RSK IRELAND

GREENHILLS RENEWABLE ENERGY PARK CO. CORK

DRAINAGE PLAN

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GREENHILLS RENEWABLE ENERGY PARK

DRAINAGE PLAN

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GREENHILLS RENEWABLE ENERGY PARK

DRAINAGE PLAN

1 INTRODUCTION

This Drainage Plan sets out the design parameters and the approach to the management of surface water associated with the Proposed Development.

The plan considers the following phases of the development:

- Permanent (Operational)
- Construction
- Decommissioning

The primary concern during the construction stage will be the management of water pumped from excavations (foundations and cable trenches) as well as pollution prevention due to the potential for reduced quality runoff.

Accordingly, construction stage measures will augment the permanent drainage measures.

2 PERMANENT (OPERATIONAL) SURFACE WATER DRAINAGE

2.1 Design Standards

Section 11.10 of Volume 1 – Main Policy Material of the Cork County Development Plan 2022 – 2028 prescribes a SUDs approach for new development. Section 11.10.2 states:

"The objective of SuDs in new developments is to replicate, as closely as possible, the surface water drainage regime of the predevelopment 'greenfield' situation. Therefore, the extent of impermeable surfaces such as road surfaces, parking areas, driveways, patios, etc., should be minimised by careful attention to site layout and the specification of porous surfacing materials where practicable. The management of storm water drainage should emphasise retention and infiltration at source, which reduces runoff volumes and slows the rates of runoff as well as providing partial treatment and promoting groundwater recharge. The latter requirement reduces the pollution threat to watercourses and groundwater".

Guidance documents are listed in 11.10.4 of Volume 1 – Main Policy Material of the Cork County Development Plan 2022 – 2028 including:

- Greater Dublin Strategic Drainage Study – Volume 2 (GDSDS).
- The SuDS Manual, CIRIA Report C753.
- Sustainable Drainage Design and Evaluation Guide 2021, Dublin City Council
- Sustainable Drainage Explanatory Design and Evaluation Guide 2022, South Dublin County Council.
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas – Water Sensitive Urban Design Best Practice Interim Guidance Document, Department of Housing, Local Government and Heritage, November 2021.

Sections 11.10.9 to 11.10.11 require that riparian zones are protected with Objective WM11(a) as follows:

"Ensure adequate protection measures along watercourses, keeping them free from development by ensuring development is kept 10m or other appropriate distance from stream and river banks is in line with best practice for riparian corridors. Development altering the hydromorphology of a watercourse will not normally be permitted, where it may result in the deterioration in the status of a water body through for example, impacts on water quality, quantity or flow rate, riparian habitat or protected species".

2.2 Design Approach

2.2.1 Approach

The Proposed Development has the potential to cause an increase in the peak rate and volume of run-off from the site without mitigation. Permanent surface water drainage design therefore adopts SuDS principles and ensures that runoff from new impermeable or semi-impermeable surfaces (tracks and ancillary infrastructure) shall be reduced to the pre-development greenfield rate. The design principles adopted in the Drainage Plan are as follows:

- The drainage system will cater protection for up to a 1% AEP (1 in 100 year) rainfall event including allowance for climate change, common to the standard of protection for flooding from surface water drainage afforded by GDSDS as best practice.
- Runoff from access tracks shall be collected via open swales or french drains. Run-off within swales shall be attenuated with the use of check dams in order to reduce the peak rate of run-off and to encourage infiltration of surface water.
- Attenuation basins, silt ponds with buffered outfalls (level spreaders) will have a beneficial effect to water quality during the construction and operational phase.

These will be provided for areas of hardstands to avoid discharge directly to streams and watercourses.

- The riparian zones will be protected by development setback in excess of 20m for mapped surface water features i.e. EPA mapped streams and rivers and in excess of 10m from existing drainage non-mapped features.
- Cut-off swales will be installed between new infrastructure and existing watercourses.

The proposed layout is such as to use existing tracks in so far as is possible and the Proposed Development includes 7,115m of existing tracks and 5,135m of new access tracks. While there are two existing watercourse crossings, no new watercourse crossings are proposed.

Subject to appropriate design specifications, the installation of solar PV arrays will not give rise to increased surface water runoff (volumes or rates) in an agricultural setting. This position is supported by both academic and industry testing of pre and post-panelled ground conditions. A 2013 paper on the hydrologic response of solar farms (reference Lauren M. Cook and Richard H. McCuen[1]) published in the Journal of Hydrologic Engineering (Volume 18, Issue 5) confirmed that "*solar parks themselves did not have a significant effect on runoff volumes, peaks or times to peak*". This research advocates the establishment of well-maintained grass underneath erected panels promoting kinetic friction and the avoidance of bare-ground in adjacent spacer sections (areas between array rows).

Having regard to the above, three distinct design aspects have been incorporated into the solar array layouts to mitigate against surface water issues. Separation distances have been incorporated between the array rows to avoid blanket coverage of the site and the maintenance of normal ground conditions. In addition, substantial buffer strips are established in a number of areas. The PV panels will sit on angled frames/racks comprised of galvanised steel arranged in portrait or landscape configuration depending on the final system deployed. The panels will be positioned on the rack at a minimum height of 0.7m above the ground and rise to maximum height of up to 3.4m. The panels will be positioned at a tilt angle between 10-25 degrees from the horizontal having regard to natural site topographical and orientation conditions to ensure the best solar absorption. The pitch (distance between the back

[1] https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29HE.1943-5584.0000530

of one table to the back of the adjacent table in the next row) between the tables will range from 6.5m to 14m. This provides two-fold benefits, reducing/mitigating against any concentrated rainwater runoff from the panels (compared with more pronounced angles sited closer to the ground surface) and the creation of natural conditions which allow grass beneath panels to flourish and be maintained. The maintenance of grass underneath the panels is a critical component of scheme design as it preserves peak water runoff rates at optimal natural levels. Part of the drainage strategy for the site will also include routine inspection and maintenance of all site drains.

Proposed surface water drainage (SuDS) layout and typical detail drawings are set out on the following Drawing Numbers submitted with the planning application:

- 7353-PL-DR-100 Site Layout Key Plan 1:5,000
- 7353-PL-DR-101 Site Layout Plan - Sheet 1 of 14
- 7353-PL-DR-102 Site Layout Plan - Sheet 2 of 14
- 7353-PL-DR-103 Site Layout Plan - Sheet 3 of 14
- 7353-PL-DR-104 Site Layout Plan - Sheet 4 of 14
- 7353-PL-DR-105 Site Layout Plan - Sheet 5 of 14
- 7353-PL-DR-106 Site Layout Plan - Sheet 6 of 14
- 7353-PL-DR-107 Site Layout Plan - Sheet 7 of 14
- 7353-PL-DR-108 Site Layout Plan - Sheet 8 of 14
- 7353-PL-DR-109 Site Layout Plan - Sheet 9 of 14
- 7353-PL-DR-110 Site Layout Plan - Sheet 10 of 14
- 7353-PL-DR-111 Site Layout Plan - Sheet 11 of 14
- 7353-PL-DR-112 Site Layout Plan - Sheet 12 of 14
- 7353-PL-DR-113 Site Layout Plan - Sheet 13 of 14
- 7353-PL-DR-114 Site Layout Plan - Sheet 14 of 14
- 7353-PL-810 Proposed Site Access Track, Silt Fence, Swale and Buffered Outfall
- 7353-PL-811 Proposed Silt Ponds Details

2.2.2 Greenfield Run-Off Rate for the Site

2.2.2.1 Calculation Method

The Greenfield Run-Off Rate is estimated using the hr Wallingford UK SUDS tool[2] and the IH124 method.

2.2.2.2 Location

Table 2.1 summaries the site location parameters:

Table 2.1: Summary of the Proposed Development location

Name	Greenhills Renewable Energy Park
Address	Greenhills Renewable Energy Park, Co. Cork
Centre point	E 603434.73, N 581729.18 (ITM)

The total land area of the Proposed Development is approximately 323.28 hectares and is characterised by relatively flat topography with associated elevations ranging between 23 and 166mAOD and slopes ranging from between 0.5 and 20° with an average slope of 4°.

Land Cover maps (EPA, Corine (2018[3]) indicates that the land use at the Proposed Development is agricultural, with much of the area classified as pastures.

2.2.2.3 Site Hydrology

The Proposed Development is situated within the Blackwater (Munster) Catchment (ID: 18, Area: c. 3307.64 km^2). Surface water runoff associated with the Site drains into Tourig_SC_010 sub catchment and the Tourig_020, Glendine (Blackwater)_010 and Tourig_010 River sub basins. Surface waters drain from the Proposed Development via the historical drains into the Tourig and the Glendine Rivers before combining in the Youghal Harbour, which eventually flows to the Celtic Sea.

In terms of local drainage and non-mapped surface water features, the Proposed Development is characterised by artificial drainage networks including agricultural and land reclamation / improvement works.

[2] UKsuds.com/tools/greenfield-runoff-rate-estimation

[3] CORINE Land Cover (2018). Online: https://land.copernicus.eu/pan-european/corine-land-cover/clc2018 [Accessed: July 2025]

2.2.2.4 Rainfall

The SAAR (Standard Average Annual Rainfall) represents the mean annual rainfall for a specific location over a 30-year period.

From Met Eireann Website[4], the 1991 – 2020 rainfall grid for Irish grid 203000 82000 is 1,243.8mm.

2.2.2.5 Site Soil and Subsoil

Consultation with the available National Soil Map (EPA map viewer[5]) indicates that most of the site is underlain by Acid Deep Well Drained Mineral (AminDW).

Consultation with the available subsoil maps (EPA map viewer) indicates that most of the Proposed Development site is underlain by sandstone till (TDSs). There are minor pockets of bedrock at or close to surface and Alluvium.

The subsoil permeability across the windfarm site is moderate or not mapped.

Site Investigations for the substation part of the site carried out by TLI Group (Report Reference: 300101185-CS-R-02-00, August 2025), see **Appendix C** of the **Planning and Environmental Report**, indicates the general soil profile is topsoil (0.3m) overlying firm brown clay with high cobble content overlying stiff brown clay with high cobble and low boulder content. In-situ tests indicate permeability values of 1.677 x 10^{-5}m/s (subsurface) and 1.098 x 10^{-5}m/s (surface). These observations are consistent with a WRAP (Winter Rainfall Acceptance Potential) soil type 2 with a standard percentage runoff (SPR) value of 0.30.

2.2.2.6 Greenfield Run-Off Rates

Using the hr Wallingford tool, the Greenfield run-off rates were computed (see Appendix A) as follows:

Flow Rate 1 Year (l/s)	809.4
Flow Rate100 Year (l/s)	1,856.9

[4] Met.ie/climate/30-yearaverages
[5] Environmental Protection Agency (EPA) (ND) EPA Map Viewer [Online], Layer SIS National Soils – Available at:

Dividing by the site area of 323.28ha, gives a 1-Year runoff rate of 2.468 l/s/ha and a 100-Year runoff rate of 5.661 l/s/ha.

2.3 Sub-Catchments

Figure 11.14 of the La**nd, Soils, Geology, Hydrology And Hydrogeology Impact Assessment** (**Appendix N** to the **Planning and Environmental Report**) identifies 7 No. drainage micro catchments based on a Digital Elevation Model (DEM) for the site.

The following Table 2.2 summarises the characteristics of each.

Table 2.2: Micro-Catchment Descriptions

Micro Catchment Ref.	Location Relative to Watercourses
1	North and south of 18_1161 and 18_1162; east and west of 18_21 Ballyneague; east and west of 18_1160 Carriganass; west of 18_1172 Knocknagappagh; Main watercourse flow south-westwards; Ground slopes towards south-westwards north of 18_1161 and 18_1162 watercourses and westwards south of these watercourses. Carriganass 18_1160 flows southwards with land east of watercourse sloping to south-west and land west of watercourses sloping southwards.
2	Located adjacent and to the south-east of micro-catchment 1. Secondary watercourse flows southwards. Ground at northern part slopes to south while for the southern part, ground slopes to north.
3	North of Tourig River 18_1166 which flows eastwards and west of 18_1159 which flows southwards. Land slopes to south.
4	Located south of Micro Catchment 1 with secondary watercourses generally flowing southwards. Land slopes generally to south-west for northern part and to south for southern part.
5	Located north of River Tourig 18_1168 and west of secondary watercourses. Land slopes southwards.

Micro Catchment Ref.	Location Relative to Watercourses
6	Located immediately to the east of River Tourig 18_1170. Land at northern part slopes westwards while southern part slopes southwards.
7	Located to the north-east of Micro Catchments 1 and 2 and bounded to the north-west by the R634 road. Land slopes towards the south-east.

2.4 Linear Track Drainage – Swales and Check Dams

Where linear track drains are specified on the drainage drawings 7353-PL-DR-101 to 7353-PL-DR-114, it is proposed that stone filled check dams will be installed at a regular frequency, in order to reduce flow velocities and improve conditions for the settlement of solids in transit. Check dams will be constructed from 5-40mm crushed rock. It is intended that these dams will be relatively simple to construct but will provide treatment of construction runoff at source. There will be outflow points (spillways) from the drains to the settlement ponds. No outflow will be permitted directly into natural watercourses.

The roads within the Proposed Development will be constructed with an appropriate surface cross slope, so that all storm water flow will be directed towards the constructed swales located along road verges or to french drains/soakaways. The width and depth of constructed swales will be minimised as far as practical in order to reduce ground disturbance, excavation footprint (and hence volume of excavated materials) and also disruption of local hydrology as far as possible.

Permanent check dams (flow barriers or dams constructed across the drainage channel) will be installed at regular intervals within the swales in order to reduce erosion and allow for greater flow control. These check dams are required in order to reduce the velocity of water and therefore allow settlement of coarser sediment particles as well as silt at low flow conditions. Reduction in flow velocity will also prevent scouring of the drainage channel itself.

Settlement build up will be monitored and cleaned during the construction stage when necessary. The number and location of check dams will be dependent on the slope, flow and volume of water, although the following general rules will be applied:

- The maximum spacing between check dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- The centre of the check dam should be at least 0.2m lower than the outside edges.
- Side slopes should be 1:2 or less.
- A Terram membrane barrier or similar non-woven geotextile membrane will be placed around check dam.
- Check dams will be keyed at least 0.1m into the drainage channel bottom in order to prevent the dam washing out.
- Check dams will be maintained and monitored on a regular basis. Sediment will be removed before it reaches one half the original dam height.

Worked examples:

- The depth of a check dam is 0.3 m high: => 0.3 m x (1 in 100 gradient) = 30 m spacing;
  => also; 0.3 m x (1 in 50 gradient) = 15 m spacing
- For a 0.5 m high check dam: => 0.5 m x (1 in 50 gradient) = 25 m spacing.

See **Table 2.3** for recommended spacing, relative to the gradient of swale, for a 0.3m high check dam.

Table 2.3: Check Dam Spacing for typical 0.3m high check dam

Max Spacing (m)	Gradient
3m	10% (1 in 10)
4m	8% (1 in 12)
5m	6% (1 in 17)
6m	5% (1 in 20)
8m	4% (1 in 25)
10m	3% (1 in 33)
15m	2% (1 in 50)
20m	1.5% (1 in 67)
30m	1% (1 in 100)

Note: Table 2.3 spacing only applies to check dams with a 0.3m height. The spacing between check dam increases as the check dam height increases.

2.5 Silt Pond / Attenuation Requirements

Drainage Swales will be provided between the Proposed Development and watercourses. Drainage from site roads, compounds, inverter stations and other hardstand areas will be collected by these drainage swales and attenuated to greenfield equivalent in three-compartment silt ponds (which are also designed for attenuation) and dispersed overland via a "*level spreader*" or buffered outfalls where the outflow will mimic existing natural overland sheet flow.

Settlement ponds are to be securely fenced to prevent easy access. The ponds are utilised to attenuate and to aid the removal of suspended solids from site runoff water. Settlement ponds will be emplaced at 46 locations along the drainage footprint.

Flows controls shall be installed at the silt pond outflow points to ensure that flows are discharged at a limited rate up to the 1% AEP Climate Change event.

The storage calculation has not included the storage provided within the drainage conveyance system i.e. by check dams in swales. The attenuation sizes required are therefore considered as being conservative.

Calculation parameters for the determination of storage requirements have been undertaken and are as follows:

- A 1 in 100-year rainfall return design (Source: Met Éireann – Please refer to Appendix B).
- An initial outlet overflow rate is applied of 5.6 l/s/ha (litres per second) which approximates to Greenfield run-off rates for the site. (Source: HR Wallingford – Please refer to Appendix A).
- The rational method is subsequently applied to calculate the flow volumes into each settlement pond over these respective periods. The Rational Method is expressed by the formula, where V is the volume of water generated in the settlement pond, C is the run-off co-efficient, A is the area of the hardstanding / catchment, I is the rainfall depth and t is the duration of rainfall occurrence.
- A runoff coefficient of 0.72 (60% runoff from unpaved/crushed stone surfaces + 20% for Climate Change) is conservatively applied to all access track areas.
- Where no formal track is proposed alongside a swale, a zone of 5m wide is assumed to be semi-compacted as it may have been used for transporting frames, solar panels etc.

- For attenuation, a 1 in 100-year rainfall, 12-hour return period is used.
- For silt settlement, velocities for the 30-minutes duration rainfall are checked such that they are lower than 0.3m/s.

Proposed surface water drainage (SuDS) layout and typical detail drawings are included in Appendix A. Calculations on individual pond sizes are included in Appendix C. A summary of attenuation requirements is included on the following Table 2.4.

Seven typical settlement/attenuation ponds are detailed on Drawings 7353-PL-811. These are denoted Type A, B, C, D, E, F and G.

Allowing an average water depth of 1.0m to account for side slopes, the following are the volumes of each pond.

Type A 18.75m^3
Type B 25m^3
Type C 31.25m^3
Type D 50m^3
Type E 64m^3
Type F 72m^3
Type G 92.5m^3

Drawings 7353-PL-DR-101 to 7353-PL-DR-114 show the locations of each of the 46 ponds and the types of ponds (e.g. Type A to Type G) at each location.

Table 2.4: Summary of Silt Pond / Attenuation Basin Details

Micro-Catchment No.	Silt Pond Reference	Description of Contributory Elements	Run-Off Area (m^3)	Volume Required for Attenuation (m^3)	Pond Type Proposal
1	SP 1.1	200m long x 5m wide semi-compacted area	1,000	38.5	D
	SP 1.2	100m long x 5m wide semi-compacted area	500	19.2	B
	SP 1.3	200m long x 5m wide access track	1,000	38.5	D
	SP 1.3A	260m long x wide track	1,300	50.0	D
	SP 1.4	195m long x 5m wide semi-compacted area	975	37.5	D
	SP 1.5	160m long x 5m wide semi-compacted area	800	30.8	C
	SP 1.6	145m long x 5m wide semi-compacted area	725	27.9	C
	SP 1.7	160m long x 5m wide semi-compacted area	800	30.8	C
	SP 1.8	350m long x 5m wide semi-compacted area	1,750	67.4	F
	SP 1.9	190m long x 5m wide semi-compacted area plus 290m x 5m wide track	2,400	92.4	G

Micro-Catchment No.	Silt Pond Reference	Description of Contributory Elements	Run-Off Area (m^3)	Volume Required for Attenuation (m^3)	Pond Type Proposal
	SP 1.10	165m long x 5m wide semi-compacted area	825	31.8	D
	SP 1.11	185m long x 5m wide semi-compacted area	925	35.6	D
	SP 1.12	75m long x 5m wide semi-compacted area	375	14.4	A
	SP 1.13	195m long x 5m wide semi-compacted area	975	37.5	D
	SP 1.14	110m long x 5m wide semi-compacted area	550	21.2	B
	SP 1.15	160m long x 5m wide semi-compacted area	800	30.8	C
2	SP 2.1	200m long x 5m wide semi-compacted area	1,000	38.5	D
	SP 2.2	160m long x 5m wide semi-compacted area	800	30.8	C
	SP 2.3	240m long x 5m wide semi-compacted area	1,200	46.2	D
	SP 2.4	120m long x 5m wide semi-compacted area	600	23.1	B

Micro-Catchment No.	Silt Pond Reference	Description of Contributory Elements	Run-Off Area (m^3)	Volume Required for Attenuation (m^3)	Pond Type Proposal
	SP 2.5	150m long x 5m wide semi-compacted area	750	28.9	C
3	SP 3.1	100m long x 5m wide semi-compacted area	500	19.2	B
	SP 3.2	180m long x 5m wide track plus 160m long x 5m wide semi-compacted area	1,700	65.4	F
	SP 3.3	190m long x 5m wide semi-compacted area	950	36.6	D
	SP 3.4	135m long x 5m wide semi-compacted zone	675	26.0	C
	SP 3.5	320m long x 5m wide track	1,600	61.6	E
4	SP 4.1	150m long x 5m wide semi-compacted area	750	28.9	C
	SP 4.2	150m long x 5m wide semi-compacted area	750	28.9	C
	SP 4.3	130m long x 5m wide track plus 190m long x 5m wide semi-compacted area	1,600	61.6	E
5	SP 5.1	320m long x 5m wide semi-compacted area	1,600	61.6	E

Micro-Catchment No.	Silt Pond Reference	Description of Contributory Elements	Run-Off Area (m^3)	Volume Required for Attenuation (m^3)	Pond Type Proposal
	SP 5.2	175m long x 5m wide track	875	33.7	D
	SP 5.3	165m long x 5m wide semi-compacted area	825	31.8	D
	SP 5.4	125m long x 5m wide semi-compacted area	625	24.0	B
	SP 5.5	120m long x 5m wide semi-compacted area	600	23.1	B
	SP 5.6	100m long x 5m wide track plus 100m long x 5m wide semi-compacted area	1,000	38.5	D
6	SP 6.1	365m long x 5m wide track	1,825	70.3	F
	SP 6.2	80m long x 5m wide track plus 60m long x 5m wide semi-compacted area adjacent to swale	700	26.9	C
	SP 6.3	140m long x 5m wide semi-compacted area adjacent to swale	700	26.9	C
	SP 6.4	100m long x 5m wide semi-compacted area adjacent to swale	500	19.2	B
	SP 6.5	160m long x 5m wide track	800	30.8	C

Micro-Catchment No.	Silt Pond Reference	Description of Contributory Elements	Run-Off Area (m^3)	Volume Required for Attenuation (m^3)	Pond Type Proposal
	SP 6.6	130m long x 5m wide track	650	25.0	B
	SP 6.7	125m long x 5m wide track	625	24.1	B
	SP 6.8	120m long x 5m wide semi-compacted area	600	23.1	B
	SP 6.9	160m long x 5m wide semi-compacted area	800	30.8	C
	SP 6.10	145m long x 5m wide semi-compacted area	725	27.9	C
7	SP 7.1	200m long x 5m wide access track plus 45m long x 5m wide semi-compacted area	1,225	47.2	D

2.6 French Drains and Soakaways

French drains comprising 0.4m wide trenches up to 900mm deep will be filled with 32mm single sized crushed stone. These will be provided along edges of new tracks where no swales are proposed and also within localised hollows where surface water would otherwise accumulate and will connect such hollows to the road drainage.

Soakaways will be provided at the following locations:

- Site entrances
- Substation
- Inverter/transformer stations

At site entrances, the soakaway will comprise 1.8m diameter perforated precast concrete manhole rings to at least 1.2m deep filled with single 32mm sized crushed stone.

During operation, the Proposed Development will have oil/fuels stored on site in the form of two no. bunded diesel tank and generator located within the Battery Energy Storage Systems (BESS) facility and the Substation and will be drained via a comprehensive SuDS Management Train, with accompanying soakaway and interceptor required. Transformers will be bunded.

At the substation, see Section 3.2 of TLI Group (Report Reference: 300101185-CS-R-02-00, August 2025) **Appendix C** of the **Planning and Environmental Report**, a soakaway of 5m x 5m x 1.8m is proposed.

For the inverter (transformer/hardstand areas, a soakaway trench 0.6m wide x 8.0m long, 1.2m deep and filled with 32mm single sized crushed stone is proposed at the end of each unit (see Drawing 7353-PL-506).

2.7 Maintenance and Monitoring

Surface water runoff control infrastructure will be checked and maintained on a regular basis and settlement ponds and check dams will be maintained (desludged/settle solids removed) on a regular basis, particularly during the construction phase of the Proposed Development by using a vactor (suction tanker) and disposing of the contents at a licenced facility. It is important to minimise the agitation of solids during these works, otherwise it will likely lead to an acute significant loading of suspended solids in the drainage network.

Site water runoff quality will be monitored during the decommissioning, construction, and operational phases of the Proposed Development. A relatively high frequency of monitoring (e.g. daily) is required during the decommissioning and construction phase. Similarly, the early stages of the operational phase will require a relatively high frequency of monitoring, however the frequency of monitoring can gradually reduce thereafter – presuming there are no issues with the quality of discharging water at that point in time.

It is recommended that a handheld turbidity meter is available to accurately measure the quality of water discharging from the site. The meter should be maintained and calibrated frequently. It is recommended that quality thresholds are established for the purposes of escalating water quality issues as/if they arise.

2.8 Post Construction Drainage Management

Following the completion of construction, a full review of construction stage temporary drainage will be undertaken by the appointed contractor (in conjunction with the Project hydrologist/Site Engineer and the Project ECoW), with a view to checking the effectiveness of drainage infrastructure and to enhance if necessary for the Operational Phase.

3 ADDITIONAL CONSTRUCTION SITE DRAINAGE REQUIREMENTS

3.1 Temporary Site Compounds

Five temporary compounds are proposed comprising one main component of c. 5,200m^2 near the substation (see Drawing 7353-PL-805 for layout) and four others each of c.2,000m^2 (see Drawing 7353-PL-808 for layout).

Each compound will be finished in either 75mm single sized crushed stone or in temporary composite matting (topsoil temporarily removed in advance). In this way water can percolate to sub-soil without the need for additional drainage. As construction nears completion, the stone/mitting will be removed and the topsoil reinstated prior to the provision of solar panels at each of the three smaller compounds. A bunded refuelling (impervious concrete) area and a bunded service area will be provided at the main compound. Gullies draining from the bunded area will pass through a class 1 bypass interceptor before discharging from the compound.

3.2 Cable Trenching

Trenches will be opened for periods of up to several weeks depending on location and numbers of electrical circuits. When rainwater accumulates in the trenches, it should be removed by pumping to a Siltbuster unit so as to provide treatment of water prior to discharge to a nearby swale or silt pond.

3.3 Site-Wide Requirements and Silt Fencing

Temporary pollution prevention measures and temporary or permanent drainage and surface water management features (SuDS) will be constructed prior to earthworks (including preliminary or enabling works including felling) proceeding to construct any linear works (tracks / hardstanding areas / cable routes), and other infrastructure. Drainage will be provided to temporary works and reinstated to suit the final footprint of the completed development.

Temporary drainage measures in advance of earthworks will include:

- Temporary silt fences erected in areas where risk of pollution to watercourses has been identified e.g., watercourse crossing locations and areas where development (such as felling) unavoidably lie within watercourse buffer zones.
- Upslope cut-off drainage channels approximately parallel to the proposed track alignment installed in advance of any excavated cuttings for the track. This will prevent washout by surface flows of exposed clays in excavations and fine sediments in track makeup, and increase efficiency of silt removal in future trackside drainage swales;
- Minor drains, other flow paths and cut-off drain outlet locations will be identified and charted, to ensure that piped crossings can be installed in advance of or adjacent to the track construction;
- Trackside drainage swales and silt/attenuation ponds will be installed in parallel with track construction. Note that this may require that drainage swales are reformed on an ongoing basis as temporary track alignments are modified to their eventual finished design level.

In addition, spoil management is to be planned in advance of earthworks and on an ongoing basis, to allow planning of drainage required in advance of spoil being deposited.

Suitable prevention measures will always be in place to prevent the conveyance of silts to receiving watercourses.

APPENDIX A

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

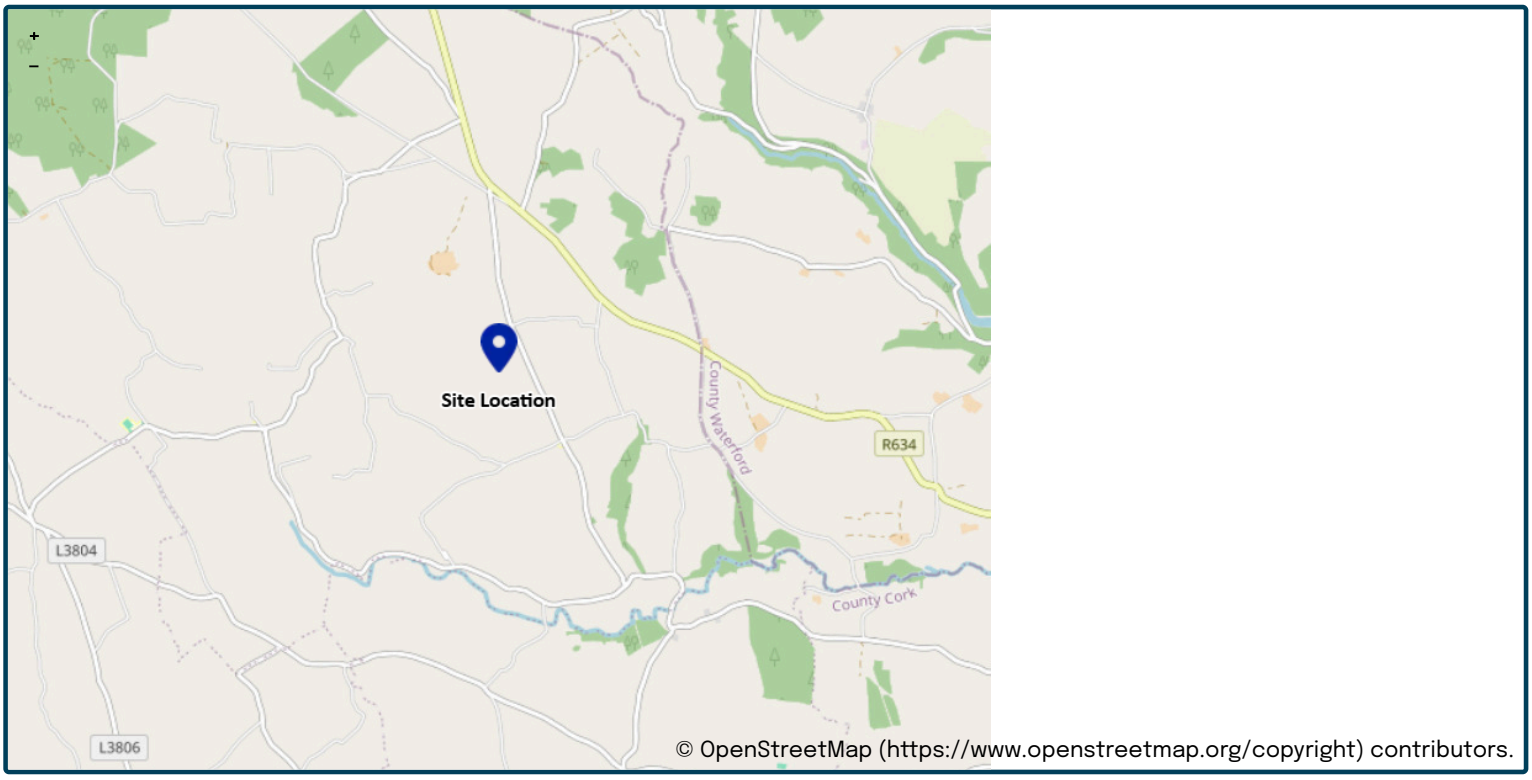
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	16/10/2025
Calculated by	David Kiely
Reference	Greenhills Solar
Model version	2.2.1

Location

Site name	Greenhills
Site location	Co. Cork



Site easting (Irish Grid)	203533
Site northing (Irish Grid)	81750
Site easting (Irish Transverse Mercator)	603483
Site northing (Irish Transverse Mercator)	581810

Site details

Total site area (ha)	328 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1243.8 mm		1149
How should SPR be derived?	WRAP soil type		
WRAP soil type	2		2
SPR	0.3		
QBar (IH124) (l/s)	952.3 l/s		

Growth curve factors

	My value		Map value
Hydrological region	13		13
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.4		
30 year growth factor	1.65		
100 year growth factor	1.95		
200 year growth factor	2.15		

Results

Method	IH124
Flow rate 1 year (l/s)	809.4 l/s
Flow rate 2 year (l/s)	904.3 l/s
Flow rate 10 years (l/s)	1333.2 l/s
Flow rate 30 years (l/s)	1571.3 l/s
Flow rate 100 years (l/s)	1856.9 l/s
Flow rate 200 years (l/s)	2047.4 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

APPENDIX B

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 203510, Northing: 81703,

	Interval		Years									
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	120,
5 mins	2.9,	3.8,	4.2,	4.8,	5.2,	5.5,	6.4,	7.5,	8.1,	9.0,	9.7,	10.3,	10.7,
10 mins	4.1,	5.3,	5.8,	6.7,	7.2,	7.7,	9.0,	10.4,	11.3,	12.5,	13.5,	14.3,	14.9,
15 mins	4.8,	6.2,	6.9,	7.9,	8.5,	9.0,	10.6,	12.2,	13.3,	14.7,	15.9,	16.9,	17.5,
30 mins	6.5,	8.3,	9.2,	10.6,	11.4,	12.1,	14.2,	16.4,	17.8,	19.7,	21.4,	22.6,	23.5,
1 hours	8.7,	11.2,	12.4,	14.2,	15.4,	16.3,	19.0,	22.0,	23.9,	26.5,	28.7,	30.3,	31.5,
2 hours	11.7,	15.0,	16.7,	19.1,	20.7,	21.9,	25.6,	29.6,	32.1,	35.5,	38.5,	40.7,	42.2,
3 hours	13.9,	17.9,	19.9,	22.7,	24.6,	26.0,	30.4,	35.1,	38.1,	42.2,	45.7,	48.3,	50.1,
4 hours	15.8,	20.2,	22.5,	25.7,	27.8,	29.4,	34.3,	39.7,	43.1,	47.7,	51.6,	54.6,	56.6,
6 hours	18.7,	24.0,	26.7,	30.5,	33.0,	34.9,	40.8,	47.2,	51.2,	56.6,	61.3,	64.8,	67.2,
9 hours	22.3,	28.6,	31.8,	36.3,	39.2,	41.5,	48.5,	56.0,	60.8,	67.2,	72.8,	77.0,	79.8,
12 hours	25.2,	32.3,	35.9,	41.0,	44.4,	46.9,	54.8,	63.3,	68.7,	76.0,	82.3,	87.0,	90.1,
18 hours	30.0,	38.5,	42.7,	48.8,	52.8,	55.8,	65.2,	75.2,	81.6,	90.3,	97.7,	103.3,	107.0,
24 hours	34.0,	43.5,	48.3,	55.2,	59.6,	63.0,	73.6,	85.0,	92.2,	102.0,	110.4,	116.7,	120.9,
2 days	45.0,	56.2,	61.7,	69.5,	74.6,	78.4,	90.1,	102.5,	110.3,	120.7,	129.6,	136.3,	140.7,
3 days	54.0,	66.4,	72.5,	81.1,	86.5,	90.7,	103.3,	116.5,	124.7,	135.7,	145.0,	152.0,	156.6,
4 days	61.9,	75.4,	82.0,	91.1,	97.0,	101.3,	114.7,	128.6,	137.2,	148.7,	158.3,	165.5,	170.3,
6 days	76.0,	91.2,	98.6,	108.7,	115.1,	119.9,	134.5,	149.5,	158.7,	171.0,	181.2,	188.8,	193.8,
8 days	88.7,	105.3,	113.2,	124.2,	131.1,	136.2,	151.8,	167.7,	177.4,	190.3,	201.1,	209.0,	214.2,
10 days	100.4,	118.2,	126.7,	138.4,	145.7,	151.1,	167.5,	184.2,	194.4,	207.8,	219.0,	227.2,	232.6,
12 days	111.4,	130.3,	139.3,	151.6,	159.3,	164.9,	182.1,	199.5,	210.0,	223.9,	235.5,	244.0,	249.5,
16 days	132.0,	152.9,	162.6,	176.0,	184.3,	190.5,	208.9,	227.4,	238.6,	253.3,	265.5,	274.4,	280.3,
20 days	151.3,	173.8,	184.3,	198.5,	207.4,	213.9,	233.4,	252.9,	264.7,	280.1,	292.8,	302.1,	308.1,
25 days	174.1,	198.4,	209.6,	224.9,	234.3,	241.2,	261.9,	282.5,	294.8,	310.9,	324.2,	333.9,	340.1,

NOTES:
These values are derived from a Depth Duration Frequency (DDF) Model update 2023
For details refer to:
'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',
Available for download at:
http://hdl.handle.net/2262/102417

APPENDIX C

Greenhills Solar Farm - SuDS Drainage Design

Ref	A (m^2)	M10 30 min Flowrate (m3/s)	Residual Volume (Reqd for Attenuation) (m3)	Width (m)	Water Depth (m)	Velocity for Settlement (<0.3) (m/s)	Required Length for Attenuation (m)	Optimised Length (m)	Pond Type
SP1.1	1000	0.009	38.4981	4.0	1.00	0.002261808	9.6	12.5	Type D
SP1.2	500	0.005	19.2491	2.5	1.00	0.001809446	7.7	10.0	Type B
SP1.3	1000	0.009	38.4981	4.0	1.00	0.002261808	9.6	12.5	Type D
SP1.3A	1300	0.012	50.0475	4.0	1.00	0.00294035	12.5	12.5	Type D
SP1.4	975	0.009	37.5357	4.0	1.00	0.002205263	9.4	12.5	Type D
SP1.5	800	0.007	30.7985	2.5	1.00	0.002895114	12.3	12.5	Type C
SP1.6	725	0.007	27.9111	2.5	1.00	0.002623697	11.2	12.5	Type C
SP1.7	800	0.007	30.7985	2.5	1.00	0.002895114	12.3	12.5	Type C
SP1.8	1750	0.016	67.3717	4.0	1.00	0.003958164	16.8	18.0	Type F
SP1.9	2400	0.022	92.3955	5.0	1.00	0.004342671	18.5	18.5	Type G
SP1.10	825	0.007	31.7609	4.0	1.00	0.001865992	7.9	12.5	Type D
SP1.11	925	0.008	35.6108	4.0	1.00	0.002092172	8.9	12.5	Type D
SP1.12	375	0.003	14.4368	2.5	1.00	0.001357085	5.8	7.5	Type A
SP1.13	975	0.009	37.5357	4.0	1.00	0.002205263	9.4	12.5	Type D
SP1.14	550	0.005	21.1740	2.5	1.00	0.001990391	8.5	10.0	Type B
SP1.15	800	0.007	30.7985	2.5	1.00	0.002895114	12.3	12.5	Type C
SP2.1	1000	0.009	38.4981	4.0	1.00	0.002261808	9.6	12.5	Type D
SP2.2	800	0.007	30.7985	2.5	1.00	0.002895114	12.3	12.5	Type C
SP2.3	1200	0.011	46.1977	4.0	1.00	0.00271417	11.5	12.5	Type D
SP2.4	600	0.005	23.0989	2.5	1.00	0.002171336	9.2	10.0	Type B
SP2.5	750	0.00679	28.8736	2.5	1.00	0.00271417	11.5	12.5	Type C
SP3.1	500	0.005	19.2491	2.5	1.00	0.001809446	7.7	10.0	Type B
SP3.2	1700	0.015	65.4468	4.0	1.00	0.003845074	16.4	18.0	Type F
SP3.3	950	0.009	36.5732	4.0	1.00	0.002148718	9.1	12.5	Type D
SP3.4	675	0.006	25.9862	2.5	1.00	0.002442753	10.4	12.5	Type C
SP3.5	1600	0.014	61.5970	4.0	1.00	0.003618893	15.4	16.0	Type E
SP4.1	750	0.007	28.8736	2.5	1.00	0.00271417	11.5	12.5	Type C
SP4.2	750	0.007	28.8736	2.5	1.00	0.00271417	11.5	5.0	Type C
SP4.3	1600	0.014	61.5970	4.0	1.00	0.003618893	15.4	16.0	Type E
SP5.1	1600	0.014	61.5970	4.0	1.00	0.003618893	15.4	16.0	Type E
SP5.2	875	0.008	33.6858	4.0	1.00	0.001979082	8.4	12.5	Type D
SP5.3	825	0.007	31.7609	4.0	1.00	0.001865992	7.9	12.5	Type D
SP5.4	625	0.006	24.0613	2.5	1.00	0.002261808	9.6	10.0	Type B
SP5.5	600	0.005	23.0989	2.5	1.00	0.002171336	9.2	10.0	Type B
SP5.6	1000	0.009	38.4981	4.0	1.00	0.002261808	9.6	12.5	Type D
SP6.1	1825	0.017	70.2591	4.0	1.00	0.0041278	17.6	18.0	Type F
SP6.2	700	0.006	26.9487	2.5	1.00	0.002533225	10.8	12.5	Type C
SP6.3	700	0.006	26.9487	2.5	1.00	0.002533225	10.8	12.5	Type C
SP6.4	500	0.00050	19.2491	2.5	1.00	0.0002	7.7	10.0	Type B
SP6.5	800	0.001	30.7985	2.5	1.00	0.000464371	12.3	12.5	Type C
SP6.6	650	0.001	25.0238	2.5	1.00	0.00026	10.0	10.0	Type B
SP6.7	625	0.001	24.0613	2.5	1.00	0.00025	9.6	10.0	Type B
SP6.8	600	0.001	23.0989	2.5	1.00	0.00024	9.2	10.0	Type B
SP6.9	800	0.001	30.7985	2.5	1.00	0.00032	12.3	12.5	Type C
SP6.10	725	0.001	27.9111	2.5	1.00	0.00029	11.2	12.5	Type C
SP7.1	1225	0.001	47.1602	4.0	1.00	0.00030625	11.8	12.5	Type D

Pond Types	W(m)	D (m)	L (m)	Vol. (m3)
Type A	2.5	1	7.5	18.75
Type B	2.5	1	10	25
Type C	2.5	1	12.5	31.25
Type D	4	1	12.5	50
Type E	4	1	16	64
Type F	4	1	18	72
Type G	5	1	18.5	92.5

Catchment 1 Pond SP1.1 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00100	0.025	7.4	1.7	0.2	7.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00100	0.017	10.3	3.4	0.3	10.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00100	0.014	12.2	5.0	0.5	11.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00100	0.009	16.3	10.1	1.0	15.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00100	0.006	21.8	20.2	2.0	19.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00100	0.004	29.3	40.3	4.0	25.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00100	0.003	39.3	80.6	8.1	31.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00100	0.002	46.7	121.0	12.1	34.6
M100 12hr	720	87	0.278	0.72	7.25	0.00100	0.001	62.7	241.9	24.2	38.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00100	0.001	84.1	483.8	48.4	35.7
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00100	0.001	98.2	967.7	96.8	1.4

Catchment 1 Pond SP1.2 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00050	0.012	3.7	1.7	0.1	3.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00050	0.009	5.2	3.4	0.2	5.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00050	0.007	6.1	5.0	0.3	5.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00050	0.005	8.1	10.1	0.5	7.6
M100 60min	60	30.3	0.278	0.72	30.3	0.00050	0.003	10.9	20.2	1.0	9.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00050	0.002	14.7	40.3	2.0	12.6
M100 4hr	240	54.6	0.278	0.72	13.65	0.00050	0.001	19.7	80.6	4.0	15.6
M100 6hr	360	64.8	0.278	0.72	10.8	0.00050	0.001	23.3	121.0	6.0	17.3
M100 12hr	720	87	0.278	0.72	7.25	0.00050	0.001	31.3	241.9	12.1	19.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00050	0.000	42.0	483.8	24.2	17.9
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00050	0.000	49.1	967.7	48.4	0.7

Catchment 1 Pond SP1.8 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00175	0.043	13.0	1.7	0.3	12.7
M100 10min	10	14.3	0.278	0.72	85.8	0.00175	0.030	18.0	3.4	0.6	17.4
M100 15min	15	16.9	0.278	0.72	67.6	0.00175	0.024	21.3	5.0	0.9	20.4
M100 30min	30	22.6	0.278	0.72	45.2	0.00175	0.016	28.5	10.1	1.8	26.7
M100 60min	60	30.3	0.278	0.72	30.3	0.00175	0.011	38.2	20.2	3.5	34.7
M100 2hr	120	40.7	0.278	0.72	20.35	0.00175	0.007	51.3	40.3	7.1	44.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00175	0.005	68.9	80.6	14.1	54.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00175	0.004	81.7	121.0	21.2	60.5
M100 12hr	720	87	0.278	0.72	7.25	0.00175	0.003	109.7	241.9	42.3	67.4
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00175	0.002	147.2	483.8	84.7	62.5
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00175	0.001	171.9	967.7	169.3	2.5

Catchment 1 Pond SP1.9 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00240	0.059	17.8	1.7	0.4	17.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00240	0.041	24.7	3.4	0.8	23.9
M100 15min	15	16.9	0.278	0.72	67.6	0.00240	0.032	29.2	5.0	1.2	28.0
M100 30min	30	22.6	0.278	0.72	45.2	0.00240	0.022	39.1	10.1	2.4	36.7
M100 60min	60	30.3	0.278	0.72	30.3	0.00240	0.015	52.4	20.2	4.8	47.6
M100 2hr	120	40.7	0.278	0.72	20.35	0.00240	0.010	70.4	40.3	9.7	60.7
M100 4hr	240	54.6	0.278	0.72	13.65	0.00240	0.007	94.4	80.6	19.4	75.1
M100 6hr	360	64.8	0.278	0.72	10.8	0.00240	0.005	112.1	121.0	29.0	83.0
M100 12hr	720	87	0.278	0.72	7.25	0.00240	0.003	150.5	241.9	58.1	92.4
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00240	0.002	201.8	483.8	116.1	85.7
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00240	0.001	235.7	967.7	232.2	3.5

Catchment 2 Pond SP2.1 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00100	0.025	7.4	1.7	0.2	7.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00100	0.017	10.3	3.4	0.3	10.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00100	0.014	12.2	5.0	0.5	11.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00100	0.009	16.3	10.1	1.0	15.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00100	0.006	21.8	20.2	2.0	19.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00100	0.004	29.3	40.3	4.0	25.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00100	0.003	39.3	80.6	8.1	31.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00100	0.002	46.7	121.0	12.1	34.6
M100 12hr	720	87	0.278	0.72	7.25	0.00100	0.001	62.7	241.9	24.2	38.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00100	0.001	84.1	483.8	48.4	35.7
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00100	0.001	98.2	967.7	96.8	1.4

Catchment 2 Pond SP2.2 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00080	0.000	78.6	967.7	77.4	1.2

Catchment 3 Pond SP3.4 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00068	0.017	5.0	1.7	0.1	4.9
M100 10min	10	14.3	0.278	0.72	85.8	0.00068	0.012	7.0	3.4	0.2	6.7
M100 15min	15	16.9	0.278	0.72	67.6	0.00068	0.009	8.2	5.0	0.3	7.9
M100 30min	30	22.6	0.278	0.72	45.2	0.00068	0.006	11.0	10.1	0.7	10.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00068	0.004	14.7	20.2	1.4	13.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00068	0.003	19.8	40.3	2.7	17.1
M100 4hr	240	54.6	0.278	0.72	13.65	0.00068	0.002	26.6	80.6	5.4	21.1
M100 6hr	360	64.8	0.278	0.72	10.8	0.00068	0.001	31.5	121.0	8.2	23.4
M100 12hr	720	87	0.278	0.72	7.25	0.00068	0.001	42.3	241.9	16.3	26.0
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00068	0.001	56.8	483.8	32.7	24.1
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00068	0.000	66.3	967.7	65.3	1.0

Catchment 4 Pond SP3.5 water discharge rate (l/s)

Clean water natural flow 5.6 l/s/ha

1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00160	0.040	11.9	1.7	0.3	11.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00160	0.027	16.5	3.4	0.5	15.9
M100 15min	15	16.9	0.278	0.72	67.6	0.00160	0.022	19.5	5.0	0.8	18.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00160	0.014	26.1	10.1	1.6	24.4
M100 60min	60	30.3	0.278	0.72	30.3	0.00160	0.010	34.9	20.2	3.2	31.7
M100 2hr	120	40.7	0.278	0.72	20.35	0.00160	0.007	46.9	40.3	6.5	40.5
M100 4hr	240	54.6	0.278	0.72	13.65	0.00160	0.004	62.9	80.6	12.9	50.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00160	0.003	74.7	121.0	19.4	55.4
M100 12hr	720	87	0.278	0.72	7.25	0.00160	0.002	100.3	241.9	38.7	61.6
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00160	0.002	134.5	483.8	77.4	57.1
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00160	0.001	157.1	0.0	0.0	157.1

Catchment			1	Pond	SP1.3				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00100	0.025	7.4	1.7	0.2	7.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00100	0.017	10.3	3.4	0.3	10.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00100	0.014	12.2	5.0	0.5	11.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00100	0.009	16.3	10.1	1.0	15.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00100	0.006	21.8	20.2	2.0	19.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00100	0.004	29.3	40.3	4.0	25.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00100	0.003	39.3	80.6	8.1	31.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00100	0.002	46.7	121.0	12.1	34.6
M100 12hr	720	87	0.278	0.72	7.25	0.00100	0.001	62.7	241.9	24.2	38.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00100	0.001	84.1	483.8	48.4	35.7
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00100	0.001	98.2	967.7	96.8	1.4

Catchment			1	Pond	SP1.10				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00083	0.020	6.1	1.7	0.1	6.0
M100 10min	10	14.3	0.278	0.72	85.8	0.00083	0.014	8.5	3.4	0.3	8.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00083	0.011	10.0	5.0	0.4	9.6
M100 30min	30	22.6	0.278	0.72	45.2	0.00083	0.007	13.4	10.1	0.8	12.6
M100 60min	60	30.3	0.278	0.72	30.3	0.00083	0.005	18.0	20.2	1.7	16.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00083	0.003	24.2	40.3	3.3	20.9
M100 4hr	240	54.6	0.278	0.72	13.65	0.00083	0.002	32.5	80.6	6.7	25.8
M100 6hr	360	64.8	0.278	0.72	10.8	0.00083	0.002	38.5	121.0	10.0	28.5
M100 12hr	720	87	0.278	0.72	7.25	0.00083	0.001	51.7	241.9	20.0	31.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00083	0.001	69.4	483.8	39.9	29.5
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00083	0.000	81.0	967.7	79.8	1.2

Catchment			2	Pond	SP2.3				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00120	0.030	8.9	1.7	0.2	8.7
M100 10min	10	14.3	0.278	0.72	85.8	0.00120	0.021	12.4	3.4	0.4	12.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00120	0.016	14.6	5.0	0.6	14.0
M100 30min	30	22.6	0.278	0.72	45.2	0.00120	0.011	19.5	10.1	1.2	18.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00120	0.007	26.2	20.2	2.4	23.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00120	0.005	35.2	40.3	4.8	30.4
M100 4hr	240	54.6	0.278	0.72	13.65	0.00120	0.003	47.2	80.6	9.7	37.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00120	0.003	56.0	121.0	14.5	41.5
M100 12hr	720	87	0.278	0.72	7.25	0.00120	0.002	75.2	241.9	29.0	46.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00120	0.001	100.9	483.8	58.1	42.8
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00120	0.001	117.9	967.7	116.1	1.7

Catchment			4	Pond	SP4.1				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00075	0.019	5.6	1.7	0.1	5.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00075	0.013	7.7	3.4	0.3	7.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00075	0.010	9.1	5.0	0.4	8.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00075	0.007	12.2	10.1	0.8	11.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00075	0.005	16.4	20.2	1.5	14.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00075	0.003	22.0	40.3	3.0	19.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00075	0.002	29.5	80.6	6.0	23.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00075	0.002	35.0	121.0	9.1	25.9
M100 12hr	720	87	0.278	0.72	7.25	0.00075	0.001	47.0	241.9	18.1	28.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00075	0.001	63.1	483.8	36.3	26.8
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00075	0.000	73.7	967.7	72.6	1.1

Catchment			1	Pond	SP1.3A				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00130	0.032	9.6	1.7	0.2	9.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00130	0.022	13.4	3.4	0.4	13.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00130	0.018	15.8	5.0	0.7	15.2
M100 30min	30	22.6	0.278	0.72	45.2	0.00130	0.012	21.2	10.1	1.3	19.9
M100 60min	60	30.3	0.278	0.72	30.3	0.00130	0.008	28.4	20.2	2.6	25.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00130	0.005	38.1	40.3	5.2	32.9
M100 4hr	240	54.6	0.278	0.72	13.65	0.00130	0.004	51.1	80.6	10.5	40.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00130	0.003	60.7	121.0	15.7	45.0
M100 12hr	720	87	0.278	0.72	7.25	0.00130	0.002	81.5	241.9	31.4	50.0
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00130	0.001	109.3	483.8	62.9	46.4
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00130	0.001	127.7	967.7	125.8	1.9

Catchment			1	Pond	SP1.11				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Discharge (m³/ha)	Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00093	0.023	6.9	1.7	0.2	6.7
M100 10min	10	14.3	0.278	0.72	85.8	0.00093	0.016	9.5	3.4	0.3	9.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00093	0.013	11.3	5.0	0.5	10.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00093	0.008	15.1	10.1	0.9	14.1
M100 60min	60	30.3	0.278	0.72	30.3	0.00093	0.006	20.2	20.2	1.9	18.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00093	0.004	27.1	40.3	3.7	23.4
M100 4hr	240	54.6	0.278	0.72	13.65	0.00093	0.003	36.4	80.6	7.5	28.9
M100 6hr	360	64.8	0.278	0.72	10.8	0.00093	0.002	43.2	121.0	11.2	32.0
M100 12hr	720	87	0.278	0.72	7.25	0.00093	0.001	58.0	241.9	22.4	35.6
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00093	0.001	77.8	483.8	44.8	33.0
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00093	0.001	90.8	967.7	89.5	1.3

Catchment			2	Pond	SP2.4				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00060	0.015	4.5	1.7	0.1	4.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00060	0.010	6.2	3.4	0.2	6.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00060	0.008	7.3	5.0	0.3	7.0
M100 30min	30	22.6	0.278	0.72	45.2	0.00060	0.005	9.8	10.1	0.6	9.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00060	0.004	13.1	20.2	1.2	11.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00060	0.002	17.6	40.3	2.4	15.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00060	0.002	23.6	80.6	4.8	18.8
M100 6hr	360	64.8	0.278	0.72	10.8	0.00060	0.001	28.0	121.0	7.3	20.8
M100 12hr	720	87	0.278	0.72	7.25	0.00060	0.001	37.6	241.9	14.5	23.1
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00060	0.001	50.5	483.8	29.0	21.4
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00060	0.000	58.9	0.0	0.0	58.9

Catchment			4	Pond	SP4.2				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00075	0.019	5.6	1.7	0.1	5.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00075	0.013	7.7	3.4	0.3	7.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00075	0.010	9.1	5.0	0.4	8.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00075	0.007	12.2	10.1	0.8	11.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00075	0.005	16.4	20.2	1.5	14.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00075	0.003	22.0	40.3	3.0	19.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00075	0.002	29.5	80.6	6.0	23.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00075	0.002	35.0	121.0	9.1	25.9
M100 12hr	720	87	0.278	0.72	7.25	0.00075	0.001	47.0	241.9	18.1	28.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00075	0.001	63.1	483.8	36.3	26.8
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00075	0.000	73.7	967.7	72.6	1.1

Catchment			1	Pond	SP1.4				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00098	0.024	7.2	1.7	0.2	7.1
M100 10min	10	14.3	0.278	0.72	85.8	0.00098	0.017	10.0	3.4	0.3	9.7
M100 15min	15	16.9	0.278	0.72	67.6	0.00098	0.013	11.9	5.0	0.5	11.4
M100 30min	30	22.6	0.278	0.72	45.2	0.00098	0.009	15.9	10.1	1.0	14.9
M100 60min	60	30.3	0.278	0.72	30.3	0.00098	0.006	21.3	20.2	2.0	19.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00098	0.004	28.6	40.3	3.9	24.7
M100 4hr	240	54.6	0.278	0.72	13.65	0.00098	0.003	38.4	80.6	7.9	30.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00098	0.002	45.5	121.0	11.8	33.7
M100 12hr	720	87	0.278	0.72	7.25	0.00098	0.001	61.1	241.9	23.6	37.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00098	0.001	82.0	483.8	47.2	34.8
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00098	0.001	95.8	967.7	94.3	1.4

Catchment			1	Pond	SP1.12				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00038	0.009	2.8	1.7	0.1	2.7
M100 10min	10	14.3	0.278	0.72	85.8	0.00038	0.006	3.9	3.4	0.1	3.7
M100 15min	15	16.9	0.278	0.72	67.6	0.00038	0.005	4.6	5.0	0.2	4.4
M100 30min	30	22.6	0.278	0.72	45.2	0.00038	0.003	6.1	10.1	0.4	5.7
M100 60min	60	30.3	0.278	0.72	30.3	0.00038	0.002	8.2	20.2	0.8	7.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00038	0.002	11.0	40.3	1.5	9.5
M100 4hr	240	54.6	0.278	0.72	13.65	0.00038	0.001	14.8	80.6	3.0	11.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00038	0.001	17.5	121.0	4.5	13.0
M100 12hr	720	87	0.278	0.72	7.25	0.00038	0.001	23.5	241.9	9.1	14.4
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00038	0.000	31.5	483.8	18.1	13.4
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00038	0.000	36.8	967.7	36.3	0.5

Catchment			3	Pond	SP2.5				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00075	0.019	5.6	1.7	0.1	5.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00075	0.013	7.7	3.4	0.3	7.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00075	0.010	9.1	5.0	0.4	8.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00075	0.007	12.2	10.1	0.8	11.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00075	0.005	16.4	20.2	1.5	14.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00075	0.003	22.0	40.3	3.0	19.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00075	0.002	29.5	80.6	6.0	23.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00075	0.002	35.0	121.0	9.1	25.9
M100 12hr	720	87	0.278	0.72	7.25	0.00075	0.001	47.0	241.9	18.1	28.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00075	0.001	63.1	483.8	36.3	26.8
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00075	0.000	73.7	967.7	72.6	1.1

Catchment			5	Pond	SP4.3				water discharge rate (l/s)	
Clean water natural flow									5.6	l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00160	0.040	11.9	1.7	0.3	11.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00160	0.027	16.5	3.4	0.5	15.9
M100 15min	15	16.9	0.278	0.72	67.6	0.00160	0.022	19.5	5.0	0.8	18.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00160	0.014	26.1	10.1	1.6	24.4
M100 60min	60	30.3	0.278	0.72	30.3	0.00160	0.010	34.9	20.2	3.2	31.7
M100 2hr	120	40.7	0.278	0.72	20.35	0.00160	0.007	46.9	40.3	6.5	40.5
M100 4hr	240	54.6	0.278	0.72	13.65	0.00160	0.004	62.9	80.6	12.9	50.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00160	0.003	74.7	121.0	19.4	55.4
M100 12hr	720	87	0.278	0.72	7.25	0.00160	0.002	100.3	241.9	38.7	61.6
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00160	0.002	134.5	483.8	77.4	57.1
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00160	0.001	157.1	967.7	154.8	2.3

Catchment			1	Pond	SP1.5				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00080	0.000	78.6	967.7	77.4	1.2

Catchment			1	Pond	SP1.13				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00098	0.024	7.2	1.7	0.2	7.1
M100 10min	10	14.3	0.278	0.72	85.8	0.00098	0.017	10.0	3.4	0.3	9.7
M100 15min	15	16.9	0.278	0.72	67.6	0.00098	0.013	11.9	5.0	0.5	11.4
M100 30min	30	22.6	0.278	0.72	45.2	0.00098	0.009	15.9	10.1	1.0	14.9
M100 60min	60	30.3	0.278	0.72	30.3	0.00098	0.006	21.3	20.2	2.0	19.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00098	0.004	28.6	40.3	3.9	24.7
M100 4hr	240	54.6	0.278	0.72	13.65	0.00098	0.003	38.4	80.6	7.9	30.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00098	0.002	45.5	121.0	11.8	33.7
M100 12hr	720	87	0.278	0.72	7.25	0.00098	0.001	61.1	241.9	23.6	37.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00098	0.001	82.0	483.8	47.2	34.8
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00098	0.001	95.8	967.7	94.3	1.4

Catchment			3	Pond	SP3.1				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00050	0.012	3.7	1.7	0.1	3.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00050	0.009	5.2	3.4	0.2	5.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00050	0.007	6.1	5.0	0.3	5.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00050	0.005	8.1	10.1	0.5	7.6
M100 60min	60	30.3	0.278	0.72	30.3	0.00050	0.003	10.9	20.2	1.0	9.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00050	0.002	14.7	40.3	2.0	12.6
M100 4hr	240	54.6	0.278	0.72	13.65	0.00050	0.001	19.7	80.6	4.0	15.6
M100 6hr	360	64.8	0.278	0.72	10.8	0.00050	0.001	23.3	121.0	6.0	17.3
M100 12hr	720	87	0.278	0.72	7.25	0.00050	0.001	31.3	241.9	12.1	19.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00050	0.000	42.0	483.8	24.2	17.9
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00050	0.000	49.1	967.7	48.4	0.7

Catchment			5	Pond	SP5.1				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00160	0.040	11.9	1.7	0.3	11.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00160	0.027	16.5	3.4	0.5	15.9
M100 15min	15	16.9	0.278	0.72	67.6	0.00160	0.022	19.5	5.0	0.8	18.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00160	0.014	26.1	10.1	1.6	24.4
M100 60min	60	30.3	0.278	0.72	30.3	0.00160	0.010	34.9	20.2	3.2	31.7
M100 2hr	120	40.7	0.278	0.72	20.35	0.00160	0.007	46.9	40.3	6.5	40.5
M100 4hr	240	54.6	0.278	0.72	13.65	0.00160	0.004	62.9	80.6	12.9	50.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00160	0.003	74.7	121.0	19.4	55.4
M100 12hr	720	87	0.278	0.72	7.25	0.00160	0.002	100.3	241.9	38.7	61.6
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00160	0.002	134.5	483.8	77.4	57.1
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00160	0.001	157.1	967.7	154.8	2.3

Catchment			1	Pond	SP1.6				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00073	0.018	5.4	1.7	0.1	5.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00073	0.012	7.5	3.4	0.2	7.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00073	0.010	8.8	5.0	0.4	8.5
M100 30min	30	22.6	0.278	0.72	45.2	0.00073	0.007	11.8	10.1	0.7	11.1
M100 60min	60	30.3	0.278	0.72	30.3	0.00073	0.004	15.8	20.2	1.5	14.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00073	0.003	21.3	40.3	2.9	18.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00073	0.002	28.5	80.6	5.8	22.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00073	0.002	33.9	121.0	8.8	25.1
M100 12hr	720	87	0.278	0.72	7.25	0.00073	0.001	45.5	241.9	17.5	27.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00073	0.001	61.0	483.8	35.1	25.9
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00073	0.000	71.2	967.7	70.2	1.0

Catchment			1	Pond	SP1.14				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00055	0.014	4.1	1.7	0.1	4.0
M100 10min	10	14.3	0.278	0.72	85.8	0.00055	0.009	5.7	3.4	0.2	5.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00055	0.007	6.7	5.0	0.3	6.4
M100 30min	30	22.6	0.278	0.72	45.2	0.00055	0.005	9.0	10.1	0.6	8.4
M100 60min	60	30.3	0.278	0.72	30.3	0.00055	0.003	12.0	20.2	1.1	10.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00055	0.002	16.1	40.3	2.2	13.9
M100 4hr	240	54.6	0.278	0.72	13.65	0.00055	0.002	21.6	80.6	4.4	17.2
M100 6hr	360	64.8	0.278	0.72	10.8	0.00055	0.001	25.7	121.0	6.7	19.0
M100 12hr	720	87	0.278	0.72	7.25	0.00055	0.001	34.5	241.9	13.3	21.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00055	0.001	46.3	483.8	26.6	19.6
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00055	0.000	54.0	967.7	53.2	0.8

Catchment			3	Pond	SP3.2				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00170	0.042	12.6	1.7	0.3	12.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00170	0.029	17.5	3.4	0.6	16.9
M100 15min	15	16.9	0.278	0.72	67.6	0.00170	0.023	20.7	5.0	0.9	19.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00170	0.015	27.7	10.1	1.7	26.0
M100 60min	60	30.3	0.278	0.72	30.3	0.00170	0.010	37.1	20.2	3.4	33.7
M100 2hr	120	40.7	0.278	0.72	20.35	0.00170	0.007	49.9	40.3	6.9	43.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00170	0.005	66.9	80.6	13.7	53.2
M100 6hr	360	64.8	0.278	0.72	10.8	0.00170	0.004	79.4	121.0	20.6	58.8
M100 12hr	720	87	0.278	0.72	7.25	0.00170	0.002	106.6	241.9	41.1	65.4
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00170	0.002	143.0	483.8	82.3	60.7
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00170	0.001	167.0	967.7	164.5	2.5

Catchment			5	Pond	SP5.2				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield	Greenfield Discharge	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00088	0.022	6.5	1.7	0.1	6.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00088	0.015	9.0	3.4	0.3	8.7
M100 15min	15	16.9	0.278	0.72	67.6	0.00088	0.012	10.7	5.0	0.4	10.2
M100 30min	30	22.6	0.278	0.72	45.2	0.00088	0.008	14.2	10.1	0.9	13.4
M100 60min	60	30.3	0.278	0.72	30.3	0.00088	0.005	19.1	20.2	1.8	17.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00088	0.004	25.7	40.3	3.5	22.1
M100 4hr	240	54.6	0.278	0.72	13.65	0.00088	0.002	34.4	80.6	7.1	27.4
M100 6hr	360	64.8	0.278	0.72	10.8	0.00088	0.002	40.9	121.0	10.6	30.3
M100 12hr	720	87	0.278	0.72	7.25	0.00088	0.001	54.9	241.9	21.2	33.7
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00088	0.001	73.6	483.8	42.3	31.2
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00088	0.000	85.9	967.7	84.7	1.3

Catchment			1	Pond	SP1.7				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.83958333	0.00080	0.000	78.6	967.7	77.4	1.2

Catchment			2	Pond	SP1.15				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.8396	0.00080	0.000	78.6	967.7	77.4	1.2

Catchment			3	Pond	SP3.3				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00095	0.024	7.1	1.7	0.2	6.9
M100 10min	10	14.3	0.278	0.72	85.8	0.00095	0.016	9.8	3.4	0.3	9.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00095	0.013	11.6	5.0	0.5	11.1
M100 30min	30	22.6	0.278	0.72	45.2	0.00095	0.009	15.5	10.1	1.0	14.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00095	0.006	20.7	20.2	1.9	18.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00095	0.004	27.9	40.3	3.8	24.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00095	0.003	37.4	80.6	7.7	29.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00095	0.002	44.4	121.0	11.5	32.9
M100 12hr	720	87	0.278	0.72	7.25	0.00095	0.001	59.6	241.9	23.0	36.6
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00095	0.001	79.9	483.8	46.0	33.9
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00095	0.001	93.3	967.7	91.9	1.4

Catchment			5	Pond	SP5.3				water discharge rate (l/s)	
Clean water natural flow								5.6	l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km²)	(m³/s)	Volume (m³)	Greenfield Discharge (m³/ha)	Greenfield Discharge (m³)	Residual Volume (m³)
M100 5min	5	10.3	0.278	0.72	123.6	0.00083	0.020	6.1	1.7	0.1	6.0
M100 10min	10	14.3	0.278	0.72	85.8	0.00083	0.014	8.5	3.4	0.3	8.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00083	0.011	10.0	5.0	0.4	9.6
M100 30min	30	22.6	0.278	0.72	45.2	0.00083	0.007	13.4	10.1	0.8	12.6
M100 60min	60	30.3	0.278	0.72	30.3	0.00083	0.005	18.0	20.2	1.7	16.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00083	0.003	24.2	40.3	3.3	20.9
M100 4hr	240	54.6	0.278	0.72	13.65	0.00083	0.002	32.5	80.6	6.7	25.8
M100 6hr	360	64.8	0.278	0.72	10.8	0.00083	0.002	38.5	121.0	10.0	28.5
M100 12hr	720	87	0.278	0.72	7.25	0.00083	0.001	51.7	241.9	20.0	31.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00083	0.001	69.4	483.8	39.9	29.5
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00083	0.000	81.0	967.7	79.8	1.2

Catchment			5	Pond	SP5.4		water discharge rate (l/s)				
Clean water natural flow								5.6		l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00063	0.015	4.6	1.7	0.1	4.5
M100 10min	10	14.3	0.278	0.72	85.8	0.00063	0.011	6.4	3.4	0.2	6.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00063	0.008	7.6	5.0	0.3	7.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00063	0.006	10.2	10.1	0.6	9.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00063	0.004	13.6	20.2	1.3	12.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00063	0.003	18.3	40.3	2.5	15.8
M100 4hr	240	54.6	0.278	0.72	13.65	0.00063	0.002	24.6	80.6	5.0	19.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00063	0.001	29.2	121.0	7.6	21.6
M100 12hr	720	87	0.278	0.72	7.25	0.00063	0.001	39.2	241.9	15.1	24.1
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00063	0.001	52.6	483.8	30.2	22.3
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00063	0.000	61.4	967.7	60.5	0.9

Catchment			6	Pond	SP6.6		water discharge rate (l/s)				
Clean water natural flow								5.6		l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00065	0.016	4.8	1.7	0.1	4.7
M100 10min	10	14.3	0.278	0.72	85.8	0.00065	0.011	6.7	3.4	0.2	6.5
M100 15min	15	16.9	0.278	0.72	67.6	0.00065	0.009	7.9	5.0	0.3	7.6
M100 30min	30	22.6	0.278	0.72	45.2	0.00065	0.006	10.6	10.1	0.7	9.9
M100 60min	60	30.3	0.278	0.72	30.3	0.00065	0.004	14.2	20.2	1.3	12.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00065	0.003	19.1	40.3	2.6	16.4
M100 4hr	240	54.6	0.278	0.72	13.65	0.00065	0.002	25.6	80.6	5.2	20.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00065	0.001	30.4	121.0	7.9	22.5
M100 12hr	720	87	0.278	0.72	7.25	0.00065	0.001	40.7	241.9	15.7	25.0
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00065	0.001	54.7	483.8	31.4	23.2
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00065	0.000	63.8	967.7	62.9	0.9

Catchment			5	Pond	SP5.5		water discharge rate (l/s)				
Clean water natural flow								5.6		l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00060	0.015	4.5	1.7	0.1	4.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00060	0.010	6.2	3.4	0.2	6.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00060	0.008	7.3	5.0	0.3	7.0
M100 30min	30	22.6	0.278	0.72	45.2	0.00060	0.005	9.8	10.1	0.6	9.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00060	0.004	13.1	20.2	1.2	11.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00060	0.002	17.6	40.3	2.4	15.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00060	0.002	23.6	80.6	4.8	18.8
M100 6hr	360	64.8	0.278	0.72	10.8	0.00060	0.001	28.0	121.0	7.3	20.8
M100 12hr	720	87	0.278	0.72	7.25	0.00060	0.001	37.6	241.9	14.5	23.1
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00060	0.001	50.5	483.8	29.0	21.4
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00060	0.000	58.9	967.7	58.1	0.9

Catchment			6	Pond	SP6.7		water discharge rate (l/s)				
Clean water natural flow								5.6		l/s/ha	
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00063	0.015	4.6	1.7	0.1	4.5
M100 10min	10	14.3	0.278	0.72	85.8	0.00063	0.011	6.4	3.4	0.2	6.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00063	0.008	7.6	5.0	0.3	7.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00063	0.006	10.2	10.1	0.6	9.5
M100 60min	60	30.3	0.278	0.72	30.3	0.00063	0.004	13.6	20.2	1.3	12.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00063	0.003	18.3	40.3	2.5	15.8
M100 4hr	240	54.6	0.278	0.72	13.65	0.00063	0.002	24.6	80.6	5.0	19.5
M100 6hr	360	64.8	0.278	0.72	10.8	0.00063	0.001	29.2	121.0	7.6	21.6
M100 12hr	720	87	0.278	0.72	7.25	0.00063	0.001	39.2	241.9	15.1	24.1
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00063	0.001	52.6	483.8	30.2	22.3
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00063	0.000	61.4	967.7	60.5	0.9

Catchment			6	Pond	SP5.6		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00100	0.025	7.4	1.7	0.2	7.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00100	0.017	10.3	3.4	0.3	10.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00100	0.014	12.2	5.0	0.5	11.7
M100 30min	30	22.6	0.278	0.72	45.2	0.00100	0.009	16.3	10.1	1.0	15.3
M100 60min	60	30.3	0.278	0.72	30.3	0.00100	0.006	21.8	20.2	2.0	19.8
M100 2hr	120	40.7	0.278	0.72	20.35	0.00100	0.004	29.3	40.3	4.0	25.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00100	0.003	39.3	80.6	8.1	31.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00100	0.002	46.7	121.0	12.1	34.6
M100 12hr	720	87	0.278	0.72	7.25	0.00100	0.001	62.7	241.9	24.2	38.5
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00100	0.001	84.1	483.8	48.4	35.7
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00100	0.001	98.2	967.7	96.8	1.4

Catchment			7	Pond	SP6.8		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00060	0.015	4.5	1.7	0.1	4.4
M100 10min	10	14.3	0.278	0.72	85.8	0.00060	0.010	6.2	3.4	0.2	6.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00060	0.008	7.3	5.0	0.3	7.0
M100 30min	30	22.6	0.278	0.72	45.2	0.00060	0.005	9.8	10.1	0.6	9.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00060	0.004	13.1	20.2	1.2	11.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00060	0.002	17.6	40.3	2.4	15.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00060	0.002	23.6	80.6	4.8	18.8
M100 6hr	360	64.8	0.278	0.72	10.8	0.00060	0.001	28.0	121.0	7.3	20.8
M100 12hr	720	87	0.278	0.72	7.25	0.00060	0.001	37.6	241.9	14.5	23.1
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00060	0.001	50.5	483.8	29.0	21.4
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00060	0.000	58.9	967.7	58.1	0.9

Catchment			6	Pond	SP6.1		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00183	0.045	13.5	1.7	0.3	13.2
M100 10min	10	14.3	0.278	0.72	85.8	0.00183	0.031	18.8	3.4	0.6	18.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00183	0.025	22.2	5.0	0.9	21.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00183	0.017	29.7	10.1	1.8	27.9
M100 60min	60	30.3	0.278	0.72	30.3	0.00183	0.011	39.8	20.2	3.7	36.2
M100 2hr	120	40.7	0.278	0.72	20.35	0.00183	0.007	53.5	40.3	7.4	46.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00183	0.005	71.8	80.6	14.7	57.1
M100 6hr	360	64.8	0.278	0.72	10.8	0.00183	0.004	85.2	121.0	22.1	63.1
M100 12hr	720	87	0.278	0.72	7.25	0.00183	0.003	114.4	241.9	44.2	70.3
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00183	0.002	153.5	483.8	88.3	65.2
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00183	0.001	179.2	967.7	176.6	2.6

Catchment			6	Pond	SP6.9		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00080	0.000	78.6	967.7	77.4	1.2

Catchment			6	Pond	SP6.2		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00070	0.017	5.2	1.7	0.1	5.1
M100 10min	10	14.3	0.278	0.72	85.8	0.00070	0.012	7.2	3.4	0.2	7.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00070	0.009	8.5	5.0	0.4	8.2
M100 30min	30	22.6	0.278	0.72	45.2	0.00070	0.006	11.4	10.1	0.7	10.7
M100 60min	60	30.3	0.278	0.72	30.3	0.00070	0.004	15.3	20.2	1.4	13.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00070	0.003	20.5	40.3	2.8	17.7
M100 4hr	240	54.6	0.278	0.72	13.65	0.00070	0.002	27.5	80.6	5.6	21.9
M100 6hr	360	64.8	0.278	0.72	10.8	0.00070	0.002	32.7	121.0	8.5	24.2
M100 12hr	720	87	0.278	0.72	7.25	0.00070	0.001	43.9	241.9	16.9	26.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00070	0.001	58.9	483.8	33.9	25.0
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00070	0.000	68.8	967.7	67.7	1.0

Catchment			6	Pond	SP6.10		water discharge rate (l/s)				
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00073	0.018	5.4	1.7	0.1	5.3
M100 10min	10	14.3	0.278	0.72	85.8	0.00073	0.012	7.5	3.4	0.2	7.2
M100 15min	15	16.9	0.278	0.72	67.6	0.00073	0.010	8.8	5.0	0.4	8.5
M100 30min	30	22.6	0.278	0.72	45.2	0.00073	0.007	11.8	10.1	0.7	11.1
M100 60min	60	30.3	0.278	0.72	30.3	0.00073	0.004	15.8	20.2	1.5	14.4
M100 2hr	120	40.7	0.278	0.72	20.35	0.00073	0.003	21.3	40.3	2.9	18.3
M100 4hr	240	54.6	0.278	0.72	13.65	0.00073	0.002	28.5	80.6	5.8	22.7
M100 6hr	360	64.8	0.278	0.72	10.8	0.00073	0.002	33.9	121.0	8.8	25.1
M100 12hr	720	87	0.278	0.72	7.25	0.00073	0.001	45.5	241.9	17.5	27.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00073	0.001	61.0	483.8	35.1	25.9
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00073	0.000	71.2	967.7	70.2	1.0

Catchment			6	Pond	SP6.3			water discharge rate (l/s)			
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00070	0.017	5.2	1.7	0.1	5.1
M100 10min	10	14.3	0.278	0.72	85.8	0.00070	0.012	7.2	3.4	0.2	7.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00070	0.009	8.5	5.0	0.4	8.2
M100 30min	30	22.6	0.278	0.72	45.2	0.00070	0.006	11.4	10.1	0.7	10.7
M100 60min	60	30.3	0.278	0.72	30.3	0.00070	0.004	15.3	20.2	1.4	13.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00070	0.003	20.5	40.3	2.8	17.7
M100 4hr	240	54.6	0.278	0.72	13.65	0.00070	0.002	27.5	80.6	5.6	21.9
M100 6hr	360	64.8	0.278	0.72	10.8	0.00070	0.002	32.7	121.0	8.5	24.2
M100 12hr	720	87	0.278	0.72	7.25	0.00070	0.001	43.9	241.9	16.9	26.9
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00070	0.001	58.9	483.8	33.9	25.0
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00070	0.000	68.8	967.7	67.7	1.0

Catchment			6	Pond	SP7.1			water discharge rate (l/s)			
Clean water natural flow									5.6		l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00123	0.030	9.1	1.7	0.2	8.9
M100 10mir	10	14.3	0.278	0.72	85.8	0.00123	0.021	12.6	3.4	0.4	12.2
M100 15mir	15	16.9	0.278	0.72	67.6	0.00123	0.017	14.9	5.0	0.6	14.3
M100 30mir	30	22.6	0.278	0.72	45.2	0.00123	0.011	19.9	10.1	1.2	18.7
M100 60mir	60	30.3	0.278	0.72	30.3	0.00123	0.007	26.7	20.2	2.5	24.3
M100 2hr	120	40.7	0.278	0.72	20.35	0.00123	0.005	35.9	40.3	4.9	31.0
M100 4hr	240	54.6	0.278	0.72	13.65	0.00123	0.003	48.2	80.6	9.9	38.3
M100 6hr	360	64.8	0.278	0.72	10.8	0.00123	0.003	57.2	121.0	14.8	42.4
M100 12hr	720	87	0.278	0.72	7.25	0.00123	0.002	76.8	241.9	29.6	47.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00123	0.001	103.0	483.8	59.3	43.7
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00123	0.001	120.3	967.7	118.5	1.8

Catchment			6	Pond	SP6.4			water discharge rate (l/s)			
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00050	0.012	3.7	1.7	0.1	3.6
M100 10min	10	14.3	0.278	0.72	85.8	0.00050	0.009	5.2	3.4	0.2	5.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00050	0.007	6.1	5.0	0.3	5.8
M100 30min	30	22.6	0.278	0.72	45.2	0.00050	0.005	8.1	10.1	0.5	7.6
M100 60min	60	30.3	0.278	0.72	30.3	0.00050	0.003	10.9	20.2	1.0	9.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00050	0.002	14.7	40.3	2.0	12.6
M100 4hr	240	54.6	0.278	0.72	13.65	0.00050	0.001	19.7	80.6	4.0	15.6
M100 6hr	360	64.8	0.278	0.72	10.8	0.00050	0.001	23.3	121.0	6.0	17.3
M100 12hr	720	87	0.278	0.72	7.25	0.00050	0.001	31.3	241.9	12.1	19.2
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00050	0.000	42.0	483.8	24.2	17.9
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00050	0.000	49.1	967.7	48.4	0.7

Catchment			6	Pond	SP6.5			water discharge rate (l/s)			
Clean water natural flow								5.6			l/s/ha
1 in 100 year return	minutes	Rainfall (mm)		C	i (mm/hr)	A (km^2)	(m^3/s)	Volume (m^3)	Greenfield Discharge (m^3/ha)	Greenfield Discharge (m^3)	Residual Volume (m^3)
M100 5min	5	10.3	0.278	0.72	123.6	0.00080	0.020	5.9	1.7	0.1	5.8
M100 10min	10	14.3	0.278	0.72	85.8	0.00080	0.014	8.2	3.4	0.3	8.0
M100 15min	15	16.9	0.278	0.72	67.6	0.00080	0.011	9.7	5.0	0.4	9.3
M100 30min	30	22.6	0.278	0.72	45.2	0.00080	0.007	13.0	10.1	0.8	12.2
M100 60min	60	30.3	0.278	0.72	30.3	0.00080	0.005	17.5	20.2	1.6	15.9
M100 2hr	120	40.7	0.278	0.72	20.35	0.00080	0.003	23.5	40.3	3.2	20.2
M100 4hr	240	54.6	0.278	0.72	13.65	0.00080	0.002	31.5	80.6	6.5	25.0
M100 6hr	360	64.8	0.278	0.72	10.8	0.00080	0.002	37.4	121.0	9.7	27.7
M100 12hr	720	87	0.278	0.72	7.25	0.00080	0.001	50.2	241.9	19.4	30.8
M100 24hr	1440	116.7	0.278	0.72	4.8625	0.00080	0.001	67.3	483.8	38.7	28.6
M100 48hr	2880	136.3	0.278	0.72	2.839583	0.00080	0.000	78.6	967.7	77.4	1.2

Ref	A (m2)	#REF!	Residual Volume (Reqd for Attenuation) (m3)	Width (m)	Velocity for Settlement (<0.3) (m/s)
SP1.1	1000	38.498112	4.0	1.00	0.002262
SP1.2	500	19.249056	2.5	1.00	0.001809
SP1.3	1000	38.498112	4.0	1.00	0.002262
SP1.3A	1300	50.0475456	4.0	1.00	0.00294
SP1.4	975	37.5356592	4.0	1.00	0.002205
SP1.5	800	30.7984896	2.5	1.00	0.002895
SP1.6	725	27.9111312	2.5	1.00	0.002624
SP1.7	800	30.7984896	2.5	1.00	0.002895
SP1.8	1750	67.371696	4.0	1.00	0.003958
SP1.9	2400	92.3954688	5.0	1.00	0.004343
SP1.10	825	31.7609424	4.0	1.00	0.001866
SP1.11	925	35.6107536	4.0	1.00	0.002092
SP1.12	375	14.436792	2.5	1.00	0.001357
SP1.13	975	37.5356592	4.0	1.00	0.002205
SP1.14	550	21.1739616	2.5	1.00	0.00199
SP1.15	800	30.7984896	2.5	1.00	0.002895
SP2.1	1000	38.498112	4.0	1.00	0.002262
SP2.2	800	30.7984896	2.5	1.00	0.002895
SP2.3	1200	46.1977344	4.0	1.00	0.002714
SP2.4	600	23.0988672	2.5	1.00	0.002171
SP2.5	750	28.873584	2.5	1.00	0.002714
SP3.1	500	19.249056	2.5	1.00	0.001809
SP3.2	1700	65.4467904	4.0	1.00	0.003845
SP3.3	950	36.5732064	4.0	1.00	0.002149
SP3.4	675	25.9862256	2.5	1.00	0.002443
SP3.5	1600	61.5969792	4.0	1.00	0.003619
SP4.1	750	28.873584	2.5	1.00	0.002714
SP4.2	750	28.873584	2.5	1.00	0.002714
SP4.3	1600	61.5969792	4.0	1.00	0.003619
SP5.1	1600	61.5969792	4.0	1.00	0.003619
SP5.2	875	33.685848	4.0	1.00	0.001979
SP5.3	825	31.7609424	4.0	1.00	0.001866
SP5.4	625	24.06132	2.5	1.00	0.002262
SP5.5	600	23.0988672	2.5	1.00	0.002171
SP5.6	1000	38.498112	4.0	1.00	0.002262
SP6.1	1825	70.2590544	4.0	1.00	0.004128
SP6.2	700	26.9486784	2.5	1.00	0.002533
SP6.3	700	26.9486784	2.5	1.00	0.002533
SP6.4	500	19.249056	2.5	1.00	0.0002
SP6.5	800	30.7984896	2.5	1.00	0.000464
SP6.6	650	25.0237728	2.5	1.00	0.00026
SP6.7	625	24.06132	2.5	1.00	0.00025
SP6.8	600	23.0988672	2.5	1.00	0.00024
SP6.9	800	30.7984896	2.5	1.00	0.00032
SP6.10	725	27.9111312	2.5	1.00	0.00029
SP7.1	1225	47.1601872	4.0	1.00	0.000306