# APPENDIX 05

## Foul Water Drainage Impact Assessment (GGP)

# ANAEROBIC DIGESTION PLANT DIRTY WATER USAGE STRATEGY

## FOR

## PROPOSED ANAEROBIC DIGESTION PLANT

## ON BEHALF OF

| | |
|---|---|
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| Document Revision Box | | | |
|---|---|---|---|
| Revision | Date | Description | Author |
| **01** | 5th July 2022 | Draft | JHC |
| | | | |
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## 1.0 Introduction

GGP Consult has been instructed by Acorn Bioenergy Ltd to prepare a dirty water usage strategy drainage impact assessment to establish the storage requirements associated with the operation function of the proposed anaerobic digestion plant.

The calculations will detail how surface water from the site will be managed, in compliance with local policy and an environmental permit.

## 2.0 Description of Proposed Site

It is typically proposed to develop an anaerobic digestion plant, consisting of 5nr digestate tank, silage clamps, a digestate lagoon, gas equipment, material storage buildings, a pond or similar, offices, parking and additional miscellaneous equipment.

## 3.0 Catchment Areas

Various areas within the site will be subject to different operation functions, causing some areas being contaminated, some clean, and some with the potential to be contaminated. Therefore, to improve water quality and optimise site efficiency, the site is split into catchments and subject to different drainage philosophies.

## 4.0 Design Philosophy

As stated within section 3.0, the site has been split into different catchments based on level of contamination. These catchments will be split into different drainage systems.

Two primary drainage systems will be adopted: clean and contaminated.

**Contaminated** runoff, caused by silage residue, from the silage clamps and sections of hardstanding area will be collected through a series of drainage channels, pipes, and chambers and be brought into a below ground holding tank. From this tank, runoff will be pumped to 3nr 400m³ holding tanks within the bund where it will be reused within the process.

The process has a yearly demand of 62,000m³, equating to 2l/s continuous flow. This offers a sustainable drainage system, compliant with the hierarchy.

**Clean** runoff will be collected from buildings and sections of hardstanding and discharged into the pond or similar. Petrochemicals will be present within the clean hardstanding runoff, which will be mitigated through a full retention petrol interceptor.

Runoff will then be discharged into the adjacent watercourse at greenfield rates.

**Bund** runoff has the potential to become contaminated through process residue. This will be collected through a channel drain and discharged into a pump chamber where it will be sampled and pumped to a pond feature (if clean) or reused in the process (if contaminated).

## 5.0 Clean / Contaminated Bund Runoff

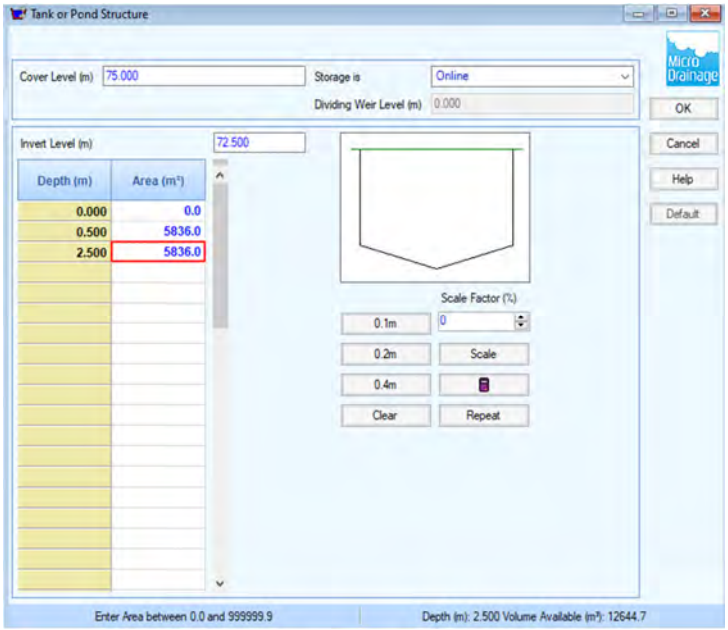
Rainfall collected within the bund has the potential to be contaminated through process residue. Therefore, runoff is collected and contained within the bund until it is sampled to determine if contamination is present.

If clean, runoff will be pumped to the pond or similar. If contaminated, runoff will be pumped into the process for reuse.

Runoff must be sampled prior to discharge, therefore, when the site is unmanned, the bund will store runoff until sampling can be undertaken. The longest period the site will be unmanned is over a 12hr night period. Therefore, the bund will be modelled within no outfall with the 12hr storm events will be taken as the critical event.

A typical bund has a slab level of between 72.500m - 73.000m AOD (AOD levels Site specific) with a top of wall level of 75.000m AOD. A internal area of 9,727m², 3,889m² of which is taken by the tanks, resulting in an available bund area of 5,836m².

These parameters have been used to model the bund within MicroDrainage 'Source Control'. An extract of the structure can be seen below.




The model has been run over a variety of storm events with the resultant volumes and depths detailed below.

| Storm Event | Volume | Depth |
|---|---|---|
| 1:1 Yr 12hr + 40%CC | 305.6m³ | 340mm |
| 1:2 Yr 12hr + 40%CC | 368.0m³ | 362mm |
| 1:10 Yr 12hr + 40%CC | 518.8m³ | 405mm |
| 1:30 Yr 12hr + 40%CC | 651.6m³ | 437mm |
| 1:100 Yr 12hr + 40%CC | 836.4m³ | 475mm |

The above results shall vary slightly based on site geographical area. However, the result shows the bund has more than sufficient capacity. The bund is typically designed for 110% of the largest tank i.e., 8,489m³

Refer to Appendix VI for the full bund calculations.

## 6.0 Contaminated Silage Clamp Runoff

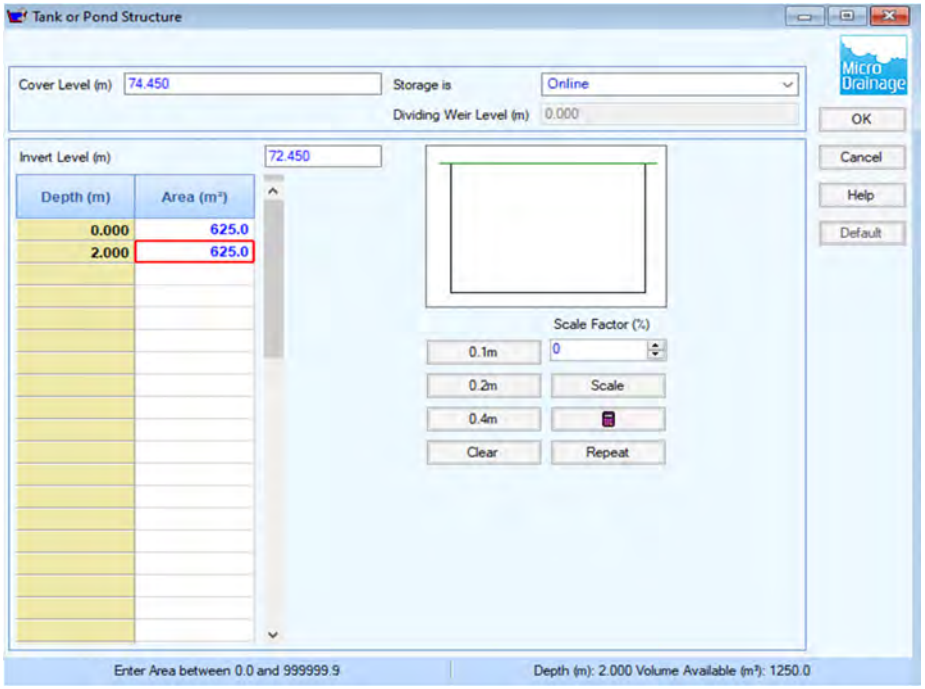
The runoff from the silage clamps will be contaminated with leachate from the crop. As the runoff has leachate within it, it has value to be reused within the process. Therefore, the site will use contaminated runoff as a main source of water.

Runoff will be collected through channel drains running along the front of the clamps where it will be brought to the south of the clamps and discharged into an underground holding tank of 50m³.

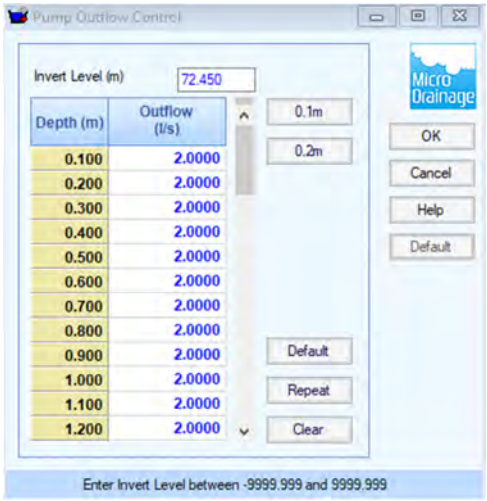
This will then be pumped into 3nr 400m³ holding tanks within the bund where it will be used within the process at a rate of 2l/s/. This provides a total storage capacity of 1,250m³.

All the storage capacity will be modelled as a single tank with a pumped discharge of 2l/s.

An extract of the storage structure and pump structure is shown below.




**MicroDrainage 'Source Control' Tank Structure**




**MicroDrainage 'Source Control' Pump Overflow**

The model has been run over a variety of storm events with the resultant volumes and depths detailed below. During extreme storm events, the discharge into the process will be increased to prevent above ground flooding.

As the site for a maximum period of 12hrs, the peak and 12hr event will be analysed.

| Storm Event | Volume | Discharge Rate | |
|---|---|---|---|
| 1:1 Yr 12hr + 40%CC | 492.7m³ | 2.0l/s | |
| 1:1 Yr 36hr + 40%CC | 546.5m³ | 2.0l/s | |
| 1:2 Yr 12hr + 40%CC | 605.9m³ | 2.0l/s | |
| 1:2 Yr 36hr + 40%CC | 678.1m³ | 2.0l/s | |
| 1:10 Yr 12hr + 40%CC | 880.9m³ | 2.0l/s | |
| 1:10 Yr 48hr + 40%CC | 1,011.4m³ | 2.0l/s | |
| 1:30 Yr 12hr + 40%CC | 1,124.4m³ | 2.0l/s | |
| 1:30 Yr 48hr + 40%CC | 1,305.6m³ | 2.0l/s | Flood |
| 1:100 Yr 12hr + 40%CC | 1,464.2m³ | 2.0l/s | Flood |
| 1:100 Yr 48hr + 40%CC | 1,712.9m³ | 2.0l/s | Flood |

Refer to Appendix IX for silage clamp 2l/s calculations.

As shown within the above calculations, the contaminated drainage system floods within the peak 1:30 event and both 1:100 events.

In these extreme storm events, it is proposed to increase the discharge rate into the process. The calculations have been remodelled with higher discharge rates to determine what rates are required to prevent flooding.

| Storm Event | Volume | Discharge Rate |
|---|---|---|
| 1:30 Yr 36hr + 40%CC | 1,231.2m³ | 2.5l/s |
| 1:100 Yr 12hr + 40%CC | 1,247.8m³ | 7.6l/s |
| 1:100 Yr 12hr (Peak) + 40%CC | 1,247.8m³ | 7.6l/s |

Refer to Appendix X for amended pump rate calculations.

As shown above, during the peak 1:30 event, the process must increase the discharge to 2.5l/s and increase the 1:100 to 7.6l/s/ to prevent above ground flooding. It should also be noted that additional storage tank are likely to be available to hold further water.

## 10.0 Plant Water Demand Against Average Annual Rainfall

The site has been designed to contain all flows up to and including the 1:100 year +40% CC below ground.

An assessment has been undertaken to compare the average annual rainfall (AAR) against the process' water demand to determine if the process demand is greater than the harvested water.

From reviewing the process, it is expected the process has a yearly operation demand of 62,000m³, equating to a continuous flow of 2l/s.

AAR = 0.667

Area (Total Catchment) = 46,347m²

CC = 40%

Total annual rainfall (including climate change) = 43,278.8m³

The rainfall generated within the contaminated catchment provides 43,278.8m³ of water each year, 70% of the yearly demand.

As shown above, the plant has a greater demand then the yearly rainfall within the site with the addition of climate change. The attenuation capacity has been solely provided to satisfy local and national policy.

Therefore, the collected runoff is recycled within the process, satisfying sustainability and drainage hierarchy requirements.

# APPENDIX I

Bund Calculations

## Summary of Results for 1 year Return Period (+40%)

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 15 min Summer | 72.718 | 0.218 | 80.1 | O K |
| 30 min Summer | 72.738 | 0.238 | 104.5 | O K |
| 60 min Summer | 72.757 | 0.257 | 132.4 | O K |
| 120 min Summer | 72.776 | 0.276 | 164.3 | O K |
| 180 min Summer | 72.788 | 0.288 | 185.5 | O K |
| 240 min Summer | 72.796 | 0.296 | 202.0 | O K |
| 360 min Summer | 72.808 | 0.308 | 226.3 | O K |
| 480 min Summer | 72.816 | 0.316 | 244.6 | O K |
| 600 min Summer | 72.822 | 0.322 | 259.8 | O K |
| 720 min Summer | 72.827 | 0.327 | 272.9 | O K |
| 960 min Summer | 72.836 | 0.336 | 294.9 | O K |
| 1440 min Summer | 72.848 | 0.348 | 329.2 | O K |
| 2160 min Summer | 72.862 | 0.362 | 367.7 | O K |
| 2880 min Summer | 72.871 | 0.371 | 397.3 | O K |
| 4320 min Summer | 72.885 | 0.385 | 443.2 | O K |
| 5760 min Summer | 72.895 | 0.395 | 479.2 | O K |
| 7200 min Summer | 72.903 | 0.403 | 509.3 | O K |
| 8640 min Summer | 72.910 | 0.410 | 535.4 | O K |
| 10080 min Summer | 72.916 | 0.416 | 558.6 | O K |
| 15 min Winter | 72.726 | 0.226 | 89.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 43.387 | 0.0 | 23 |
| 30 min Summer | 28.301 | 0.0 | 38 |
| 60 min Summer | 17.920 | 0.0 | 68 |
| 120 min Summer | 11.119 | 0.0 | 128 |
| 180 min Summer | 8.370 | 0.0 | 188 |
| 240 min Summer | 6.835 | 0.0 | 248 |
| 360 min Summer | 5.105 | 0.0 | 368 |
| 480 min Summer | 4.138 | 0.0 | 488 |
| 600 min Summer | 3.516 | 0.0 | 608 |
| 720 min Summer | 3.078 | 0.0 | 728 |
| 960 min Summer | 2.495 | 0.0 | 968 |
| 1440 min Summer | 1.857 | 0.0 | 1448 |
| 2160 min Summer | 1.383 | 0.0 | 2168 |
| 2880 min Summer | 1.120 | 0.0 | 2888 |
| 4320 min Summer | 0.833 | 0.0 | 4328 |
| 5760 min Summer | 0.676 | 0.0 | 5768 |
| 7200 min Summer | 0.574 | 0.0 | 7208 |
| 8640 min Summer | 0.503 | 0.0 | 8648 |
| 10080 min Summer | 0.450 | 0.0 | 10088 |
| 15 min Winter | 43.387 | 0.0 | 23 |

## Summary of Results for 1 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 30 min Winter | 72.747 | 0.247 | 117.1 | O K |
| 60 min Winter | 72.767 | 0.267 | 148.3 | O K |
| 120 min Winter | 72.787 | 0.287 | 184.0 | O K |
| 180 min Winter | 72.799 | 0.299 | 207.8 | O K |
| 240 min Winter | 72.807 | 0.307 | 226.2 | O K |
| 360 min Winter | 72.819 | 0.319 | 253.4 | O K |
| 480 min Winter | 72.828 | 0.328 | 273.9 | O K |
| 600 min Winter | 72.834 | 0.334 | 290.9 | O K |
| 720 min Winter | 72.840 | 0.340 | 305.6 | O K |
| 960 min Winter | 72.849 | 0.349 | 330.3 | O K |
| 1440 min Winter | 72.862 | 0.362 | 368.7 | O K |
| 2160 min Winter | 72.875 | 0.375 | 411.9 | O K |
| 2880 min Winter | 72.885 | 0.385 | 445.0 | O K |
| 4320 min Winter | 72.900 | 0.400 | 496.4 | O K |
| 5760 min Winter | 72.910 | 0.410 | 536.7 | O K |
| 7200 min Winter | 72.919 | 0.419 | 570.4 | O K |
| 8640 min Winter | 72.926 | 0.426 | 599.7 | O K |
| 10080 min Winter | 72.932 | 0.432 | 625.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 28.301 | 0.0 | 38 |
| 60 min Winter | 17.920 | 0.0 | 68 |
| 120 min Winter | 11.119 | 0.0 | 128 |
| 180 min Winter | 8.370 | 0.0 | 188 |
| 240 min Winter | 6.835 | 0.0 | 248 |
| 360 min Winter | 5.105 | 0.0 | 368 |
| 480 min Winter | 4.138 | 0.0 | 488 |
| 600 min Winter | 3.516 | 0.0 | 608 |
| 720 min Winter | 3.078 | 0.0 | 728 |
| 960 min Winter | 2.495 | 0.0 | 968 |
| 1440 min Winter | 1.857 | 0.0 | 1448 |
| 2160 min Winter | 1.383 | 0.0 | 2168 |
| 2880 min Winter | 1.120 | 0.0 | 2888 |
| 4320 min Winter | 0.833 | 0.0 | 4328 |
| 5760 min Winter | 0.676 | 0.0 | 5768 |
| 7200 min Winter | 0.574 | 0.0 | 7208 |
| 8640 min Winter | 0.503 | 0.0 | 8648 |
| 10080 min Winter | 0.450 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 1 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.985

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.492 | 4 | 8 | 0.493 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 75.000

## Tank or Pond Structure

Invert Level (m) 72.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 0.0 | 0.500 | 5836.0 | 2.500 | 5836.0 |

## Summary of Results for 2 year Return Period (+40%)

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 15 min Summer | 72.737 | 0.237 | 103.6 | O K |
| 30 min Summer | 72.758 | 0.258 | 134.3 | O K |
| 60 min Summer | 72.778 | 0.278 | 167.5 | O K |
| 120 min Summer | 72.797 | 0.297 | 204.7 | O K |
| 180 min Summer | 72.809 | 0.309 | 228.9 | O K |
| 240 min Summer | 72.817 | 0.317 | 247.5 | O K |
| 360 min Summer | 72.828 | 0.328 | 275.2 | O K |
| 480 min Summer | 72.836 | 0.336 | 296.3 | O K |
| 600 min Summer | 72.843 | 0.343 | 313.7 | O K |
| 720 min Summer | 72.848 | 0.348 | 328.6 | O K |
| 960 min Summer | 72.857 | 0.357 | 353.5 | O K |
| 1440 min Summer | 72.869 | 0.369 | 391.9 | O K |
| 2160 min Summer | 72.882 | 0.382 | 434.5 | O K |
| 2880 min Summer | 72.892 | 0.392 | 467.2 | O K |
| 4320 min Summer | 72.905 | 0.405 | 517.7 | O K |
| 5760 min Summer | 72.915 | 0.415 | 556.8 | O K |
| 7200 min Summer | 72.923 | 0.423 | 589.3 | O K |
| 8640 min Summer | 72.930 | 0.430 | 617.3 | O K |
| 10080 min Summer | 72.935 | 0.435 | 642.1 | O K |
| 15 min Winter | 72.746 | 0.246 | 116.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 56.082 | 0.0 | 23 |
| 30 min Summer | 36.348 | 0.0 | 38 |
| 60 min Summer | 22.680 | 0.0 | 68 |
| 120 min Summer | 13.855 | 0.0 | 128 |
| 180 min Summer | 10.330 | 0.0 | 188 |
| 240 min Summer | 8.375 | 0.0 | 248 |
| 360 min Summer | 6.209 | 0.0 | 368 |
| 480 min Summer | 5.013 | 0.0 | 488 |
| 600 min Summer | 4.246 | 0.0 | 608 |
| 720 min Summer | 3.706 | 0.0 | 728 |
| 960 min Summer | 2.991 | 0.0 | 968 |
| 1440 min Summer | 2.210 | 0.0 | 1448 |
| 2160 min Summer | 1.634 | 0.0 | 2168 |
| 2880 min Summer | 1.318 | 0.0 | 2888 |
| 4320 min Summer | 0.973 | 0.0 | 4328 |
| 5760 min Summer | 0.785 | 0.0 | 5768 |
| 7200 min Summer | 0.665 | 0.0 | 7208 |
| 8640 min Summer | 0.580 | 0.0 | 8648 |
| 10080 min Summer | 0.517 | 0.0 | 10088 |
| 15 min Winter | 56.082 | 0.0 | 23 |

## Summary of Results for 2 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 30 min Winter | 72.768 | 0.268 | 150.4 | O K |
| 60 min Winter | 72.789 | 0.289 | 187.7 | O K |
| 120 min Winter | 72.809 | 0.309 | 229.3 | O K |
| 180 min Winter | 72.821 | 0.321 | 256.4 | O K |
| 240 min Winter | 72.829 | 0.329 | 277.2 | O K |
| 360 min Winter | 72.841 | 0.341 | 308.2 | O K |
| 480 min Winter | 72.849 | 0.349 | 331.8 | O K |
| 600 min Winter | 72.856 | 0.356 | 351.3 | O K |
| 720 min Winter | 72.862 | 0.362 | 368.0 | O K |
| 960 min Winter | 72.871 | 0.371 | 395.9 | O K |
| 1440 min Winter | 72.884 | 0.384 | 438.9 | O K |
| 2160 min Winter | 72.897 | 0.397 | 486.6 | O K |
| 2880 min Winter | 72.907 | 0.407 | 523.3 | O K |
| 4320 min Winter | 72.921 | 0.421 | 579.8 | O K |
| 5760 min Winter | 72.931 | 0.431 | 623.6 | O K |
| 7200 min Winter | 72.939 | 0.439 | 660.0 | O K |
| 8640 min Winter | 72.946 | 0.446 | 691.4 | O K |
| 10080 min Winter | 72.952 | 0.452 | 719.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 36.348 | 0.0 | 38 |
| 60 min Winter | 22.680 | 0.0 | 68 |
| 120 min Winter | 13.855 | 0.0 | 128 |
| 180 min Winter | 10.330 | 0.0 | 188 |
| 240 min Winter | 8.375 | 0.0 | 248 |
| 360 min Winter | 6.209 | 0.0 | 368 |
| 480 min Winter | 5.013 | 0.0 | 488 |
| 600 min Winter | 4.246 | 0.0 | 608 |
| 720 min Winter | 3.706 | 0.0 | 728 |
| 960 min Winter | 2.991 | 0.0 | 968 |
| 1440 min Winter | 2.210 | 0.0 | 1448 |
| 2160 min Winter | 1.634 | 0.0 | 2168 |
| 2880 min Winter | 1.318 | 0.0 | 2888 |
| 4320 min Winter | 0.973 | 0.0 | 4328 |
| 5760 min Winter | 0.785 | 0.0 | 5768 |
| 7200 min Winter | 0.665 | 0.0 | 7208 |
| 8640 min Winter | 0.580 | 0.0 | 8648 |
| 10080 min Winter | 0.517 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 2 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.985

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.492 | 4 | 8 | 0.493 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 75.000

## Tank or Pond Structure

Invert Level (m) 72.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 0.0 | 0.500 | 5836.0 | 2.500 | 5836.0 |

## Summary of Results for 10 year Return Period (+40%)

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 15 min Summer | 72.771 | 0.271 | 155.0 | O K |
| 30 min Summer | 72.795 | 0.295 | 200.2 | O K |
| 60 min Summer | 72.817 | 0.317 | 248.2 | O K |
| 120 min Summer | 72.838 | 0.338 | 300.1 | O K |
| 180 min Summer | 72.850 | 0.350 | 332.7 | O K |
| 240 min Summer | 72.858 | 0.358 | 356.9 | O K |
| 360 min Summer | 72.870 | 0.370 | 393.3 | O K |
| 480 min Summer | 72.878 | 0.378 | 421.1 | O K |
| 600 min Summer | 72.885 | 0.385 | 443.8 | O K |
| 720 min Summer | 72.890 | 0.390 | 463.2 | O K |
| 960 min Summer | 72.899 | 0.399 | 495.2 | O K |
| 1440 min Summer | 72.912 | 0.412 | 543.8 | O K |
| 2160 min Summer | 72.925 | 0.425 | 596.7 | O K |
| 2880 min Summer | 72.934 | 0.434 | 637.1 | O K |
| 4320 min Summer | 72.948 | 0.448 | 698.4 | O K |
| 5760 min Summer | 72.958 | 0.458 | 745.2 | O K |
| 7200 min Summer | 72.965 | 0.465 | 783.5 | O K |
| 8640 min Summer | 72.972 | 0.472 | 816.2 | O K |
| 10080 min Summer | 72.977 | 0.477 | 844.9 | O K |
| 15 min Winter | 72.781 | 0.281 | 173.6 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 83.912 | 0.0 | 23 |
| 30 min Summer | 54.206 | 0.0 | 38 |
| 60 min Summer | 33.604 | 0.0 | 68 |
| 120 min Summer | 20.311 | 0.0 | 128 |
| 180 min Summer | 15.011 | 0.0 | 188 |
| 240 min Summer | 12.078 | 0.0 | 248 |
| 360 min Summer | 8.874 | 0.0 | 368 |
| 480 min Summer | 7.126 | 0.0 | 488 |
| 600 min Summer | 6.008 | 0.0 | 608 |
| 720 min Summer | 5.225 | 0.0 | 728 |
| 960 min Summer | 4.190 | 0.0 | 968 |
| 1440 min Summer | 3.067 | 0.0 | 1448 |
| 2160 min Summer | 2.244 | 0.0 | 2168 |
| 2880 min Summer | 1.797 | 0.0 | 2888 |
| 4320 min Summer | 1.313 | 0.0 | 4328 |
| 5760 min Summer | 1.051 | 0.0 | 5768 |
| 7200 min Summer | 0.884 | 0.0 | 7208 |
| 8640 min Summer | 0.767 | 0.0 | 8648 |
| 10080 min Summer | 0.681 | 0.0 | 10088 |
| 15 min Winter | 83.912 | 0.0 | 23 |

## Summary of Results for 10 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 30 min Winter | 72.807 | 0.307 | 224.2 | O K |
| 60 min Winter | 72.829 | 0.329 | 278.0 | O K |
| 120 min Winter | 72.851 | 0.351 | 336.1 | O K |
| 180 min Winter | 72.863 | 0.363 | 372.6 | O K |
| 240 min Winter | 72.872 | 0.372 | 399.7 | O K |
| 360 min Winter | 72.884 | 0.384 | 440.5 | O K |
| 480 min Winter | 72.893 | 0.393 | 471.7 | O K |
| 600 min Winter | 72.900 | 0.400 | 497.1 | O K |
| 720 min Winter | 72.905 | 0.405 | 518.8 | O K |
| 960 min Winter | 72.915 | 0.415 | 554.6 | O K |
| 1440 min Winter | 72.928 | 0.428 | 609.0 | O K |
| 2160 min Winter | 72.941 | 0.441 | 668.3 | O K |
| 2880 min Winter | 72.951 | 0.451 | 713.5 | O K |
| 4320 min Winter | 72.965 | 0.465 | 782.2 | O K |
| 5760 min Winter | 72.975 | 0.475 | 834.6 | O K |
| 7200 min Winter | 72.983 | 0.483 | 877.5 | O K |
| 8640 min Winter | 72.990 | 0.490 | 914.2 | O K |
| 10080 min Winter | 72.995 | 0.495 | 946.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 54.206 | 0.0 | 38 |
| 60 min Winter | 33.604 | 0.0 | 68 |
| 120 min Winter | 20.311 | 0.0 | 128 |
| 180 min Winter | 15.011 | 0.0 | 188 |
| 240 min Winter | 12.078 | 0.0 | 248 |
| 360 min Winter | 8.874 | 0.0 | 368 |
| 480 min Winter | 7.126 | 0.0 | 488 |
| 600 min Winter | 6.008 | 0.0 | 608 |
| 720 min Winter | 5.225 | 0.0 | 728 |
| 960 min Winter | 4.190 | 0.0 | 968 |
| 1440 min Winter | 3.067 | 0.0 | 1448 |
| 2160 min Winter | 2.244 | 0.0 | 2168 |
| 2880 min Winter | 1.797 | 0.0 | 2888 |
| 4320 min Winter | 1.313 | 0.0 | 4328 |
| 5760 min Winter | 1.051 | 0.0 | 5768 |
| 7200 min Winter | 0.884 | 0.0 | 7208 |
| 8640 min Winter | 0.767 | 0.0 | 8648 |
| 10080 min Winter | 0.681 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 10 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.985

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.492 | 4 | 8 | 0.493 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 75.000

## Tank or Pond Structure

Invert Level (m) 72.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 0.0 | 0.500 | 5836.0 | 2.500 | 5836.0 |

## Summary of Results for 30 year Return Period (+40%)

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 15 min Summer | 72.793 | 0.293 | 196.6 | O K |
| 30 min Summer | 72.820 | 0.320 | 256.0 | O K |
| 60 min Summer | 72.845 | 0.345 | 318.7 | O K |
| 120 min Summer | 72.867 | 0.367 | 385.0 | O K |
| 180 min Summer | 72.880 | 0.380 | 425.6 | O K |
| 240 min Summer | 72.888 | 0.388 | 454.8 | O K |
| 360 min Summer | 72.900 | 0.400 | 498.6 | O K |
| 480 min Summer | 72.909 | 0.409 | 531.9 | O K |
| 600 min Summer | 72.916 | 0.416 | 558.9 | O K |
| 720 min Summer | 72.921 | 0.421 | 581.8 | O K |
| 960 min Summer | 72.930 | 0.430 | 619.4 | O K |
| 1440 min Summer | 72.943 | 0.443 | 675.9 | O K |
| 2160 min Summer | 72.956 | 0.456 | 736.8 | O K |
| 2880 min Summer | 72.965 | 0.465 | 782.7 | O K |
| 4320 min Summer | 72.978 | 0.478 | 851.5 | O K |
| 5760 min Summer | 72.988 | 0.488 | 903.4 | O K |
| 7200 min Summer | 72.995 | 0.495 | 945.5 | O K |
| 8640 min Summer | 73.001 | 0.501 | 981.2 | O K |
| 10080 min Summer | 73.007 | 0.507 | 1012.2 | O K |
| 15 min Winter | 72.805 | 0.305 | 220.2 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 106.449 | 0.0 | 23 |
| 30 min Summer | 69.298 | 0.0 | 38 |
| 60 min Summer | 43.136 | 0.0 | 68 |
| 120 min Summer | 26.061 | 0.0 | 128 |
| 180 min Summer | 19.202 | 0.0 | 188 |
| 240 min Summer | 15.393 | 0.0 | 248 |
| 360 min Summer | 11.248 | 0.0 | 368 |
| 480 min Summer | 8.999 | 0.0 | 488 |
| 600 min Summer | 7.565 | 0.0 | 608 |
| 720 min Summer | 6.562 | 0.0 | 728 |
| 960 min Summer | 5.240 | 0.0 | 968 |
| 1440 min Summer | 3.812 | 0.0 | 1448 |
| 2160 min Summer | 2.770 | 0.0 | 2168 |
| 2880 min Summer | 2.207 | 0.0 | 2888 |
| 4320 min Summer | 1.601 | 0.0 | 4328 |
| 5760 min Summer | 1.274 | 0.0 | 5768 |
| 7200 min Summer | 1.067 | 0.0 | 7208 |
| 8640 min Summer | 0.922 | 0.0 | 8648 |
| 10080 min Summer | 0.816 | 0.0 | 10088 |
| 15 min Winter | 106.449 | 0.0 | 23 |

## Summary of Results for 30 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 30 min Winter | 72.833 | 0.333 | 286.7 | O K |
| 60 min Winter | 72.858 | 0.358 | 356.9 | O K |
| 120 min Winter | 72.881 | 0.381 | 431.3 | O K |
| 180 min Winter | 72.894 | 0.394 | 476.6 | O K |
| 240 min Winter | 72.903 | 0.403 | 509.4 | O K |
| 360 min Winter | 72.916 | 0.416 | 558.4 | O K |
| 480 min Winter | 72.925 | 0.425 | 595.7 | O K |
| 600 min Winter | 72.932 | 0.432 | 625.9 | O K |
| 720 min Winter | 72.937 | 0.437 | 651.6 | O K |
| 960 min Winter | 72.947 | 0.447 | 693.7 | O K |
| 1440 min Winter | 72.960 | 0.460 | 757.1 | O K |
| 2160 min Winter | 72.973 | 0.473 | 825.2 | O K |
| 2880 min Winter | 72.983 | 0.483 | 876.6 | O K |
| 4320 min Winter | 72.997 | 0.497 | 953.7 | O K |
| 5760 min Winter | 73.007 | 0.507 | 1011.8 | O K |
| 7200 min Winter | 73.015 | 0.515 | 1059.0 | O K |
| 8640 min Winter | 73.022 | 0.522 | 1098.9 | O K |
| 10080 min Winter | 73.028 | 0.528 | 1133.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 69.298 | 0.0 | 38 |
| 60 min Winter | 43.136 | 0.0 | 68 |
| 120 min Winter | 26.061 | 0.0 | 128 |
| 180 min Winter | 19.202 | 0.0 | 188 |
| 240 min Winter | 15.393 | 0.0 | 248 |
| 360 min Winter | 11.248 | 0.0 | 368 |
| 480 min Winter | 8.999 | 0.0 | 488 |
| 600 min Winter | 7.565 | 0.0 | 608 |
| 720 min Winter | 6.562 | 0.0 | 728 |
| 960 min Winter | 5.240 | 0.0 | 968 |
| 1440 min Winter | 3.812 | 0.0 | 1448 |
| 2160 min Winter | 2.770 | 0.0 | 2168 |
| 2880 min Winter | 2.207 | 0.0 | 2888 |
| 4320 min Winter | 1.601 | 0.0 | 4328 |
| 5760 min Winter | 1.274 | 0.0 | 5768 |
| 7200 min Winter | 1.067 | 0.0 | 7208 |
| 8640 min Winter | 0.922 | 0.0 | 8648 |
| 10080 min Winter | 0.816 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.985

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.492 | 4 | 8 | 0.493 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 75.000

## Tank or Pond Structure

Invert Level (m) 72.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 0.0 | 0.500 | 5836.0 | 2.500 | 5836.0 |

## Summary of Results for 100 year Return Period (+40%)

Outflow is too low. Design is unsatisfactory.

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 15 min Summer | 72.820 | 0.320 | 255.2 | O K |
| 30 min Summer | 72.850 | 0.350 | 335.0 | O K |
| 60 min Summer | 72.878 | 0.378 | 419.0 | O K |
| 120 min Summer | 72.902 | 0.402 | 506.0 | O K |
| 180 min Summer | 72.915 | 0.415 | 557.4 | O K |
| 240 min Summer | 72.924 | 0.424 | 593.3 | O K |
| 360 min Summer | 72.936 | 0.436 | 646.5 | O K |
| 480 min Summer | 72.945 | 0.445 | 686.9 | O K |
| 600 min Summer | 72.952 | 0.452 | 719.4 | O K |
| 720 min Summer | 72.958 | 0.458 | 746.8 | O K |
| 960 min Summer | 72.967 | 0.467 | 791.6 | O K |
| 1440 min Summer | 72.980 | 0.480 | 857.9 | O K |
| 2160 min Summer | 72.992 | 0.492 | 928.3 | O K |
| 2880 min Summer | 73.001 | 0.501 | 980.7 | O K |
| 4320 min Summer | 73.015 | 0.515 | 1058.1 | O K |
| 5760 min Summer | 73.025 | 0.525 | 1115.7 | O K |
| 7200 min Summer | 73.032 | 0.532 | 1161.8 | O K |
| 8640 min Summer | 73.039 | 0.539 | 1200.5 | O K |
| 10080 min Summer | 73.045 | 0.545 | 1233.9 | O K |
| 15 min Winter | 72.832 | 0.332 | 285.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 15 min Summer | 138.153 | 0.0 | 23 |
| 30 min Summer | 90.705 | 0.0 | 38 |
| 60 min Summer | 56.713 | 0.0 | 68 |
| 120 min Summer | 34.246 | 0.0 | 128 |
| 180 min Summer | 25.149 | 0.0 | 188 |
| 240 min Summer | 20.078 | 0.0 | 248 |
| 360 min Summer | 14.585 | 0.0 | 368 |
| 480 min Summer | 11.622 | 0.0 | 488 |
| 600 min Summer | 9.738 | 0.0 | 608 |
| 720 min Summer | 8.424 | 0.0 | 728 |
| 960 min Summer | 6.697 | 0.0 | 968 |
| 1440 min Summer | 4.839 | 0.0 | 1448 |
| 2160 min Summer | 3.490 | 0.0 | 2168 |
| 2880 min Summer | 2.766 | 0.0 | 2888 |
| 4320 min Summer | 1.989 | 0.0 | 4328 |
| 5760 min Summer | 1.573 | 0.0 | 5768 |
| 7200 min Summer | 1.311 | 0.0 | 7208 |
| 8640 min Summer | 1.129 | 0.0 | 8648 |
| 10080 min Summer | 0.994 | 0.0 | 10088 |
| 15 min Winter | 138.153 | 0.0 | 23 |

## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Volume (m³) | Status |
|---|---|---|---|---|
| 30 min Winter | 72.864 | 0.364 | 375.2 | O K |
| 60 min Winter | 72.892 | 0.392 | 469.2 | O K |
| 120 min Winter | 72.918 | 0.418 | 566.7 | O K |
| 180 min Winter | 72.931 | 0.431 | 624.2 | O K |
| 240 min Winter | 72.940 | 0.440 | 664.5 | O K |
| 360 min Winter | 72.953 | 0.453 | 724.1 | O K |
| 480 min Winter | 72.962 | 0.462 | 769.3 | O K |
| 600 min Winter | 72.970 | 0.470 | 805.8 | O K |
| 720 min Winter | 72.975 | 0.475 | 836.4 | O K |
| 960 min Winter | 72.985 | 0.485 | 886.6 | O K |
| 1440 min Winter | 72.998 | 0.498 | 960.9 | O K |
| 2160 min Winter | 73.011 | 0.511 | 1039.7 | O K |
| 2880 min Winter | 73.022 | 0.522 | 1098.4 | O K |
| 4320 min Winter | 73.036 | 0.536 | 1185.1 | O K |
| 5760 min Winter | 73.047 | 0.547 | 1249.6 | O K |
| 7200 min Winter | 73.056 | 0.556 | 1301.3 | O K |
| 8640 min Winter | 73.064 | 0.564 | 1344.6 | O K |
| 10080 min Winter | 73.070 | 0.570 | 1382.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Time-Peak (mins) |
|---|---|---|---|
| 30 min Winter | 90.705 | 0.0 | 38 |
| 60 min Winter | 56.713 | 0.0 | 68 |
| 120 min Winter | 34.246 | 0.0 | 128 |
| 180 min Winter | 25.149 | 0.0 | 188 |
| 240 min Winter | 20.078 | 0.0 | 248 |
| 360 min Winter | 14.585 | 0.0 | 368 |
| 480 min Winter | 11.622 | 0.0 | 488 |
| 600 min Winter | 9.738 | 0.0 | 608 |
| 720 min Winter | 8.424 | 0.0 | 728 |
| 960 min Winter | 6.697 | 0.0 | 968 |
| 1440 min Winter | 4.839 | 0.0 | 1448 |
| 2160 min Winter | 3.490 | 0.0 | 2168 |
| 2880 min Winter | 2.766 | 0.0 | 2888 |
| 4320 min Winter | 1.989 | 0.0 | 4328 |
| 5760 min Winter | 1.573 | 0.0 | 5768 |
| 7200 min Winter | 1.311 | 0.0 | 7208 |
| 8640 min Winter | 1.129 | 0.0 | 8648 |
| 10080 min Winter | 0.994 | 0.0 | 10088 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 0.985

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|
| 0 | 4 | 0.492 | 4 | 8 | 0.493 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 75.000

## Tank or Pond Structure

Invert Level (m) 72.500

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 0.0 | 0.500 | 5836.0 | 2.500 | 5836.0 |

# APPENDIX II

Silage Clamp 2l/s Calculations

## Summary of Results for 1 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 72.683 | 0.233 | 2.0 | 145.8 | O K |
| 30 min Summer | 72.753 | 0.303 | 2.0 | 189.6 | O K |
| 60 min Summer | 72.831 | 0.381 | 2.0 | 238.3 | O K |
| 120 min Summer | 72.917 | 0.467 | 2.0 | 291.6 | O K |
| 180 min Summer | 72.970 | 0.520 | 2.0 | 325.0 | O K |
| 240 min Summer | 73.009 | 0.559 | 2.0 | 349.5 | O K |
| 360 min Summer | 73.062 | 0.612 | 2.0 | 382.4 | O K |
| 480 min Summer | 73.097 | 0.647 | 2.0 | 404.3 | O K |
| 600 min Summer | 73.122 | 0.672 | 2.0 | 420.3 | O K |
| 720 min Summer | 73.142 | 0.692 | 2.0 | 432.4 | O K |
| 960 min Summer | 73.168 | 0.718 | 2.0 | 449.0 | O K |
| 1440 min Summer | 73.193 | 0.743 | 2.0 | 464.2 | O K |
| 2160 min Summer | 73.197 | 0.747 | 2.0 | 466.6 | O K |
| 2880 min Summer | 73.191 | 0.741 | 2.0 | 463.0 | O K |
| 4320 min Summer | 73.170 | 0.720 | 2.0 | 449.7 | O K |
| 5760 min Summer | 73.143 | 0.693 | 2.0 | 433.1 | O K |
| 7200 min Summer | 73.114 | 0.664 | 2.0 | 415.0 | O K |
| 8640 min Summer | 73.084 | 0.634 | 2.0 | 396.4 | O K |
| 10080 min Summer | 73.054 | 0.604 | 2.0 | 377.5 | O K |
| 15 min Winter | 72.712 | 0.262 | 2.0 | 163.5 | O K |
| 30 min Winter | 72.790 | 0.340 | 2.0 | 212.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 43.387 | 0.0 | 132.2 | 27 |
| 30 min Summer | 28.301 | 0.0 | 160.4 | 41 |
| 60 min Summer | 17.920 | 0.0 | 239.6 | 70 |
| 120 min Summer | 11.119 | 0.0 | 290.8 | 130 |
| 180 min Summer | 8.370 | 0.0 | 318.6 | 190 |
| 240 min Summer | 6.835 | 0.0 | 333.3 | 250 |
| 360 min Summer | 5.105 | 0.0 | 336.5 | 368 |
| 480 min Summer | 4.138 | 0.0 | 334.1 | 488 |
| 600 min Summer | 3.516 | 0.0 | 331.7 | 606 |
| 720 min Summer | 3.078 | 0.0 | 329.4 | 726 |
| 960 min Summer | 2.495 | 0.0 | 324.8 | 964 |
| 1440 min Summer | 1.857 | 0.0 | 315.5 | 1442 |
| 2160 min Summer | 1.383 | 0.0 | 640.0 | 1888 |
| 2880 min Summer | 1.120 | 0.0 | 629.4 | 2280 |
| 4320 min Summer | 0.833 | 0.0 | 590.5 | 3068 |
| 5760 min Summer | 0.676 | 0.0 | 884.1 | 3880 |
| 7200 min Summer | 0.574 | 0.0 | 939.5 | 4696 |
| 8640 min Summer | 0.503 | 0.0 | 986.0 | 5536 |
| 10080 min Summer | 0.450 | 0.0 | 1020.3 | 6360 |
| 15 min Winter | 43.387 | 0.0 | 144.8 | 26 |
| 30 min Winter | 28.301 | 0.0 | 169.0 | 41 |

## Summary of Results for 1 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 72.878 | 0.428 | 2.0 | 267.5 | O K |
| 120 min Winter | 72.975 | 0.525 | 2.0 | 327.8 | O K |
| 180 min Winter | 73.035 | 0.585 | 2.0 | 365.9 | O K |
| 240 min Winter | 73.081 | 0.631 | 2.0 | 394.1 | O K |
| 360 min Winter | 73.142 | 0.692 | 2.0 | 432.4 | O K |
| 480 min Winter | 73.183 | 0.733 | 2.0 | 458.3 | O K |
| 600 min Winter | 73.214 | 0.764 | 2.0 | 477.7 | O K |
| 720 min Winter | 73.238 | 0.788 | 2.0 | 492.7 | O K |
| 960 min Winter | 73.273 | 0.823 | 2.0 | 514.2 | O K |
| 1440 min Winter | 73.310 | 0.860 | 2.0 | 537.3 | O K |
| 2160 min Winter | 73.324 | 0.874 | 2.0 | 546.5 | O K |
| 2880 min Winter | 73.314 | 0.864 | 2.0 | 539.9 | O K |
| 4320 min Winter | 73.282 | 0.832 | 2.0 | 520.2 | O K |
| 5760 min Winter | 73.241 | 0.791 | 2.0 | 494.3 | O K |
| 7200 min Winter | 73.194 | 0.744 | 2.0 | 465.0 | O K |
| 8640 min Winter | 73.145 | 0.695 | 2.0 | 434.3 | O K |
| 10080 min Winter | 73.095 | 0.645 | 2.0 | 403.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 17.920 | 0.0 | 266.1 | 70 |
| 120 min Winter | 11.119 | 0.0 | 317.4 | 128 |
| 180 min Winter | 8.370 | 0.0 | 337.8 | 186 |
| 240 min Winter | 6.835 | 0.0 | 339.4 | 246 |
| 360 min Winter | 5.105 | 0.0 | 337.2 | 362 |
| 480 min Winter | 4.138 | 0.0 | 334.9 | 480 |
| 600 min Winter | 3.516 | 0.0 | 332.8 | 596 |
| 720 min Winter | 3.078 | 0.0 | 330.7 | 714 |
| 960 min Winter | 2.495 | 0.0 | 326.5 | 944 |
| 1440 min Winter | 1.857 | 0.0 | 318.1 | 1400 |
| 2160 min Winter | 1.383 | 0.0 | 650.7 | 2060 |
| 2880 min Winter | 1.120 | 0.0 | 636.7 | 2656 |
| 4320 min Winter | 0.833 | 0.0 | 604.8 | 3324 |
| 5760 min Winter | 0.676 | 0.0 | 990.2 | 4224 |
| 7200 min Winter | 0.574 | 0.0 | 1051.1 | 5128 |
| 8640 min Winter | 0.503 | 0.0 | 1098.9 | 6048 |
| 10080 min Winter | 0.450 | 0.0 | 1118.7 | 6864 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 1 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.0000 | 0.900 | 2.0000 | 1.700 | 2.0000 | 2.500 | 2.0000 |
| 0.200 | 2.0000 | 1.000 | 2.0000 | 1.800 | 2.0000 | 2.600 | 2.0000 |
| 0.300 | 2.0000 | 1.100 | 2.0000 | 1.900 | 2.0000 | 2.700 | 2.0000 |
| 0.400 | 2.0000 | 1.200 | 2.0000 | 2.000 | 2.0000 | 2.800 | 2.0000 |
| 0.500 | 2.0000 | 1.300 | 2.0000 | 2.100 | 2.0000 | 2.900 | 2.0000 |
| 0.600 | 2.0000 | 1.400 | 2.0000 | 2.200 | 2.0000 | 3.000 | 2.0000 |
| 0.700 | 2.0000 | 1.500 | 2.0000 | 2.300 | 2.0000 | | |
| 0.800 | 2.0000 | 1.600 | 2.0000 | 2.400 | 2.0000 | | |

## Summary of Results for 2 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 72.752 | 0.302 | 2.0 | 188.9 | O K |
| 30 min Summer | 72.841 | 0.391 | 2.0 | 244.3 | O K |
| 60 min Summer | 72.935 | 0.485 | 2.0 | 302.9 | O K |
| 120 min Summer | 73.035 | 0.585 | 2.0 | 365.7 | O K |
| 180 min Summer | 73.097 | 0.647 | 2.0 | 404.4 | O K |
| 240 min Summer | 73.142 | 0.692 | 2.0 | 432.6 | O K |
| 360 min Summer | 73.204 | 0.754 | 2.0 | 471.5 | O K |
| 480 min Summer | 73.247 | 0.797 | 2.0 | 498.1 | O K |
| 600 min Summer | 73.278 | 0.828 | 2.0 | 517.8 | O K |
| 720 min Summer | 73.303 | 0.853 | 2.0 | 532.9 | O K |
| 960 min Summer | 73.337 | 0.887 | 2.0 | 554.1 | O K |
| 1440 min Summer | 73.371 | 0.921 | 2.0 | 575.4 | O K |
| 2160 min Summer | 73.379 | 0.929 | 2.0 | 580.5 | O K |
| 2880 min Summer | 73.369 | 0.919 | 2.0 | 574.3 | O K |
| 4320 min Summer | 73.342 | 0.892 | 2.0 | 557.3 | O K |
| 5760 min Summer | 73.311 | 0.861 | 2.0 | 538.1 | O K |
| 7200 min Summer | 73.278 | 0.828 | 2.0 | 517.8 | O K |
| 8640 min Summer | 73.245 | 0.795 | 2.0 | 496.9 | O K |
| 10080 min Summer | 73.212 | 0.762 | 2.0 | 476.0 | O K |
| 15 min Winter | 72.789 | 0.339 | 2.0 | 211.8 | O K |
| 30 min Winter | 72.888 | 0.438 | 2.0 | 274.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 56.082 | 0.0 | 159.8 | 27 |
| 30 min Summer | 36.348 | 0.0 | 171.3 | 41 |
| 60 min Summer | 22.680 | 0.0 | 295.9 | 72 |
| 120 min Summer | 13.855 | 0.0 | 337.1 | 130 |
| 180 min Summer | 10.330 | 0.0 | 340.9 | 190 |
| 240 min Summer | 8.375 | 0.0 | 339.8 | 250 |
| 360 min Summer | 6.209 | 0.0 | 337.7 | 368 |
| 480 min Summer | 5.013 | 0.0 | 335.7 | 488 |
| 600 min Summer | 4.246 | 0.0 | 333.7 | 608 |
| 720 min Summer | 3.706 | 0.0 | 331.7 | 726 |
| 960 min Summer | 2.991 | 0.0 | 327.8 | 966 |
| 1440 min Summer | 2.210 | 0.0 | 319.9 | 1444 |
| 2160 min Summer | 1.634 | 0.0 | 653.0 | 2148 |
| 2880 min Summer | 1.318 | 0.0 | 638.7 | 2460 |
| 4320 min Summer | 0.973 | 0.0 | 604.7 | 3208 |
| 5760 min Summer | 0.785 | 0.0 | 1027.1 | 4032 |
| 7200 min Summer | 0.665 | 0.0 | 1084.4 | 4832 |
| 8640 min Summer | 0.580 | 0.0 | 1122.5 | 5696 |
| 10080 min Summer | 0.517 | 0.0 | 1105.7 | 6464 |
| 15 min Winter | 56.082 | 0.0 | 168.9 | 27 |
| 30 min Winter | 36.348 | 0.0 | 171.4 | 41 |

## Summary of Results for 2 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 72.994 | 0.544 | 2.0 | 340.0 | O K |
| 120 min Winter | 73.108 | 0.658 | 2.0 | 411.0 | O K |
| 180 min Winter | 73.178 | 0.728 | 2.0 | 455.1 | O K |
| 240 min Winter | 73.230 | 0.780 | 2.0 | 487.4 | O K |
| 360 min Winter | 73.302 | 0.852 | 2.0 | 532.5 | O K |
| 480 min Winter | 73.352 | 0.902 | 2.0 | 563.8 | O K |
| 600 min Winter | 73.390 | 0.940 | 2.0 | 587.4 | O K |
| 720 min Winter | 73.419 | 0.969 | 2.0 | 605.9 | O K |
| 960 min Winter | 73.462 | 1.012 | 2.0 | 632.7 | O K |
| 1440 min Winter | 73.510 | 1.060 | 2.0 | 662.8 | O K |
| 2160 min Winter | 73.535 | 1.085 | 2.0 | 678.1 | O K |
| 2880 min Winter | 73.530 | 1.080 | 2.0 | 674.9 | O K |
| 4320 min Winter | 73.489 | 1.039 | 2.0 | 649.5 | O K |
| 5760 min Winter | 73.446 | 0.996 | 2.0 | 622.5 | O K |
| 7200 min Winter | 73.396 | 0.946 | 2.0 | 591.5 | O K |
| 8640 min Winter | 73.344 | 0.894 | 2.0 | 558.6 | O K |
| 10080 min Winter | 73.290 | 0.840 | 2.0 | 525.0 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 22.680 | 0.0 | 322.3 | 70 |
| 120 min Winter | 13.855 | 0.0 | 342.3 | 128 |
| 180 min Winter | 10.330 | 0.0 | 341.2 | 188 |
| 240 min Winter | 8.375 | 0.0 | 340.2 | 246 |
| 360 min Winter | 6.209 | 0.0 | 338.2 | 364 |
| 480 min Winter | 5.013 | 0.0 | 336.3 | 480 |
| 600 min Winter | 4.246 | 0.0 | 334.4 | 598 |
| 720 min Winter | 3.706 | 0.0 | 332.6 | 716 |
| 960 min Winter | 2.991 | 0.0 | 328.9 | 948 |
| 1440 min Winter | 2.210 | 0.0 | 321.7 | 1408 |
| 2160 min Winter | 1.634 | 0.0 | 656.2 | 2080 |
| 2880 min Winter | 1.318 | 0.0 | 644.1 | 2736 |
| 4320 min Winter | 0.973 | 0.0 | 616.3 | 3460 |
| 5760 min Winter | 0.785 | 0.0 | 1147.9 | 4376 |
| 7200 min Winter | 0.665 | 0.0 | 1201.3 | 5264 |
| 8640 min Winter | 0.580 | 0.0 | 1196.1 | 6216 |
| 10080 min Winter | 0.517 | 0.0 | 1151.8 | 7064 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 2 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.0000 | 0.900 | 2.0000 | 1.700 | 2.0000 | 2.500 | 2.0000 |
| 0.200 | 2.0000 | 1.000 | 2.0000 | 1.800 | 2.0000 | 2.600 | 2.0000 |
| 0.300 | 2.0000 | 1.100 | 2.0000 | 1.900 | 2.0000 | 2.700 | 2.0000 |
| 0.400 | 2.0000 | 1.200 | 2.0000 | 2.000 | 2.0000 | 2.800 | 2.0000 |
| 0.500 | 2.0000 | 1.300 | 2.0000 | 2.100 | 2.0000 | 2.900 | 2.0000 |
| 0.600 | 2.0000 | 1.400 | 2.0000 | 2.200 | 2.0000 | 3.000 | 2.0000 |
| 0.700 | 2.0000 | 1.500 | 2.0000 | 2.300 | 2.0000 | | |
| 0.800 | 2.0000 | 1.600 | 2.0000 | 2.400 | 2.0000 | | |

## Summary of Results for 10 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 72.904 | 0.454 | 2.0 | 283.7 | O K |
| 30 min Summer | 73.035 | 0.585 | 2.0 | 365.8 | O K |
| 60 min Summer | 73.172 | 0.722 | 2.0 | 451.5 | O K |
| 120 min Summer | 73.316 | 0.866 | 2.0 | 540.9 | O K |
| 180 min Summer | 73.402 | 0.952 | 2.0 | 594.8 | O K |
| 240 min Summer | 73.463 | 1.013 | 2.0 | 633.1 | O K |
| 360 min Summer | 73.550 | 1.100 | 2.0 | 687.6 | O K |
| 480 min Summer | 73.612 | 1.162 | 2.0 | 726.0 | O K |
| 600 min Summer | 73.658 | 1.208 | 2.0 | 754.9 | O K |
| 720 min Summer | 73.694 | 1.244 | 2.0 | 777.7 | O K |
| 960 min Summer | 73.747 | 1.297 | 2.0 | 810.8 | O K |
| 1440 min Summer | 73.808 | 1.358 | 2.0 | 848.5 | O K |
| 2160 min Summer | 73.840 | 1.390 | 2.0 | 868.7 | O K |
| 2880 min Summer | 73.837 | 1.387 | 2.0 | 866.7 | O K |
| 4320 min Summer | 73.793 | 1.343 | 2.0 | 839.2 | O K |
| 5760 min Summer | 73.747 | 1.297 | 2.0 | 810.8 | O K |
| 7200 min Summer | 73.704 | 1.254 | 2.0 | 783.9 | O K |
| 8640 min Summer | 73.663 | 1.213 | 2.0 | 757.8 | O K |
| 10080 min Summer | 73.621 | 1.171 | 2.0 | 732.2 | O K |
| 15 min Winter | 72.959 | 0.509 | 2.0 | 318.0 | O K |
| 30 min Winter | 73.106 | 0.656 | 2.0 | 410.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 83.912 | 0.0 | 172.0 | 27 |
| 30 min Summer | 54.206 | 0.0 | 171.5 | 42 |
| 60 min Summer | 33.604 | 0.0 | 343.8 | 72 |
| 120 min Summer | 20.311 | 0.0 | 342.8 | 132 |
| 180 min Summer | 15.011 | 0.0 | 342.0 | 190 |
| 240 min Summer | 12.078 | 0.0 | 341.2 | 250 |
| 360 min Summer | 8.874 | 0.0 | 339.6 | 370 |
| 480 min Summer | 7.126 | 0.0 | 338.2 | 490 |
| 600 min Summer | 6.008 | 0.0 | 336.7 | 608 |
| 720 min Summer | 5.225 | 0.0 | 335.3 | 728 |
| 960 min Summer | 4.190 | 0.0 | 332.5 | 968 |
| 1440 min Summer | 3.067 | 0.0 | 327.0 | 1446 |
| 2160 min Summer | 2.244 | 0.0 | 663.9 | 2164 |
| 2880 min Summer | 1.797 | 0.0 | 654.2 | 2880 |
| 4320 min Summer | 1.313 | 0.0 | 630.7 | 3680 |
| 5760 min Summer | 1.051 | 0.0 | 1291.3 | 4440 |
| 7200 min Summer | 0.884 | 0.0 | 1253.6 | 5192 |
| 8640 min Summer | 0.767 | 0.0 | 1210.6 | 5976 |
| 10080 min Summer | 0.681 | 0.0 | 1163.6 | 6856 |
| 15 min Winter | 83.912 | 0.0 | 172.0 | 27 |
| 30 min Winter | 54.206 | 0.0 | 171.6 | 41 |

## Summary of Results for 10 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 73.260 | 0.810 | 2.0 | 506.4 | O K |
| 120 min Winter | 73.422 | 0.972 | 2.0 | 607.5 | O K |
| 180 min Winter | 73.520 | 1.070 | 2.0 | 668.6 | O K |
| 240 min Winter | 73.590 | 1.140 | 2.0 | 712.3 | O K |
| 360 min Winter | 73.690 | 1.240 | 2.0 | 775.0 | O K |
| 480 min Winter | 73.761 | 1.311 | 2.0 | 819.7 | O K |
| 600 min Winter | 73.816 | 1.366 | 2.0 | 853.8 | O K |
| 720 min Winter | 73.859 | 1.409 | 2.0 | 880.9 | O K |
| 960 min Winter | 73.924 | 1.474 | 2.0 | 921.4 | O K |
| 1440 min Winter | 74.003 | 1.553 | 2.0 | 970.5 | O K |
| 2160 min Winter | 74.055 | 1.605 | 2.0 | 1003.4 | O K |
| 2880 min Winter | 74.068 | 1.618 | 2.0 | 1011.4 | O K |
| 4320 min Winter | 74.036 | 1.586 | 2.0 | 991.4 | O K |
| 5760 min Winter | 73.971 | 1.521 | 2.0 | 950.8 | O K |
| 7200 min Winter | 73.915 | 1.465 | 2.0 | 915.8 | O K |
| 8640 min Winter | 73.857 | 1.407 | 2.0 | 879.2 | O K |
| 10080 min Winter | 73.796 | 1.346 | 2.0 | 841.3 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 33.604 | 0.0 | 343.9 | 70 |
| 120 min Winter | 20.311 | 0.0 | 343.0 | 130 |
| 180 min Winter | 15.011 | 0.0 | 342.1 | 188 |
| 240 min Winter | 12.078 | 0.0 | 341.3 | 246 |
| 360 min Winter | 8.874 | 0.0 | 339.8 | 364 |
| 480 min Winter | 7.126 | 0.0 | 338.3 | 482 |
| 600 min Winter | 6.008 | 0.0 | 336.9 | 600 |
| 720 min Winter | 5.225 | 0.0 | 335.5 | 718 |
| 960 min Winter | 4.190 | 0.0 | 332.8 | 952 |
| 1440 min Winter | 3.067 | 0.0 | 327.3 | 1420 |
| 2160 min Winter | 2.244 | 0.0 | 664.8 | 2108 |
| 2880 min Winter | 1.797 | 0.0 | 656.1 | 2796 |
| 4320 min Winter | 1.313 | 0.0 | 636.6 | 4104 |
| 5760 min Winter | 1.051 | 0.0 | 1303.8 | 4792 |
| 7200 min Winter | 0.884 | 0.0 | 1274.4 | 5616 |
| 8640 min Winter | 0.767 | 0.0 | 1240.4 | 6488 |
| 10080 min Winter | 0.681 | 0.0 | 1202.5 | 7456 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 10 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.0000 | 0.900 | 2.0000 | 1.700 | 2.0000 | 2.500 | 2.0000 |
| 0.200 | 2.0000 | 1.000 | 2.0000 | 1.800 | 2.0000 | 2.600 | 2.0000 |
| 0.300 | 2.0000 | 1.100 | 2.0000 | 1.900 | 2.0000 | 2.700 | 2.0000 |
| 0.400 | 2.0000 | 1.200 | 2.0000 | 2.000 | 2.0000 | 2.800 | 2.0000 |
| 0.500 | 2.0000 | 1.300 | 2.0000 | 2.100 | 2.0000 | 2.900 | 2.0000 |
| 0.600 | 2.0000 | 1.400 | 2.0000 | 2.200 | 2.0000 | 3.000 | 2.0000 |
| 0.700 | 2.0000 | 1.500 | 2.0000 | 2.300 | 2.0000 | | |
| 0.800 | 2.0000 | 1.600 | 2.0000 | 2.400 | 2.0000 | | |

## Summary of Results for 30 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 73.027 | 0.577 | 2.0 | 360.4 | O K |
| 30 min Summer | 73.200 | 0.750 | 2.0 | 468.6 | O K |
| 60 min Summer | 73.380 | 0.930 | 2.0 | 581.2 | O K |
| 120 min Summer | 73.566 | 1.116 | 2.0 | 697.3 | O K |
| 180 min Summer | 73.675 | 1.225 | 2.0 | 765.6 | O K |
| 240 min Summer | 73.751 | 1.301 | 2.0 | 813.1 | O K |
| 360 min Summer | 73.859 | 1.409 | 2.0 | 880.7 | O K |
| 480 min Summer | 73.936 | 1.486 | 2.0 | 928.9 | O K |
| 600 min Summer | 73.995 | 1.545 | 2.0 | 965.6 | O K |
| 720 min Summer | 74.041 | 1.591 | 2.0 | 994.5 | O K |
| 960 min Summer | 74.110 | 1.660 | 2.0 | 1037.5 | O K |
| 1440 min Summer | 74.192 | 1.742 | 2.0 | 1088.7 | O K |
| 2160 min Summer | 74.244 | 1.794 | 2.0 | 1121.5 | O K |
| 2880 min Summer | 74.254 | 1.804 | 2.0 | 1127.3 | O K |
| 4320 min Summer | 74.209 | 1.759 | 2.0 | 1099.3 | O K |
| 5760 min Summer | 74.145 | 1.695 | 2.0 | 1059.4 | O K |
| 7200 min Summer | 74.086 | 1.636 | 2.0 | 1022.8 | O K |
| 8640 min Summer | 74.033 | 1.583 | 2.0 | 989.4 | O K |
| 10080 min Summer | 73.983 | 1.533 | 2.0 | 958.2 | O K |
| 15 min Winter | 73.096 | 0.646 | 2.0 | 403.9 | O K |
| 30 min Winter | 73.290 | 0.840 | 2.0 | 525.3 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 106.449 | 0.0 | 172.0 | 27 |
| 30 min Summer | 69.298 | 0.0 | 171.7 | 42 |
| 60 min Summer | 43.136 | 0.0 | 344.0 | 72 |
| 120 min Summer | 26.061 | 0.0 | 343.3 | 132 |
| 180 min Summer | 19.202 | 0.0 | 342.6 | 190 |
| 240 min Summer | 15.393 | 0.0 | 341.9 | 250 |
| 360 min Summer | 11.248 | 0.0 | 340.7 | 370 |
| 480 min Summer | 8.999 | 0.0 | 339.5 | 490 |
| 600 min Summer | 7.565 | 0.0 | 338.4 | 610 |
| 720 min Summer | 6.562 | 0.0 | 337.2 | 728 |
| 960 min Summer | 5.240 | 0.0 | 335.0 | 968 |
| 1440 min Summer | 3.812 | 0.0 | 330.6 | 1446 |
| 2160 min Summer | 2.770 | 0.0 | 669.5 | 2164 |
| 2880 min Summer | 2.207 | 0.0 | 662.2 | 2884 |
| 4320 min Summer | 1.601 | 0.0 | 644.8 | 4276 |
| 5760 min Summer | 1.274 | 0.0 | 1313.2 | 4848 |
| 7200 min Summer | 1.067 | 0.0 | 1283.0 | 5552 |
| 8640 min Summer | 0.922 | 0.0 | 1246.1 | 6312 |
| 10080 min Summer | 0.816 | 0.0 | 1204.1 | 7064 |
| 15 min Winter | 106.449 | 0.0 | 172.1 | 27 |
| 30 min Winter | 69.298 | 0.0 | 171.7 | 41 |

## Summary of Results for 30 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 73.493 | 1.043 | 2.0 | 651.7 | O K |
| 120 min Winter | 73.702 | 1.252 | 2.0 | 782.7 | O K |
| 180 min Winter | 73.826 | 1.376 | 2.0 | 860.0 | O K |
| 240 min Winter | 73.913 | 1.463 | 2.0 | 914.1 | O K |
| 360 min Winter | 74.037 | 1.587 | 2.0 | 991.6 | O K |
| 480 min Winter | 74.126 | 1.676 | 2.0 | 1047.4 | O K |
| 600 min Winter | 74.194 | 1.744 | 2.0 | 1090.1 | O K |
| 720 min Winter | 74.249 | 1.799 | 2.0 | 1124.4 | O K |
| 960 min Winter | 74.332 | 1.882 | 2.0 | 1176.1 | Flood Risk |
| 1440 min Winter | 74.435 | 1.985 | 2.0 | 1240.6 | Flood Risk |
| 2160 min Winter | 74.511 | 2.061 | 2.0 | 1288.2 | FLOOD |
| 2880 min Winter | 74.539 | 2.089 | 2.0 | 1305.6 | FLOOD |
| 4320 min Winter | 74.523 | 2.073 | 2.0 | 1295.4 | FLOOD |
| 5760 min Winter | 74.458 | 2.008 | 2.0 | 1255.0 | FLOOD |
| 7200 min Winter | 74.375 | 1.925 | 2.0 | 1202.9 | Flood Risk |
| 8640 min Winter | 74.306 | 1.856 | 2.0 | 1160.0 | Flood Risk |
| 10080 min Winter | 74.239 | 1.789 | 2.0 | 1117.9 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 43.136 | 0.0 | 344.1 | 72 |
| 120 min Winter | 26.061 | 0.0 | 343.3 | 130 |
| 180 min Winter | 19.202 | 0.0 | 342.6 | 188 |
| 240 min Winter | 15.393 | 0.0 | 341.9 | 248 |
| 360 min Winter | 11.248 | 0.0 | 340.7 | 366 |
| 480 min Winter | 8.999 | 0.0 | 339.4 | 484 |
| 600 min Winter | 7.565 | 0.0 | 338.2 | 602 |
| 720 min Winter | 6.562 | 0.0 | 337.0 | 720 |
| 960 min Winter | 5.240 | 0.0 | 334.7 | 956 |
| 1440 min Winter | 3.812 | 0.0 | 330.1 | 1426 |
| 2160 min Winter | 2.770 | 38.2 | 668.9 | 2124 |
| 2880 min Winter | 2.207 | 55.6 | 661.9 | 2804 |
| 4320 min Winter | 1.601 | 45.4 | 646.6 | 4152 |
| 5760 min Winter | 1.274 | 5.0 | 1320.1 | 5424 |
| 7200 min Winter | 1.067 | 0.0 | 1297.5 | 6480 |
| 8640 min Winter | 0.922 | 0.0 | 1269.3 | 6752 |
| 10080 min Winter | 0.816 | 0.0 | 1236.4 | 7672 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.0000 | 0.900 | 2.0000 | 1.700 | 2.0000 | 2.500 | 2.0000 |
| 0.200 | 2.0000 | 1.000 | 2.0000 | 1.800 | 2.0000 | 2.600 | 2.0000 |
| 0.300 | 2.0000 | 1.100 | 2.0000 | 1.900 | 2.0000 | 2.700 | 2.0000 |
| 0.400 | 2.0000 | 1.200 | 2.0000 | 2.000 | 2.0000 | 2.800 | 2.0000 |
| 0.500 | 2.0000 | 1.300 | 2.0000 | 2.100 | 2.0000 | 2.900 | 2.0000 |
| 0.600 | 2.0000 | 1.400 | 2.0000 | 2.200 | 2.0000 | 3.000 | 2.0000 |
| 0.700 | 2.0000 | 1.500 | 2.0000 | 2.300 | 2.0000 | | |
| 0.800 | 2.0000 | 1.600 | 2.0000 | 2.400 | 2.0000 | | |

## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 73.200 | 0.750 | 2.0 | 468.5 | O K |
| 30 min Summer | 73.433 | 0.983 | 2.0 | 614.4 | O K |
| 60 min Summer | 73.676 | 1.226 | 2.0 | 766.1 | O K |
| 120 min Summer | 73.922 | 1.472 | 2.0 | 920.1 | O K |
| 180 min Summer | 74.063 | 1.613 | 2.0 | 1008.3 | O K |
| 240 min Summer | 74.159 | 1.709 | 2.0 | 1068.0 | O K |
| 360 min Summer | 74.294 | 1.844 | 2.0 | 1152.7 | O K |
| 480 min Summer | 74.392 | 1.942 | 2.0 | 1213.9 | Flood Risk |
| 600 min Summer | 74.467 | 2.017 | 2.0 | 1260.4 | FLOOD |
| 720 min Summer | 74.526 | 2.076 | 2.0 | 1297.5 | FLOOD |
| 960 min Summer | 74.615 | 2.165 | 2.0 | 1353.0 | FLOOD |
| 1440 min Summer | 74.724 | 2.274 | 2.0 | 1421.4 | FLOOD |
| 2160 min Summer | 74.802 | 2.352 | 2.0 | 1470.1 | FLOOD |
| 2880 min Summer | 74.828 | 2.378 | 2.0 | 1486.0 | FLOOD |
| 4320 min Summer | 74.800 | 2.350 | 2.0 | 1468.7 | FLOOD |
| 5760 min Summer | 74.720 | 2.270 | 2.0 | 1418.4 | FLOOD |
| 7200 min Summer | 74.635 | 2.185 | 2.0 | 1365.6 | FLOOD |
| 8640 min Summer | 74.560 | 2.110 | 2.0 | 1318.5 | FLOOD |
| 10080 min Summer | 74.492 | 2.042 | 2.0 | 1276.0 | FLOOD |
| 15 min Winter | 73.290 | 0.840 | 2.0 | 524.9 | O K |
| 30 min Winter | 73.552 | 1.102 | 2.0 | 688.6 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 138.153 | 0.0 | 172.1 | 27 |
| 30 min Summer | 90.705 | 0.0 | 171.8 | 42 |
| 60 min Summer | 56.713 | 0.0 | 344.3 | 72 |
| 120 min Summer | 34.246 | 0.0 | 343.7 | 132 |
| 180 min Summer | 25.149 | 0.0 | 343.1 | 192 |
| 240 min Summer | 20.078 | 0.0 | 342.6 | 252 |
| 360 min Summer | 14.585 | 0.0 | 341.6 | 370 |
| 480 min Summer | 11.622 | 0.0 | 340.7 | 490 |
| 600 min Summer | 9.738 | 10.4 | 339.8 | 610 |
| 720 min Summer | 8.424 | 47.5 | 338.9 | 730 |
| 960 min Summer | 6.697 | 103.0 | 337.2 | 970 |
| 1440 min Summer | 4.839 | 171.4 | 333.8 | 1448 |
| 2160 min Summer | 3.490 | 220.1 | 674.3 | 2168 |
| 2880 min Summer | 2.766 | 236.0 | 668.9 | 2884 |
| 4320 min Summer | 1.989 | 218.7 | 656.5 | 4324 |
| 5760 min Summer | 1.573 | 168.4 | 1332.2 | 5592 |
| 7200 min Summer | 1.311 | 115.6 | 1311.3 | 6128 |
| 8640 min Summer | 1.129 | 68.5 | 1283.5 | 6832 |
| 10080 min Summer | 0.994 | 26.0 | 1249.0 | 7568 |
| 15 min Winter | 138.153 | 0.0 | 172.1 | 27 |
| 30 min Winter | 90.705 | 0.0 | 171.8 | 42 |

## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 73.824 | 1.374 | 2.0 | 858.9 | O K |
| 120 min Winter | 74.102 | 1.652 | 2.0 | 1032.3 | O K |
| 180 min Winter | 74.261 | 1.811 | 2.0 | 1132.0 | O K |
| 240 min Winter | 74.370 | 1.920 | 2.0 | 1199.8 | Flood Risk |
| 360 min Winter | 74.524 | 2.074 | 2.0 | 1296.5 | FLOOD |
| 480 min Winter | 74.637 | 2.187 | 2.0 | 1366.8 | FLOOD |
| 600 min Winter | 74.723 | 2.273 | 2.0 | 1420.8 | FLOOD |
| 720 min Winter | 74.793 | 2.343 | 2.0 | 1464.2 | FLOOD |
| 960 min Winter | 74.898 | 2.448 | 2.0 | 1530.1 | FLOOD |
| 1440 min Winter | 75.033 | 2.583 | 2.0 | 1614.2 | FLOOD |
| 2160 min Winter | 75.138 | 2.688 | 2.0 | 1680.1 | FLOOD |
| 2880 min Winter | 75.185 | 2.735 | 2.0 | 1709.4 | FLOOD |
| 4320 min Winter | 75.191 | 2.741 | 2.0 | 1712.9 | FLOOD |
| 5760 min Winter | 75.135 | 2.685 | 2.0 | 1677.9 | FLOOD |
| 7200 min Winter | 75.047 | 2.597 | 2.0 | 1623.1 | FLOOD |
| 8640 min Winter | 74.945 | 2.495 | 2.0 | 1559.2 | FLOOD |
| 10080 min Winter | 74.852 | 2.402 | 2.0 | 1501.3 | FLOOD |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 56.713 | 0.0 | 344.3 | 72 |
| 120 min Winter | 34.246 | 0.0 | 343.6 | 130 |
| 180 min Winter | 25.149 | 0.0 | 343.0 | 190 |
| 240 min Winter | 20.078 | 0.0 | 342.5 | 248 |
| 360 min Winter | 14.585 | 46.5 | 341.4 | 366 |
| 480 min Winter | 11.622 | 116.8 | 340.4 | 484 |
| 600 min Winter | 9.738 | 170.8 | 339.3 | 604 |
| 720 min Winter | 8.424 | 214.2 | 338.3 | 722 |
| 960 min Winter | 6.697 | 280.1 | 336.4 | 958 |
| 1440 min Winter | 4.839 | 364.2 | 332.5 | 1430 |
| 2160 min Winter | 3.490 | 430.1 | 672.4 | 2128 |
| 2880 min Winter | 2.766 | 459.4 | 666.5 | 2828 |
| 4320 min Winter | 1.989 | 462.9 | 654.2 | 4196 |
| 5760 min Winter | 1.573 | 427.9 | 1332.1 | 5536 |
| 7200 min Winter | 1.311 | 373.1 | 1316.8 | 6840 |
| 8640 min Winter | 1.129 | 309.2 | 1297.7 | 7960 |
| 10080 min Winter | 0.994 | 251.3 | 1272.5 | 8080 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.0000 | 0.900 | 2.0000 | 1.700 | 2.0000 | 2.500 | 2.0000 |
| 0.200 | 2.0000 | 1.000 | 2.0000 | 1.800 | 2.0000 | 2.600 | 2.0000 |
| 0.300 | 2.0000 | 1.100 | 2.0000 | 1.900 | 2.0000 | 2.700 | 2.0000 |
| 0.400 | 2.0000 | 1.200 | 2.0000 | 2.000 | 2.0000 | 2.800 | 2.0000 |
| 0.500 | 2.0000 | 1.300 | 2.0000 | 2.100 | 2.0000 | 2.900 | 2.0000 |
| 0.600 | 2.0000 | 1.400 | 2.0000 | 2.200 | 2.0000 | 3.000 | 2.0000 |
| 0.700 | 2.0000 | 1.500 | 2.0000 | 2.300 | 2.0000 | | |
| 0.800 | 2.0000 | 1.600 | 2.0000 | 2.400 | 2.0000 | | |

# APPENDIX III

Silage Clamp Amended Discharge Rate Calculations

## Summary of Results for 30 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 73.026 | 0.576 | 2.5 | 359.8 | O K |
| 30 min Summer | 73.198 | 0.748 | 2.5 | 467.6 | O K |
| 60 min Summer | 73.377 | 0.927 | 2.5 | 579.5 | O K |
| 120 min Summer | 73.560 | 1.110 | 2.5 | 694.0 | O K |
| 180 min Summer | 73.667 | 1.217 | 2.5 | 760.7 | O K |
| 240 min Summer | 73.741 | 1.291 | 2.5 | 806.6 | O K |
| 360 min Summer | 73.843 | 1.393 | 2.5 | 870.9 | O K |
| 480 min Summer | 73.915 | 1.465 | 2.5 | 915.9 | O K |
| 600 min Summer | 73.969 | 1.519 | 2.5 | 949.3 | O K |
| 720 min Summer | 74.010 | 1.560 | 2.5 | 975.0 | O K |
| 960 min Summer | 74.068 | 1.618 | 2.5 | 1011.5 | O K |
| 1440 min Summer | 74.130 | 1.680 | 2.5 | 1049.8 | O K |
| 2160 min Summer | 74.152 | 1.702 | 2.5 | 1063.7 | O K |
| 2880 min Summer | 74.132 | 1.682 | 2.5 | 1051.5 | O K |
| 4320 min Summer | 74.055 | 1.605 | 2.5 | 1003.4 | O K |
| 5760 min Summer | 73.985 | 1.535 | 2.5 | 959.1 | O K |
| 7200 min Summer | 73.921 | 1.471 | 2.5 | 919.4 | O K |
| 8640 min Summer | 73.861 | 1.411 | 2.5 | 881.9 | O K |
| 10080 min Summer | 73.803 | 1.353 | 2.5 | 845.7 | O K |
| 15 min Winter | 73.095 | 0.645 | 2.5 | 403.3 | O K |
| 30 min Winter | 73.289 | 0.839 | 2.5 | 524.3 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 106.449 | 0.0 | 215.0 | 27 |
| 30 min Summer | 69.298 | 0.0 | 214.6 | 42 |
| 60 min Summer | 43.136 | 0.0 | 430.0 | 72 |
| 120 min Summer | 26.061 | 0.0 | 429.1 | 132 |
| 180 min Summer | 19.202 | 0.0 | 428.2 | 190 |
| 240 min Summer | 15.393 | 0.0 | 427.4 | 250 |
| 360 min Summer | 11.248 | 0.0 | 425.8 | 370 |
| 480 min Summer | 8.999 | 0.0 | 424.3 | 490 |
| 600 min Summer | 7.565 | 0.0 | 422.8 | 608 |
| 720 min Summer | 6.562 | 0.0 | 421.4 | 728 |
| 960 min Summer | 5.240 | 0.0 | 418.5 | 968 |
| 1440 min Summer | 3.812 | 0.0 | 412.6 | 1446 |
| 2160 min Summer | 2.770 | 0.0 | 835.2 | 2164 |
| 2880 min Summer | 2.207 | 0.0 | 824.4 | 2880 |
| 4320 min Summer | 1.601 | 0.0 | 796.5 | 3640 |
| 5760 min Summer | 1.274 | 0.0 | 1619.5 | 4376 |
| 7200 min Summer | 1.067 | 0.0 | 1572.4 | 5120 |
| 8640 min Summer | 0.922 | 0.0 | 1516.3 | 5960 |
| 10080 min Summer | 0.816 | 0.0 | 1455.2 | 6760 |
| 15 min Winter | 106.449 | 0.0 | 215.1 | 27 |
| 30 min Winter | 69.298 | 0.0 | 214.6 | 41 |

## Summary of Results for 30 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 73.490 | 1.040 | 2.5 | 650.0 | O K |
| 120 min Winter | 73.697 | 1.247 | 2.5 | 779.4 | O K |
| 180 min Winter | 73.818 | 1.368 | 2.5 | 855.2 | O K |
| 240 min Winter | 73.902 | 1.452 | 2.5 | 907.7 | O K |
| 360 min Winter | 74.021 | 1.571 | 2.5 | 981.9 | O K |
| 480 min Winter | 74.105 | 1.655 | 2.5 | 1034.5 | O K |
| 600 min Winter | 74.169 | 1.719 | 2.5 | 1074.1 | O K |
| 720 min Winter | 74.218 | 1.768 | 2.5 | 1105.1 | O K |
| 960 min Winter | 74.291 | 1.841 | 2.5 | 1150.4 | O K |
| 1440 min Winter | 74.374 | 1.924 | 2.5 | 1202.3 | Flood Risk |
| 2160 min Winter | 74.420 | 1.970 | 2.5 | 1231.2 | Flood Risk |
| 2880 min Winter | 74.419 | 1.969 | 2.5 | 1230.7 | Flood Risk |
| 4320 min Winter | 74.351 | 1.901 | 2.5 | 1187.9 | Flood Risk |
| 5760 min Winter | 74.252 | 1.802 | 2.5 | 1126.3 | O K |
| 7200 min Winter | 74.169 | 1.719 | 2.5 | 1074.4 | O K |
| 8640 min Winter | 74.085 | 1.635 | 2.5 | 1021.8 | O K |
| 10080 min Winter | 74.000 | 1.550 | 2.5 | 968.8 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 43.136 | 0.0 | 430.1 | 70 |
| 120 min Winter | 26.061 | 0.0 | 429.1 | 130 |
| 180 min Winter | 19.202 | 0.0 | 428.2 | 188 |
| 240 min Winter | 15.393 | 0.0 | 427.4 | 248 |
| 360 min Winter | 11.248 | 0.0 | 425.8 | 364 |
| 480 min Winter | 8.999 | 0.0 | 424.2 | 482 |
| 600 min Winter | 7.565 | 0.0 | 422.7 | 600 |
| 720 min Winter | 6.562 | 0.0 | 421.2 | 718 |
| 960 min Winter | 5.240 | 0.0 | 418.2 | 952 |
| 1440 min Winter | 3.812 | 0.0 | 412.2 | 1420 |
| 2160 min Winter | 2.770 | 0.0 | 835.3 | 2108 |
| 2880 min Winter | 2.207 | 0.0 | 825.6 | 2792 |
| 4320 min Winter | 1.601 | 0.0 | 803.2 | 4072 |
| 5760 min Winter | 1.274 | 0.0 | 1637.7 | 4680 |
| 7200 min Winter | 1.067 | 0.0 | 1599.6 | 5552 |
| 8640 min Winter | 0.922 | 0.0 | 1555.0 | 6480 |
| 10080 min Winter | 0.816 | 0.0 | 1505.7 | 7368 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 30 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 2.5000 | 0.900 | 2.5000 | 1.700 | 2.5000 | 2.500 | 2.5000 |
| 0.200 | 2.5000 | 1.000 | 2.5000 | 1.800 | 2.5000 | 2.600 | 2.5000 |
| 0.300 | 2.5000 | 1.100 | 2.5000 | 1.900 | 2.5000 | 2.700 | 2.5000 |
| 0.400 | 2.5000 | 1.200 | 2.5000 | 2.000 | 2.5000 | 2.800 | 2.5000 |
| 0.500 | 2.5000 | 1.300 | 2.5000 | 2.100 | 2.5000 | 2.900 | 2.5000 |
| 0.600 | 2.5000 | 1.400 | 2.5000 | 2.200 | 2.5000 | 3.000 | 2.5000 |
| 0.700 | 2.5000 | 1.500 | 2.5000 | 2.300 | 2.5000 | | |
| 0.800 | 2.5000 | 1.600 | 2.5000 | 2.400 | 2.5000 | | |

## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 15 min Summer | 73.188 | 0.738 | 7.6 | 461.6 | O K |
| 30 min Summer | 73.416 | 0.966 | 7.6 | 603.5 | O K |
| 60 min Summer | 73.644 | 1.194 | 7.6 | 746.3 | O K |
| 120 min Summer | 73.862 | 1.412 | 7.6 | 882.3 | O K |
| 180 min Summer | 73.973 | 1.523 | 7.6 | 952.1 | O K |
| 240 min Summer | 74.040 | 1.590 | 7.6 | 993.5 | O K |
| 360 min Summer | 74.117 | 1.667 | 7.6 | 1041.6 | O K |
| 480 min Summer | 74.156 | 1.706 | 7.6 | 1066.3 | O K |
| 600 min Summer | 74.172 | 1.722 | 7.6 | 1076.5 | O K |
| 720 min Summer | 74.174 | 1.724 | 7.6 | 1077.5 | O K |
| 960 min Summer | 74.149 | 1.699 | 7.6 | 1062.2 | O K |
| 1440 min Summer | 74.063 | 1.613 | 7.6 | 1008.1 | O K |
| 2160 min Summer | 73.949 | 1.499 | 7.6 | 936.9 | O K |
| 2880 min Summer | 73.850 | 1.400 | 7.6 | 874.8 | O K |
| 4320 min Summer | 73.666 | 1.216 | 7.6 | 760.3 | O K |
| 5760 min Summer | 73.497 | 1.047 | 7.6 | 654.3 | O K |
| 7200 min Summer | 73.340 | 0.890 | 7.6 | 556.5 | O K |
| 8640 min Summer | 73.198 | 0.748 | 7.6 | 467.6 | O K |
| 10080 min Summer | 73.070 | 0.620 | 7.6 | 387.6 | O K |
| 15 min Winter | 73.279 | 0.829 | 7.6 | 518.0 | O K |
| 30 min Winter | 73.534 | 1.084 | 7.6 | 677.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 138.153 | 0.0 | 469.7 | 26 |
| 30 min Summer | 90.705 | 0.0 | 605.1 | 41 |
| 60 min Summer | 56.713 | 0.0 | 773.3 | 70 |
| 120 min Summer | 34.246 | 0.0 | 933.8 | 130 |
| 180 min Summer | 25.149 | 0.0 | 1028.4 | 190 |
| 240 min Summer | 20.078 | 0.0 | 1094.2 | 248 |
| 360 min Summer | 14.585 | 0.0 | 1188.8 | 366 |
| 480 min Summer | 11.622 | 0.0 | 1252.3 | 486 |
| 600 min Summer | 9.738 | 0.0 | 1284.2 | 604 |
| 720 min Summer | 8.424 | 0.0 | 1282.8 | 724 |
| 960 min Summer | 6.697 | 0.0 | 1271.9 | 960 |
| 1440 min Summer | 4.839 | 0.0 | 1243.2 | 1216 |
| 2160 min Summer | 3.490 | 0.0 | 1713.3 | 1580 |
| 2880 min Summer | 2.766 | 0.0 | 1810.1 | 1972 |
| 4320 min Summer | 1.989 | 0.0 | 1952.6 | 2776 |
| 5760 min Summer | 1.573 | 0.0 | 2058.9 | 3584 |
| 7200 min Summer | 1.311 | 0.0 | 2144.1 | 4336 |
| 8640 min Summer | 1.129 | 0.0 | 2215.5 | 5104 |
| 10080 min Summer | 0.994 | 0.0 | 2277.1 | 5848 |
| 15 min Winter | 138.153 | 0.0 | 524.4 | 26 |
| 30 min Winter | 90.705 | 0.0 | 649.2 | 41 |

## Summary of Results for 100 year Return Period (+40%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Control (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|
| 60 min Winter | 73.793 | 1.343 | 7.6 | 839.4 | O K |
| 120 min Winter | 74.042 | 1.592 | 7.6 | 995.1 | O K |
| 180 min Winter | 74.173 | 1.723 | 7.6 | 1076.8 | O K |
| 240 min Winter | 74.253 | 1.803 | 7.6 | 1126.6 | O K |
| 360 min Winter | 74.350 | 1.900 | 7.6 | 1187.4 | Flood Risk |
| 480 min Winter | 74.405 | 1.955 | 7.6 | 1221.7 | Flood Risk |
| 600 min Winter | 74.434 | 1.984 | 7.6 | 1240.0 | Flood Risk |
| 720 min Winter | 74.446 | 1.996 | 7.6 | 1247.8 | Flood Risk |
| 960 min Winter | 74.440 | 1.990 | 7.6 | 1243.6 | Flood Risk |
| 1440 min Winter | 74.360 | 1.910 | 7.6 | 1193.5 | Flood Risk |
| 2160 min Winter | 74.207 | 1.757 | 7.6 | 1097.8 | O K |
| 2880 min Winter | 74.070 | 1.620 | 7.6 | 1012.4 | O K |
| 4320 min Winter | 73.799 | 1.349 | 7.6 | 842.9 | O K |
| 5760 min Winter | 73.541 | 1.091 | 7.6 | 681.8 | O K |
| 7200 min Winter | 73.305 | 0.855 | 7.6 | 534.2 | O K |
| 8640 min Winter | 73.094 | 0.644 | 7.6 | 402.4 | O K |
| 10080 min Winter | 72.912 | 0.462 | 7.6 | 288.6 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 60 min Winter | 56.713 | 0.0 | 866.1 | 70 |
| 120 min Winter | 34.246 | 0.0 | 1045.6 | 128 |
| 180 min Winter | 25.149 | 0.0 | 1150.1 | 186 |
| 240 min Winter | 20.078 | 0.0 | 1219.5 | 244 |
| 360 min Winter | 14.585 | 0.0 | 1292.9 | 360 |
| 480 min Winter | 11.622 | 0.0 | 1292.0 | 476 |
| 600 min Winter | 9.738 | 0.0 | 1287.4 | 592 |
| 720 min Winter | 8.424 | 0.0 | 1282.8 | 708 |
| 960 min Winter | 6.697 | 0.0 | 1273.0 | 932 |
| 1440 min Winter | 4.839 | 0.0 | 1250.2 | 1362 |
| 2160 min Winter | 3.490 | 0.0 | 1918.9 | 1696 |
| 2880 min Winter | 2.766 | 0.0 | 2027.3 | 2160 |
| 4320 min Winter | 1.989 | 0.0 | 2182.5 | 3032 |
| 5760 min Winter | 1.573 | 0.0 | 2306.3 | 3872 |
| 7200 min Winter | 1.311 | 0.0 | 2401.4 | 4680 |
| 8640 min Winter | 1.129 | 0.0 | 2481.7 | 5376 |
| 10080 min Winter | 0.994 | 0.0 | 2550.7 | 6056 |

## Rainfall Details

| | | | |
|---|---|---|---|
| Rainfall Model | FSR | Winter Storms | Yes |
| Return Period (years) | 100 | Cv (Summer) | 0.750 |
| Region | England and Wales | Cv (Winter) | 0.840 |
| M5-60 (mm) | 20.000 | Shortest Storm (mins) | 15 |
| Ratio R | 0.400 | Longest Storm (mins) | 10080 |
| Summer Storms | Yes | Climate Change % | +40 |

## Time Area Diagram

Total Area (ha) 1.818

| Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) | Time From: | (mins) To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.606 | 4 | 8 | 0.606 | 8 | 12 | 0.606 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Time Area Diagram

Total Area (ha) 0.000

| Time From: | (mins) To: | Area (ha) |
|---|---|---|
| 0 | 4 | 0.000 |

## Model Details

Storage is Online Cover Level (m) 74.450

## Tank or Pond Structure

Invert Level (m) 72.450

| Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|
| 0.000 | 625.0 | 2.000 | 625.0 |

## Pump Outflow Control

Invert Level (m) 72.450

| Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) | Depth (m) | Flow (l/s) |
|---|---|---|---|---|---|---|---|
| 0.100 | 7.6000 | 1.200 | 7.6000 | 3.000 | 7.6000 | 7.000 | 7.6000 |
| 0.200 | 7.6000 | 1.400 | 7.6000 | 3.500 | 7.6000 | 7.500 | 7.6000 |
| 0.300 | 7.6000 | 1.600 | 7.6000 | 4.000 | 7.6000 | 8.000 | 7.6000 |
| 0.400 | 7.6000 | 1.800 | 7.6000 | 4.500 | 7.6000 | 8.500 | 7.6000 |
| 0.500 | 7.6000 | 2.000 | 7.6000 | 5.000 | 7.6000 | 9.000 | 7.6000 |
| 0.600 | 7.6000 | 2.200 | 7.6000 | 5.500 | 7.6000 | 9.500 | 7.6000 |
| 0.800 | 7.6000 | 2.400 | 7.6000 | 6.000 | 7.6000 | | |
| 1.000 | 7.6000 | 2.600 | 7.6000 | 6.500 | 7.6000 | | |

# APPENDIX 06

## Post Development Runoff Calculations

## Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 775 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 80.112 | 0.262 | 0.0 | 12.4 | 12.4 | 421.0 | O K |
| 30 min Summer | 80.183 | 0.333 | 0.0 | 12.4 | 12.4 | 540.6 | O K |
| 60 min Summer | 80.251 | 0.401 | 0.0 | 12.4 | 12.4 | 657.3 | O K |
| 120 min Summer | 80.342 | 0.492 | 0.0 | 12.4 | 12.4 | 815.8 | O K |
| 180 min Summer | 80.389 | 0.539 | 0.0 | 12.4 | 12.4 | 899.4 | O K |
| 240 min Summer | 80.416 | 0.566 | 0.0 | 12.4 | 12.4 | 947.3 | O K |
| 360 min Summer | 80.439 | 0.589 | 0.0 | 12.4 | 12.4 | 988.5 | O K |
| 480 min Summer | 80.442 | 0.592 | 0.0 | 12.4 | 12.4 | 993.8 | O K |
| 600 min Summer | 80.435 | 0.585 | 0.0 | 12.4 | 12.4 | 982.4 | O K |
| 720 min Summer | 80.425 | 0.575 | 0.0 | 12.4 | 12.4 | 964.6 | O K |
| 960 min Summer | 80.405 | 0.555 | 0.0 | 12.4 | 12.4 | 928.2 | O K |
| 1440 min Summer | 80.363 | 0.513 | 0.0 | 12.4 | 12.4 | 852.5 | O K |
| 2160 min Summer | 80.304 | 0.454 | 0.0 | 12.4 | 12.4 | 748.5 | O K |
| 2880 min Summer | 80.254 | 0.404 | 0.0 | 12.4 | 12.4 | 662.4 | O K |
| 4320 min Summer | 80.178 | 0.328 | 0.0 | 12.4 | 12.4 | 531.8 | O K |
| 5760 min Summer | 80.123 | 0.273 | 0.0 | 12.4 | 12.4 | 439.4 | O K |
| 7200 min Summer | 80.085 | 0.235 | 0.0 | 12.4 | 12.4 | 376.8 | O K |
| 8640 min Summer | 80.058 | 0.208 | 0.0 | 12.3 | 12.3 | 332.8 | O K |
| 10080 min Summer | 80.040 | 0.190 | 0.0 | 12.2 | 12.2 | 302.2 | O K |
| 15 min Winter | 80.143 | 0.293 | 0.0 | 12.4 | 12.4 | 472.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 120.891 | 0.0 | 388.7 | 26 |
| 30 min Summer | 78.142 | 0.0 | 508.4 | 40 |
| 60 min Summer | 48.178 | 0.0 | 665.4 | 70 |
| 120 min Summer | 30.604 | 0.0 | 848.5 | 128 |
| 180 min Summer | 22.997 | 0.0 | 957.1 | 188 |
| 240 min Summer | 18.593 | 0.0 | 1031.8 | 246 |
| 360 min Summer | 13.571 | 0.0 | 1129.1 | 364 |
| 480 min Summer | 10.745 | 0.0 | 1190.9 | 482 |
| 600 min Summer | 8.928 | 0.0 | 1235.4 | 600 |
| 720 min Summer | 7.656 | 0.0 | 1269.6 | 650 |
| 960 min Summer | 5.987 | 0.0 | 1319.6 | 766 |
| 1440 min Summer | 4.219 | 0.0 | 1383.7 | 1014 |
| 2160 min Summer | 2.983 | 0.0 | 1519.5 | 1404 |
| 2880 min Summer | 2.347 | 0.0 | 1592.9 | 1792 |
| 4320 min Summer | 1.703 | 0.0 | 1725.5 | 2552 |
| 5760 min Summer | 1.377 | 0.0 | 1882.5 | 3280 |
| 7200 min Summer | 1.183 | 0.0 | 2020.1 | 3968 |
| 8640 min Summer | 1.055 | 0.0 | 2157.5 | 4664 |
| 10080 min Summer | 0.964 | 0.0 | 2292.1 | 5344 |
| 15 min Winter | 120.891 | 0.0 | 438.1 | 26 |

## Summary of Results for 100 year Return Period

Half Drain Time : 628 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 80.069 | 0.219 | 0.0 | 12.3 | 12.3 | 349.8 | O K |
| 30 min Summer | 80.128 | 0.278 | 0.0 | 12.4 | 12.4 | 448.4 | O K |
| 60 min Summer | 80.185 | 0.335 | 0.0 | 12.4 | 12.4 | 543.5 | O K |
| 120 min Summer | 80.259 | 0.409 | 0.0 | 12.4 | 12.4 | 671.0 | O K |
| 180 min Summer | 80.296 | 0.446 | 0.0 | 12.4 | 12.4 | 735.6 | O K |
| 240 min Summer | 80.317 | 0.467 | 0.0 | 12.4 | 12.4 | 771.4 | O K |
| 360 min Summer | 80.332 | 0.482 | 0.0 | 12.4 | 12.4 | 798.6 | O K |
| 480 min Summer | 80.330 | 0.480 | 0.0 | 12.4 | 12.4 | 795.4 | O K |
| 600 min Summer | 80.323 | 0.473 | 0.0 | 12.4 | 12.4 | 781.5 | O K |
| 720 min Summer | 80.314 | 0.464 | 0.0 | 12.4 | 12.4 | 766.1 | O K |
| 960 min Summer | 80.295 | 0.445 | 0.0 | 12.4 | 12.4 | 733.3 | O K |
| 1440 min Summer | 80.257 | 0.407 | 0.0 | 12.4 | 12.4 | 667.0 | O K |
| 2160 min Summer | 80.205 | 0.355 | 0.0 | 12.4 | 12.4 | 577.7 | O K |
| 2880 min Summer | 80.161 | 0.311 | 0.0 | 12.4 | 12.4 | 503.6 | O K |
| 4320 min Summer | 80.097 | 0.247 | 0.0 | 12.4 | 12.4 | 396.3 | O K |
| 5760 min Summer | 80.055 | 0.205 | 0.0 | 12.3 | 12.3 | 327.9 | O K |
| 7200 min Summer | 80.030 | 0.180 | 0.0 | 12.1 | 12.1 | 286.1 | O K |
| 8640 min Summer | 80.016 | 0.166 | 0.0 | 11.6 | 11.6 | 262.9 | O K |
| 10080 min Summer | 80.007 | 0.157 | 0.0 | 11.0 | 11.0 | 248.5 | O K |
| 15 min Winter | 80.095 | 0.245 | 0.0 | 12.4 | 12.4 | 392.5 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 100.742 | 0.0 | 319.7 | 26 |
| 30 min Summer | 65.119 | 0.0 | 420.3 | 40 |
| 60 min Summer | 40.148 | 0.0 | 552.1 | 68 |
| 120 min Summer | 25.504 | 0.0 | 705.1 | 128 |
| 180 min Summer | 19.164 | 0.0 | 796.1 | 186 |
| 240 min Summer | 15.494 | 0.0 | 858.8 | 244 |
| 360 min Summer | 11.309 | 0.0 | 940.5 | 362 |
| 480 min Summer | 8.955 | 0.0 | 992.6 | 480 |
| 600 min Summer | 7.440 | 0.0 | 1030.3 | 524 |
| 720 min Summer | 6.380 | 0.0 | 1059.5 | 580 |
| 960 min Summer | 4.989 | 0.0 | 1102.9 | 698 |
| 1440 min Summer | 3.516 | 0.0 | 1160.0 | 958 |
| 2160 min Summer | 2.485 | 0.0 | 1264.9 | 1352 |
| 2880 min Summer | 1.956 | 0.0 | 1325.6 | 1736 |
| 4320 min Summer | 1.419 | 0.0 | 1434.3 | 2468 |
| 5760 min Summer | 1.148 | 0.0 | 1567.4 | 3168 |
| 7200 min Summer | 0.986 | 0.0 | 1681.8 | 3824 |
| 8640 min Summer | 0.879 | 0.0 | 1795.7 | 4504 |
| 10080 min Summer | 0.804 | 0.0 | 1906.9 | 5248 |
| 15 min Winter | 100.742 | 0.0 | 361.1 | 26 |

## Summary of Results for 100 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 30 min Winter | 80.161 | 0.311 | 0.0 | 12.4 | 12.4 | 503.9 | O K |
| 60 min Winter | 80.225 | 0.375 | 0.0 | 12.4 | 12.4 | 611.9 | O K |
| 120 min Winter | 80.309 | 0.459 | 0.0 | 12.4 | 12.4 | 757.5 | O K |
| 180 min Winter | 80.352 | 0.502 | 0.0 | 12.4 | 12.4 | 833.1 | O K |
| 240 min Winter | 80.376 | 0.526 | 0.0 | 12.4 | 12.4 | 876.9 | O K |
| 360 min Winter | 80.397 | 0.547 | 0.0 | 12.4 | 12.4 | 913.8 | O K |
| 480 min Winter | 80.399 | 0.549 | 0.0 | 12.4 | 12.4 | 916.9 | O K |
| 600 min Winter | 80.392 | 0.542 | 0.0 | 12.4 | 12.4 | 904.6 | O K |
| 720 min Winter | 80.380 | 0.530 | 0.0 | 12.4 | 12.4 | 883.9 | O K |
| 960 min Winter | 80.352 | 0.502 | 0.0 | 12.4 | 12.4 | 833.1 | O K |
| 1440 min Winter | 80.298 | 0.448 | 0.0 | 12.4 | 12.4 | 738.2 | O K |
| 2160 min Winter | 80.221 | 0.371 | 0.0 | 12.4 | 12.4 | 605.2 | O K |
| 2880 min Winter | 80.155 | 0.305 | 0.0 | 12.4 | 12.4 | 494.0 | O K |
| 4320 min Winter | 80.064 | 0.214 | 0.0 | 12.3 | 12.3 | 341.6 | O K |
| 5760 min Winter | 80.018 | 0.168 | 0.0 | 11.8 | 11.8 | 266.9 | O K |
| 7200 min Winter | 80.000 | 0.150 | 0.0 | 10.5 | 10.5 | 237.4 | O K |
| 8640 min Winter | 79.988 | 0.138 | 0.0 | 9.5 | 9.5 | 218.4 | O K |
| 10080 min Winter | 79.980 | 0.130 | 0.0 | 8.8 | 8.8 | 205.4 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 30 min Winter | 65.119 | 0.0 | 473.3 | 40 |
| 60 min Winter | 40.148 | 0.0 | 620.1 | 68 |
| 120 min Winter | 25.504 | 0.0 | 791.3 | 126 |
| 180 min Winter | 19.164 | 0.0 | 892.9 | 184 |
| 240 min Winter | 15.494 | 0.0 | 962.8 | 240 |
| 360 min Winter | 11.309 | 0.0 | 1053.9 | 356 |
| 480 min Winter | 8.955 | 0.0 | 1112.0 | 468 |
| 600 min Winter | 7.440 | 0.0 | 1153.9 | 578 |
| 720 min Winter | 6.380 | 0.0 | 1186.3 | 680 |
| 960 min Winter | 4.989 | 0.0 | 1234.5 | 762 |
| 1440 min Winter | 3.516 | 0.0 | 1298.0 | 1052 |
| 2160 min Winter | 2.485 | 0.0 | 1418.0 | 1472 |
| 2880 min Winter | 1.956 | 0.0 | 1486.4 | 1852 |
| 4320 min Winter | 1.419 | 0.0 | 1609.8 | 2552 |
| 5760 min Winter | 1.148 | 0.0 | 1756.6 | 3168 |
| 7200 min Winter | 0.986 | 0.0 | 1885.0 | 3888 |
| 8640 min Winter | 0.879 | 0.0 | 2013.3 | 4584 |
| 10080 min Winter | 0.804 | 0.0 | 2139.6 | 5256 |

## Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| Return Period (years) | 100 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 564139 246926 TL 64139 46926 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 1.907

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.769 | 4 | 8 | 0.569 | 8 | 12 | 0.569 |

## Model Details

Storage is Online Cover Level (m) 80.850

## Infiltration Basin Structure

Invert Level (m) 79.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 1552.7 | 0.700 | 1859.9 | 1.000 | 2000.0 |

## Hydro-Brake® Optimum Outflow Control

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1240-0700-1240 |
| Design Head (m) | 0.700 |
| Design Flow (l/s) | 12.4 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 79.850 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.700 | 12.4 |
| Flush-Flo™ | 0.262 | 12.4 |
| Kick-Flo® | 0.523 | 10.8 |
| Mean Flow over Head Range | - | 10.2 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 5.9 | 1.200 | 16.0 | 3.000 | 24.8 | 7.000 | 37.3 |
| 0.200 | 12.2 | 1.400 | 17.2 | 3.500 | 26.7 | 7.500 | 38.4 |
| 0.300 | 12.4 | 1.600 | 18.4 | 4.000 | 28.5 | 8.000 | 39.7 |
| 0.400 | 12.0 | 1.800 | 19.4 | 4.500 | 30.1 | 8.500 | 40.9 |
| 0.500 | 11.2 | 2.000 | 20.4 | 5.000 | 31.7 | 9.000 | 42.1 |
| 0.600 | 11.5 | 2.200 | 21.4 | 5.500 | 33.2 | 9.500 | 43.3 |
| 0.800 | 13.2 | 2.400 | 22.3 | 6.000 | 34.6 | | |
| 1.000 | 14.7 | 2.600 | 23.1 | 6.500 | 36.0 | | |

## Summary of Results for 30 year Return Period

Half Drain Time : 463 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 80.020 | 0.170 | 0.0 | 12.0 | 12.0 | 270.3 | O K |
| 30 min Summer | 80.065 | 0.215 | 0.0 | 12.3 | 12.3 | 344.0 | O K |
| 60 min Summer | 80.107 | 0.257 | 0.0 | 12.4 | 12.4 | 412.6 | O K |
| 120 min Summer | 80.165 | 0.315 | 0.0 | 12.4 | 12.4 | 510.5 | O K |
| 180 min Summer | 80.191 | 0.341 | 0.0 | 12.4 | 12.4 | 555.0 | O K |
| 240 min Summer | 80.204 | 0.354 | 0.0 | 12.4 | 12.4 | 576.3 | O K |
| 360 min Summer | 80.209 | 0.359 | 0.0 | 12.4 | 12.4 | 584.8 | O K |
| 480 min Summer | 80.206 | 0.356 | 0.0 | 12.4 | 12.4 | 579.0 | O K |
| 600 min Summer | 80.200 | 0.350 | 0.0 | 12.4 | 12.4 | 569.9 | O K |
| 720 min Summer | 80.194 | 0.344 | 0.0 | 12.4 | 12.4 | 559.2 | O K |
| 960 min Summer | 80.180 | 0.330 | 0.0 | 12.4 | 12.4 | 535.4 | O K |
| 1440 min Summer | 80.150 | 0.300 | 0.0 | 12.4 | 12.4 | 485.2 | O K |
| 2160 min Summer | 80.111 | 0.261 | 0.0 | 12.4 | 12.4 | 419.1 | O K |
| 2880 min Summer | 80.079 | 0.229 | 0.0 | 12.4 | 12.4 | 366.7 | O K |
| 4320 min Summer | 80.037 | 0.187 | 0.0 | 12.2 | 12.2 | 297.3 | O K |
| 5760 min Summer | 80.015 | 0.165 | 0.0 | 11.6 | 11.6 | 261.4 | O K |
| 7200 min Summer | 80.002 | 0.152 | 0.0 | 10.7 | 10.7 | 241.0 | O K |
| 8640 min Summer | 79.993 | 0.143 | 0.0 | 9.9 | 9.9 | 226.9 | O K |
| 10080 min Summer | 79.987 | 0.137 | 0.0 | 9.4 | 9.4 | 216.6 | O K |
| 15 min Winter | 80.040 | 0.190 | 0.0 | 12.2 | 12.2 | 303.1 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 78.073 | 0.0 | 241.6 | 26 |
| 30 min Summer | 50.296 | 0.0 | 318.9 | 40 |
| 60 min Summer | 30.837 | 0.0 | 420.4 | 68 |
| 120 min Summer | 19.785 | 0.0 | 543.7 | 126 |
| 180 min Summer | 14.863 | 0.0 | 614.4 | 184 |
| 240 min Summer | 12.002 | 0.0 | 662.3 | 242 |
| 360 min Summer | 8.745 | 0.0 | 724.7 | 344 |
| 480 min Summer | 6.918 | 0.0 | 764.5 | 394 |
| 600 min Summer | 5.750 | 0.0 | 794.1 | 454 |
| 720 min Summer | 4.935 | 0.0 | 817.7 | 516 |
| 960 min Summer | 3.874 | 0.0 | 854.9 | 652 |
| 1440 min Summer | 2.751 | 0.0 | 907.1 | 916 |
| 2160 min Summer | 1.967 | 0.0 | 999.0 | 1304 |
| 2880 min Summer | 1.564 | 0.0 | 1057.4 | 1676 |
| 4320 min Summer | 1.155 | 0.0 | 1163.2 | 2380 |
| 5760 min Summer | 0.947 | 0.0 | 1291.9 | 3064 |
| 7200 min Summer | 0.822 | 0.0 | 1399.6 | 3816 |
| 8640 min Summer | 0.738 | 0.0 | 1505.3 | 4504 |
| 10080 min Summer | 0.678 | 0.0 | 1606.8 | 5248 |
| 15 min Winter | 78.073 | 0.0 | 273.9 | 25 |

## Summary of Results for 30 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 30 min Winter | 80.091 | 0.241 | 0.0 | 12.4 | 12.4 | 386.7 | O K |
| 60 min Winter | 80.138 | 0.288 | 0.0 | 12.4 | 12.4 | 464.8 | O K |
| 120 min Winter | 80.204 | 0.354 | 0.0 | 12.4 | 12.4 | 577.1 | O K |
| 180 min Winter | 80.235 | 0.385 | 0.0 | 12.4 | 12.4 | 629.5 | O K |
| 240 min Winter | 80.250 | 0.400 | 0.0 | 12.4 | 12.4 | 656.0 | O K |
| 360 min Winter | 80.259 | 0.409 | 0.0 | 12.4 | 12.4 | 670.9 | O K |
| 480 min Winter | 80.254 | 0.404 | 0.0 | 12.4 | 12.4 | 661.4 | O K |
| 600 min Winter | 80.244 | 0.394 | 0.0 | 12.4 | 12.4 | 644.6 | O K |
| 720 min Winter | 80.235 | 0.385 | 0.0 | 12.4 | 12.4 | 629.0 | O K |
| 960 min Winter | 80.214 | 0.364 | 0.0 | 12.4 | 12.4 | 593.4 | O K |
| 1440 min Winter | 80.169 | 0.319 | 0.0 | 12.4 | 12.4 | 517.0 | O K |
| 2160 min Winter | 80.109 | 0.259 | 0.0 | 12.4 | 12.4 | 416.5 | O K |
| 2880 min Winter | 80.063 | 0.213 | 0.0 | 12.3 | 12.3 | 340.1 | O K |
| 4320 min Winter | 80.013 | 0.163 | 0.0 | 11.5 | 11.5 | 259.0 | O K |
| 5760 min Winter | 79.993 | 0.143 | 0.0 | 9.9 | 9.9 | 225.7 | O K |
| 7200 min Winter | 79.980 | 0.130 | 0.0 | 8.8 | 8.8 | 205.7 | O K |
| 8640 min Winter | 79.972 | 0.122 | 0.0 | 8.0 | 8.0 | 192.4 | O K |
| 10080 min Winter | 79.966 | 0.116 | 0.0 | 7.4 | 7.4 | 182.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 30 min Winter | 50.296 | 0.0 | 360.3 | 39 |
| 60 min Winter | 30.837 | 0.0 | 472.8 | 68 |
| 120 min Winter | 19.785 | 0.0 | 610.8 | 124 |
| 180 min Winter | 14.863 | 0.0 | 689.9 | 182 |
| 240 min Winter | 12.002 | 0.0 | 743.5 | 238 |
| 360 min Winter | 8.745 | 0.0 | 813.3 | 350 |
| 480 min Winter | 6.918 | 0.0 | 857.9 | 454 |
| 600 min Winter | 5.750 | 0.0 | 891.1 | 490 |
| 720 min Winter | 4.935 | 0.0 | 917.5 | 560 |
| 960 min Winter | 3.874 | 0.0 | 959.1 | 710 |
| 1440 min Winter | 2.751 | 0.0 | 1017.8 | 996 |
| 2160 min Winter | 1.967 | 0.0 | 1120.4 | 1392 |
| 2880 min Winter | 1.564 | 0.0 | 1186.2 | 1756 |
| 4320 min Winter | 1.155 | 0.0 | 1306.0 | 2420 |
| 5760 min Winter | 0.947 | 0.0 | 1447.9 | 3120 |
| 7200 min Winter | 0.822 | 0.0 | 1569.0 | 3824 |
| 8640 min Winter | 0.738 | 0.0 | 1687.9 | 4584 |
| 10080 min Winter | 0.678 | 0.0 | 1803.3 | 5256 |

## Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| Return Period (years) | 30 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 564139 246926 TL 64139 46926 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 1.907

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.769 | 4 | 8 | 0.569 | 8 | 12 | 0.569 |

## Model Details

Storage is Online Cover Level (m) 80.850

## Infiltration Basin Structure

Invert Level (m) 79.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 1552.7 | 0.700 | 1859.9 | 1.000 | 2000.0 |

## Hydro-Brake® Optimum Outflow Control

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1240-0700-1240 |
| Design Head (m) | 0.700 |
| Design Flow (l/s) | 12.4 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 79.850 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.700 | 12.4 |
| Flush-Flo™ | 0.262 | 12.4 |
| Kick-Flo® | 0.523 | 10.8 |
| Mean Flow over Head Range | - | 10.2 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 5.9 | 1.200 | 16.0 | 3.000 | 24.8 | 7.000 | 37.3 |
| 0.200 | 12.2 | 1.400 | 17.2 | 3.500 | 26.7 | 7.500 | 38.4 |
| 0.300 | 12.4 | 1.600 | 18.4 | 4.000 | 28.5 | 8.000 | 39.7 |
| 0.400 | 12.0 | 1.800 | 19.4 | 4.500 | 30.1 | 8.500 | 40.9 |
| 0.500 | 11.2 | 2.000 | 20.4 | 5.000 | 31.7 | 9.000 | 42.1 |
| 0.600 | 11.5 | 2.200 | 21.4 | 5.500 | 33.2 | 9.500 | 43.3 |
| 0.800 | 13.2 | 2.400 | 22.3 | 6.000 | 34.6 | | |
| 1.000 | 14.7 | 2.600 | 23.1 | 6.500 | 36.0 | | |

## Summary of Results for 2 year Return Period

Half Drain Time : 295 minutes.

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 15 min Summer | 79.927 | 0.077 | 0.0 | 3.7 | 3.7 | 120.4 | O K |
| 30 min Summer | 79.946 | 0.096 | 0.0 | 5.5 | 5.5 | 150.3 | O K |
| 60 min Summer | 79.963 | 0.113 | 0.0 | 7.2 | 7.2 | 178.4 | O K |
| 120 min Summer | 80.000 | 0.150 | 0.0 | 10.5 | 10.5 | 238.2 | O K |
| 180 min Summer | 80.015 | 0.165 | 0.0 | 11.6 | 11.6 | 262.3 | O K |
| 240 min Summer | 80.023 | 0.173 | 0.0 | 12.0 | 12.0 | 275.3 | O K |
| 360 min Summer | 80.030 | 0.180 | 0.0 | 12.1 | 12.1 | 286.8 | O K |
| 480 min Summer | 80.032 | 0.182 | 0.0 | 12.1 | 12.1 | 289.0 | O K |
| 600 min Summer | 80.030 | 0.180 | 0.0 | 12.1 | 12.1 | 287.1 | O K |
| 720 min Summer | 80.028 | 0.178 | 0.0 | 12.1 | 12.1 | 283.0 | O K |
| 960 min Summer | 80.021 | 0.171 | 0.0 | 12.0 | 12.0 | 272.5 | O K |
| 1440 min Summer | 80.009 | 0.159 | 0.0 | 11.1 | 11.1 | 251.5 | O K |
| 2160 min Summer | 79.994 | 0.144 | 0.0 | 10.0 | 10.0 | 227.2 | O K |
| 2880 min Summer | 79.983 | 0.133 | 0.0 | 9.0 | 9.0 | 210.0 | O K |
| 4320 min Summer | 79.969 | 0.119 | 0.0 | 7.7 | 7.7 | 187.7 | O K |
| 5760 min Summer | 79.960 | 0.110 | 0.0 | 6.9 | 6.9 | 173.4 | O K |
| 7200 min Summer | 79.954 | 0.104 | 0.0 | 6.2 | 6.2 | 163.6 | O K |
| 8640 min Summer | 79.950 | 0.100 | 0.0 | 5.9 | 5.9 | 156.7 | O K |
| 10080 min Summer | 79.946 | 0.096 | 0.0 | 5.5 | 5.5 | 151.4 | O K |
| 15 min Winter | 79.936 | 0.086 | 0.0 | 4.5 | 4.5 | 134.7 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 15 min Summer | 34.396 | 0.0 | 92.5 | 26 |
| 30 min Summer | 21.829 | 0.0 | 123.4 | 40 |
| 60 min Summer | 13.379 | 0.0 | 173.1 | 66 |
| 120 min Summer | 9.625 | 0.0 | 256.0 | 122 |
| 180 min Summer | 7.561 | 0.0 | 304.4 | 162 |
| 240 min Summer | 6.255 | 0.0 | 337.3 | 192 |
| 360 min Summer | 4.672 | 0.0 | 379.6 | 258 |
| 480 min Summer | 3.751 | 0.0 | 407.0 | 328 |
| 600 min Summer | 3.147 | 0.0 | 427.1 | 394 |
| 720 min Summer | 2.720 | 0.0 | 443.0 | 462 |
| 960 min Summer | 2.152 | 0.0 | 466.9 | 594 |
| 1440 min Summer | 1.541 | 0.0 | 498.7 | 852 |
| 2160 min Summer | 1.114 | 0.0 | 560.5 | 1232 |
| 2880 min Summer | 0.893 | 0.0 | 597.8 | 1592 |
| 4320 min Summer | 0.667 | 0.0 | 662.6 | 2336 |
| 5760 min Summer | 0.550 | 0.0 | 747.4 | 3056 |
| 7200 min Summer | 0.480 | 0.0 | 814.1 | 3816 |
| 8640 min Summer | 0.433 | 0.0 | 878.7 | 4504 |
| 10080 min Summer | 0.400 | 0.0 | 939.8 | 5248 |
| 15 min Winter | 34.396 | 0.0 | 106.3 | 26 |

## Summary of Results for 2 year Return Period

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 30 min Winter | 79.957 | 0.107 | 0.0 | 6.5 | 6.5 | 168.2 | O K |
| 60 min Winter | 79.976 | 0.126 | 0.0 | 8.4 | 8.4 | 199.5 | O K |
| 120 min Winter | 80.018 | 0.168 | 0.0 | 11.8 | 11.8 | 267.6 | O K |
| 180 min Winter | 80.037 | 0.187 | 0.0 | 12.2 | 12.2 | 297.2 | O K |
| 240 min Winter | 80.045 | 0.195 | 0.0 | 12.2 | 12.2 | 310.7 | O K |
| 360 min Winter | 80.051 | 0.201 | 0.0 | 12.2 | 12.2 | 320.9 | O K |
| 480 min Winter | 80.050 | 0.200 | 0.0 | 12.2 | 12.2 | 319.6 | O K |
| 600 min Winter | 80.046 | 0.196 | 0.0 | 12.2 | 12.2 | 313.1 | O K |
| 720 min Winter | 80.041 | 0.191 | 0.0 | 12.2 | 12.2 | 304.4 | O K |
| 960 min Winter | 80.029 | 0.179 | 0.0 | 12.1 | 12.1 | 284.8 | O K |
| 1440 min Winter | 80.009 | 0.159 | 0.0 | 11.2 | 11.2 | 252.2 | O K |
| 2160 min Winter | 79.989 | 0.139 | 0.0 | 9.6 | 9.6 | 219.4 | O K |
| 2880 min Winter | 79.975 | 0.125 | 0.0 | 8.3 | 8.3 | 197.8 | O K |
| 4320 min Winter | 79.959 | 0.109 | 0.0 | 6.7 | 6.7 | 171.2 | O K |
| 5760 min Winter | 79.949 | 0.099 | 0.0 | 5.8 | 5.8 | 155.2 | O K |
| 7200 min Winter | 79.942 | 0.092 | 0.0 | 5.1 | 5.1 | 144.7 | O K |
| 8640 min Winter | 79.937 | 0.087 | 0.0 | 4.7 | 4.7 | 137.1 | O K |
| 10080 min Winter | 79.934 | 0.084 | 0.0 | 4.4 | 4.4 | 131.3 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 30 min Winter | 21.829 | 0.0 | 141.1 | 39 |
| 60 min Winter | 13.379 | 0.0 | 195.8 | 66 |
| 120 min Winter | 9.625 | 0.0 | 288.8 | 120 |
| 180 min Winter | 7.561 | 0.0 | 343.0 | 174 |
| 240 min Winter | 6.255 | 0.0 | 379.9 | 220 |
| 360 min Winter | 4.672 | 0.0 | 427.2 | 280 |
| 480 min Winter | 3.751 | 0.0 | 458.0 | 356 |
| 600 min Winter | 3.147 | 0.0 | 480.7 | 430 |
| 720 min Winter | 2.720 | 0.0 | 498.5 | 500 |
| 960 min Winter | 2.152 | 0.0 | 525.5 | 636 |
| 1440 min Winter | 1.541 | 0.0 | 561.6 | 898 |
| 2160 min Winter | 1.114 | 0.0 | 629.2 | 1280 |
| 2880 min Winter | 0.893 | 0.0 | 671.3 | 1648 |
| 4320 min Winter | 0.667 | 0.0 | 744.8 | 2384 |
| 5760 min Winter | 0.550 | 0.0 | 838.1 | 3120 |
| 7200 min Winter | 0.480 | 0.0 | 913.0 | 3824 |
| 8640 min Winter | 0.433 | 0.0 | 985.9 | 4584 |
| 10080 min Winter | 0.400 | 0.0 | 1055.6 | 5264 |

## Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| Return Period (years) | 2 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 564139 246926 TL 64139 46926 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +0 |

## Time Area Diagram

Total Area (ha) 1.907

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.769 | 4 | 8 | 0.569 | 8 | 12 | 0.569 |

## Model Details

Storage is Online Cover Level (m) 80.850

## Infiltration Basin Structure

Invert Level (m) 79.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 1552.7 | 0.700 | 1859.9 | 1.000 | 2000.0 |

## Hydro-Brake® Optimum Outflow Control

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1240-0700-1240 |
| Design Head (m) | 0.700 |
| Design Flow (l/s) | 12.4 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 79.850 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.700 | 12.4 |
| Flush-Flo™ | 0.262 | 12.4 |
| Kick-Flo® | 0.523 | 10.8 |
| Mean Flow over Head Range | - | 10.2 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 5.9 | 1.200 | 16.0 | 3.000 | 24.8 | 7.000 | 37.3 |
| 0.200 | 12.2 | 1.400 | 17.2 | 3.500 | 26.7 | 7.500 | 38.4 |
| 0.300 | 12.4 | 1.600 | 18.4 | 4.000 | 28.5 | 8.000 | 39.7 |
| 0.400 | 12.0 | 1.800 | 19.4 | 4.500 | 30.1 | 8.500 | 40.9 |
| 0.500 | 11.2 | 2.000 | 20.4 | 5.000 | 31.7 | 9.000 | 42.1 |
| 0.600 | 11.5 | 2.200 | 21.4 | 5.500 | 33.2 | 9.500 | 43.3 |
| 0.800 | 13.2 | 2.400 | 22.3 | 6.000 | 34.6 | | |
| 1.000 | 14.7 | 2.600 | 23.1 | 6.500 | 36.0 | | |

## Summary of Results for 100 year Return Period (+20%)

| Storm Event | Max Level (m) | Max Depth (m) | Max Infiltration (l/s) | Max Control (l/s) | Max Σ Outflow (l/s) | Max Volume (m³) | Status |
|---|---|---|---|---|---|---|---|
| 30 min Winter | 80.222 | 0.372 | 0.0 | 12.4 | 12.4 | 607.5 | O K |
| 60 min Winter | 80.299 | 0.449 | 0.0 | 12.4 | 12.4 | 739.5 | O K |
| 120 min Winter | 80.401 | 0.551 | 0.0 | 12.4 | 12.4 | 920.4 | O K |
| 180 min Winter | 80.453 | 0.603 | 0.0 | 12.4 | 12.4 | 1014.7 | O K |
| 240 min Winter | 80.483 | 0.633 | 0.0 | 12.4 | 12.4 | 1069.7 | O K |
| 360 min Winter | 80.511 | 0.661 | 0.0 | 12.4 | 12.4 | 1119.7 | O K |
| 480 min Winter | 80.516 | 0.666 | 0.0 | 12.4 | 12.4 | 1130.1 | O K |
| 600 min Winter | 80.512 | 0.662 | 0.0 | 12.4 | 12.4 | 1122.1 | O K |
| 720 min Winter | 80.502 | 0.652 | 0.0 | 12.4 | 12.4 | 1104.1 | O K |
| 960 min Winter | 80.475 | 0.625 | 0.0 | 12.4 | 12.4 | 1053.9 | O K |
| 1440 min Winter | 80.424 | 0.574 | 0.0 | 12.4 | 12.4 | 962.7 | O K |
| 2160 min Winter | 80.343 | 0.493 | 0.0 | 12.4 | 12.4 | 818.0 | O K |
| 2880 min Winter | 80.268 | 0.418 | 0.0 | 12.4 | 12.4 | 685.7 | O K |
| 4320 min Winter | 80.151 | 0.301 | 0.0 | 12.4 | 12.4 | 486.9 | O K |
| 5760 min Winter | 80.074 | 0.224 | 0.0 | 12.3 | 12.3 | 357.9 | O K |
| 7200 min Winter | 80.029 | 0.179 | 0.0 | 12.1 | 12.1 | 284.8 | O K |
| 8640 min Winter | 80.011 | 0.161 | 0.0 | 11.3 | 11.3 | 255.3 | O K |
| 10080 min Winter | 80.000 | 0.150 | 0.0 | 10.5 | 10.5 | 237.4 | O K |

| Storm Event | Rain (mm/hr) | Flooded Volume (m³) | Discharge Volume (m³) | Time-Peak (mins) |
|---|---|---|---|---|
| 30 min Winter | 78.142 | 0.0 | 571.1 | 40 |
| 60 min Winter | 48.178 | 0.0 | 746.9 | 68 |
| 120 min Winter | 30.604 | 0.0 | 951.3 | 126 |
| 180 min Winter | 22.997 | 0.0 | 1072.6 | 184 |
| 240 min Winter | 18.593 | 0.0 | 1156.0 | 242 |
| 360 min Winter | 13.571 | 0.0 | 1264.3 | 356 |
| 480 min Winter | 10.745 | 0.0 | 1332.8 | 470 |
| 600 min Winter | 8.928 | 0.0 | 1382.0 | 580 |
| 720 min Winter | 7.656 | 0.0 | 1419.7 | 688 |
| 960 min Winter | 5.987 | 0.0 | 1474.0 | 870 |
| 1440 min Winter | 4.219 | 0.0 | 1538.7 | 1096 |
| 2160 min Winter | 2.983 | 0.0 | 1702.8 | 1540 |
| 2880 min Winter | 2.347 | 0.0 | 1785.3 | 1936 |
| 4320 min Winter | 1.703 | 0.0 | 1936.1 | 2684 |
| 5760 min Winter | 1.377 | 0.0 | 2109.5 | 3352 |
| 7200 min Winter | 1.183 | 0.0 | 2264.0 | 3960 |
| 8640 min Winter | 1.055 | 0.0 | 2418.6 | 4592 |
| 10080 min Winter | 0.964 | 0.0 | 2571.3 | 5344 |

## Rainfall Details

| | |
|---|---|
| Rainfall Model | FEH |
| Return Period (years) | 100 |
| FEH Rainfall Version | 2013 |
| Site Location | GB 564139 246926 TL 64139 46926 |
| Data Type | Point |
| Summer Storms | Yes |
| Winter Storms | Yes |
| Cv (Summer) | 0.750 |
| Cv (Winter) | 0.840 |
| Shortest Storm (mins) | 15 |
| Longest Storm (mins) | 10080 |
| Climate Change % | +20 |

## Time Area Diagram

Total Area (ha) 1.907

| Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) | Time (mins) From: | To: | Area (ha) |
|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 0.769 | 4 | 8 | 0.569 | 8 | 12 | 0.569 |

## Model Details

Storage is Online Cover Level (m) 80.850

## Infiltration Basin Structure

Invert Level (m) 79.850 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

| Depth (m) | Area (m²) | Depth (m) | Area (m²) | Depth (m) | Area (m²) |
|---|---|---|---|---|---|
| 0.000 | 1552.7 | 0.700 | 1859.9 | 1.000 | 2000.0 |

## Hydro-Brake® Optimum Outflow Control

| | |
|---|---|
| Unit Reference | MD-SHE-0165-1240-0700-1240 |
| Design Head (m) | 0.700 |
| Design Flow (l/s) | 12.4 |
| Flush-Flo™ | Calculated |
| Objective | Minimise upstream storage |
| Application | Surface |
| Sump Available | Yes |
| Diameter (mm) | 165 |
| Invert Level (m) | 79.850 |
| Minimum Outlet Pipe Diameter (mm) | 225 |
| Suggested Manhole Diameter (mm) | 1200 |

| Control Points | Head (m) | Flow (l/s) |
|---|---|---|
| Design Point (Calculated) | 0.700 | 12.4 |
| Flush-Flo™ | 0.262 | 12.4 |
| Kick-Flo® | 0.523 | 10.8 |
| Mean Flow over Head Range | - | 10.2 |

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) |
|---|---|---|---|---|---|---|---|
| 0.100 | 5.9 | 1.200 | 16.0 | 3.000 | 24.8 | 7.000 | 37.3 |
| 0.200 | 12.2 | 1.400 | 17.2 | 3.500 | 26.7 | 7.500 | 38.4 |
| 0.300 | 12.4 | 1.600 | 18.4 | 4.000 | 28.5 | 8.000 | 39.7 |
| 0.400 | 12.0 | 1.800 | 19.4 | 4.500 | 30.1 | 8.500 | 40.9 |
| 0.500 | 11.2 | 2.000 | 20.4 | 5.000 | 31.7 | 9.000 | 42.1 |
| 0.600 | 11.5 | 2.200 | 21.4 | 5.500 | 33.2 | 9.500 | 43.3 |
| 0.800 | 13.2 | 2.400 | 22.3 | 6.000 | 34.6 | | |
| 1.000 | 14.7 | 2.600 | 23.1 | 6.500 | 36.0 | | |

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