          | Open Manhole     | 1200                  |
| 2.000 | 2.613         | 3.9            | Flow Control | 145.600        | 144.480        | 0.970          | Open Manhole     | 1200                  |
| 1.005 | 5.446         | 13.6           |              | 144.430        | 143.930        | 0.275          | Open Manhole     | 0                     |

#### Free Flowing Outfall Details for Storm

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

|       |  |         |         |       |   |   |
|-------|--|---------|---------|-------|---|---|
| 1.005 |  | 144.430 | 143.930 | 0.000 | 0 | 0 |
|-------|--|---------|---------|-------|---|---|

#### Simulation Criteria for Storm

|                                 |       |                                     |       |
|---------------------------------|-------|-------------------------------------|-------|
| Volumetric Runoff Coeff         | 1.000 | Additional Flow - % of Total Flow   | 0.000 |
| Areal Reduction Factor          | 1.000 | MADD Factor * 10m³/ha Storage       | 2.000 |
| Hot Start (mins)                | 0     | Inlet Coefficient                   | 0.800 |
| Hot Start Level (mm)            | 0     | Flow per Person per Day (l/per/day) | 0.000 |
| Manhole Headloss Coeff (Global) | 0.500 | Run Time (mins)                     | 60    |
| Foul Sewage per hectare (l/s)   | 0.000 | Output Interval (mins)              | 1     |

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

#### Synthetic Rainfall Details

|                                               |                             |               |       |
|-----------------------------------------------|-----------------------------|---------------|-------|
| Rainfall Model                                | FEH                         | Summer Storms | Yes   |
| Return Period (years)                         | 2                           | Winter Storms | Yes   |
| FEH Rainfall Version                          | 2013                        | Cv (Summer)   | 1.000 |
| Site Location GB 306202 203750 SO 06202 03750 |                             | Cv (Winter)   | 0.840 |
| Data Type                                     | Point Storm Duration (mins) |               | 30    |

Online Controls for Storm

Hydro-Brake® Optimum Manhole: Flow Control, DS/PN: 1.005, Volume (m³): 1.7

|                                   |                            |
|-----------------------------------|----------------------------|
| Unit Reference                    | MD-SCU-0122-1590-1120-1590 |
| Design Head (m)                   | 1.120                      |
| Design Flow (l/s)                 | 15.9                       |
| Flush-Flo™                        | Calculated                 |
| Objective                         | Linear discharge profile   |
| Application                       | Surface                    |
| Sump Available                    | Yes                        |
| Diameter (mm)                     | 122                        |
| Invert Level (m)                  | 144.330                    |
| Minimum Outlet Pipe Diameter (mm) | 150                        |
| Suggested Manhole Diameter (mm)   | 1200                       |

| Control Points            | Head (m) | Flow (l/s) | Control Points            | Head (m) | Flow (l/s) |
|---------------------------|----------|------------|---------------------------|----------|------------|
| Design Point (Calculated) | 1.120    | 15.9       | Kick-Flo®                 | 0.182    | 6.8        |
| Flush-Flo™                | 0.147    | 6.9        | Mean Flow over Head Range | -        | 10.7       |

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|-----------|------------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 0.100     | 4.8        | 0.800     | 13.6       | 2.000     | 21.0       | 4.000     | 29.3       | 7.000     | 38.4       |
| 0.200     | 7.1        | 1.000     | 15.1       | 2.200     | 22.0       | 4.500     | 31.0       | 7.500     | 39.7       |
| 0.300     | 8.5        | 1.200     | 16.4       | 2.400     | 22.9       | 5.000     | 32.6       | 8.000     | 40.9       |
| 0.400     | 9.8        | 1.400     | 17.7       | 2.600     | 23.8       | 5.500     | 34.1       | 8.500     | 42.2       |
| 0.500     | 10.9       | 1.600     | 18.8       | 3.000     | 25.5       | 6.000     | 35.6       | 9.000     | 43.4       |
| 0.600     | 11.8       | 1.800     | 19.9       | 3.500     | 27.4       | 6.500     | 37.0       | 9.500     | 44.5       |

Storage Structures for Storm

Complex Manhole: Basin / Tank, DS/PN: 1.003

Cellular Storage

Invert Level (m) 144.370 Safety Factor 2.0  
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95  
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) | Depth (m) | Area (m²) | Inf. Area (m²) |
|-----------|-----------|----------------|-----------|-----------|----------------|-----------|-----------|----------------|
| 0.000     | 66.0      | 66.0           | 0.400     | 66.0      | 79.6           | 0.401     | 0.0       | 79.6           |

Tank or Pond

| Invert Level (m) 145.150 |           |           |           |
|--------------------------|-----------|-----------|-----------|
| Depth (m)                | Area (m²) | Depth (m) | Area (m²) |
| 0.000                    | 38.2      | 0.600     | 92.7      |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 7                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:29                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 100  
 Climate Change (%) 40

| PN    | US/MH Name   | Storm      | Return Period | Climate Change | First (X) Surge | First (Y) Flood | First (Z) Overflow | Overflow Act. | Water Level (m) | Surcharged Depth (m) |
|-------|--------------|------------|---------------|----------------|-----------------|-----------------|--------------------|---------------|-----------------|----------------------|
| 1.000 | Catchpit     | 120 Summer | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.559         | 0.749                |
| 1.001 | 2            | 60 Summer  | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.524         | 0.744                |
| 1.002 | 3            | 120 Summer | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.453         | 0.753                |
| 1.003 | Basin / Tank | 120 Summer | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.447         | 0.777                |
| 1.004 | 5            | 120 Summer | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.444         | 0.794                |
| 2.000 | Rain Garden  | 120 Summer | 100           | +40%           | 100/60 Summer   |                 |                    |               | 145.443         | 0.143                |
| 1.005 | Flow Control | 120 Summer | 100           | +40%           | 100/15 Summer   |                 |                    |               | 145.440         | 0.885                |

| PN    | US/MH Name   | Flooded     |                   | Pipe       |                | Status | Level Exceeded |
|-------|--------------|-------------|-------------------|------------|----------------|--------|----------------|
|       |              | Volume (m³) | Flow / Cap. (l/s) | Flow (l/s) | Overflow (l/s) |        |                |
| 1.000 | Catchpit     | 0.000       | 0.73              | 36.6       | FLOOD RISK     |        |                |
| 1.001 | 2            | 0.000       | 0.80              | 49.7       | FLOOD RISK     |        |                |
| 1.002 | 3            | 0.000       | 0.64              | 33.3       | SURCHARGED     |        |                |
| 1.003 | Basin / Tank | 0.000       | 0.37              | 16.3       | SURCHARGED     |        |                |
| 1.004 | 5            | 0.000       | 0.30              | 14.1       | SURCHARGED     |        |                |
| 2.000 | Rain Garden  | 0.000       | 0.15              | 7.9        | SURCHARGED     |        |                |
| 1.005 | Flow Control | 0.000       | 0.18              | 15.8       | SURCHARGED     |        |                |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 1                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:31                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 100 year Summer I+40% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status ON

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, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 100

Climate Change (%) 40

| PN    | US/MH<br>Name | Event                            | US/CL<br>(m) | Surcharged   |                | Flooded      |                | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) |
|-------|---------------|----------------------------------|--------------|--------------|----------------|--------------|----------------|---------------------|-----------------------|-----------------------|
|       |               |                                  |              | Depth<br>(m) | Volume<br>(m³) | Depth<br>(m) | Volume<br>(m³) |                     |                       |                       |
| 1.000 | Catchpit      | 360 minute 100 year Summer I+40% | 145.600      | 0.539        | 0.000          | 0.943        | 114.230        | 20.2                |                       |                       |
| 1.001 | 2             | 360 minute 100 year Summer I+40% | 145.650      | 0.562        | 0.000          | 1.475        | 114.136        | 19.7                |                       |                       |
| 1.002 | 3             | 360 minute 100 year Summer I+40% | 145.700      | 0.631        | 0.000          | 2.307        | 114.172        | 19.1                |                       |                       |
| 1.003 | Basin / Tank  | 360 minute 100 year Summer I+40% | 145.750      | 0.655        | 0.000          | 34.440       | 132.898        | 13.7                |                       |                       |
| 1.004 | 5             | 360 minute 100 year Summer I+40% | 145.750      | 0.674        | 0.000          | 1.435        | 132.877        | 13.2                |                       |                       |
| 2.000 | Rain Garden   | 360 minute 100 year Summer I+40% | 145.750      | 0.021        | 0.000          | 0.188        | 23.067         | 4.2                 |                       |                       |
| 1.005 | Flow Control  | 360 minute 100 year Summer I+40% | 145.600      | 0.766        | 0.000          | 1.366        | 155.916        | 14.9                |                       |                       |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | SURCHARGED |
| 1.001 | 2             | SURCHARGED |
| 1.002 | 3             | SURCHARGED |
| 1.003 | Basin / Tank  | SURCHARGED |
| 1.004 | 5             | SURCHARGED |
| 2.000 | Rain Garden   | SURCHARGED |
| 1.005 | Flow Control  | SURCHARGED |

|                                                    |                      |                                                                                     |
|----------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Simpson Associates                                 |                      | Page 2                                                                              |
| 1 Market Place Mews<br>Henley-on-Thames<br>RG9 2AH |                      |  |
| Date 09/05/2024 12:31                              | Designed by GaryHunt |                                                                                     |
| File P24-0081 Proposed SW Network.MDX              | Checked by           |                                                                                     |
| Micro Drainage                                     | Network 2019.1       |                                                                                     |

### Summary Wizard of 360 minute 100 year Winter I+40% 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 0  
 Number of Online Controls 1    Number of Storage Structures 1    Number of Real Time Controls 0

#### Synthetic Rainfall Details

Rainfall Model FEH    Data Type Point  
 FEH Rainfall Version 2013 Cv (Summer) 1.000  
 Site Location GB 306202 203750 SO 06202 03750 Cv (Winter) 1.000

Margin for Flood Risk Warning (mm) 150.0  
 Analysis Timestep 2.5 Second Increment (Extended)  
 DTS Status ON  
 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, 2160, 2880, 4320, 5760, 7200, 8640, 10080  
 Return Period(s) (years) 100  
 Climate Change (%) 40

| PN    | US/MH<br>Name | Event                            | US/CL<br>(m) | Surcharged Flooded |                |        | Maximum<br>Vol (m³) | Discharge<br>Vol (m³) | Pipe<br>Flow<br>(l/s) |
|-------|---------------|----------------------------------|--------------|--------------------|----------------|--------|---------------------|-----------------------|-----------------------|
|       |               |                                  |              | Depth<br>(m)       | Volume<br>(m³) |        |                     |                       |                       |
| 1.000 | Catchpit      | 360 minute 100 year Winter I+40% | 145.600      | 0.400              | 0.000          | 0.786  | 114.238             | 13.4                  |                       |
| 1.001 | 2             | 360 minute 100 year Winter I+40% | 145.650      | 0.425              | 0.000          | 1.320  | 114.129             | 13.4                  |                       |
| 1.002 | 3             | 360 minute 100 year Winter I+40% | 145.700      | 0.496              | 0.000          | 2.154  | 114.166             | 13.1                  |                       |
| 1.003 | Basin / Tank  | 360 minute 100 year Winter I+40% | 145.750      | 0.520              | 0.000          | 28.040 | 132.852             | 12.5                  |                       |
| 1.004 | 5             | 360 minute 100 year Winter I+40% | 145.750      | 0.549              | 0.000          | 1.293  | 132.822             | 12.3                  |                       |
| 2.000 | Rain Garden   | 360 minute 100 year Winter I+40% | 145.750      | -0.115             | 0.000          | 0.034  | 23.067              | 2.7                   |                       |
| 1.005 | Flow Control  | 360 minute 100 year Winter I+40% | 145.600      | 0.643              | 0.000          | 1.226  | 155.837             | 13.8                  |                       |

| PN    | US/MH<br>Name | Status     |
|-------|---------------|------------|
| 1.000 | Catchpit      | SURCHARGED |
| 1.001 | 2             | SURCHARGED |
| 1.002 | 3             | SURCHARGED |
| 1.003 | Basin / Tank  | SURCHARGED |
| 1.004 | 5             | SURCHARGED |
| 2.000 | Rain Garden   | OK         |
| 1.005 | Flow Control  | SURCHARGED |

#### **Henley-On-Thames**

8 Friday Street  
Henley-on-Thames  
Oxfordshire  
RG9 1AH  
+44 (0)1491 576 22

#### **Gloucester**

Unit B10  
Elmbridge Court Business  
Park  
Gloucester  
GL3 1JZ  
+44 (0)1452 309 727

#### **London**

4<sup>th</sup> Floor Devonshire House  
60 Goswell Road  
London  
EC1M 7AD  
+44 (0)207 253 2626

#### **Online**

[www.simpsoneng.com](http://www.simpsoneng.com)  
[mail@simpsoneng.com](mailto:mail@simpsoneng.com)