



Functional Servicing and Stormwater Management Report

Wooden Sticks Golf Course

Wooden Sticks Golf Inc.

November 2022

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1. Introduction

GHD has been retained by Wooden Sticks Golf Inc. (Mr. Greg Seemann) to provide engineering services for the proposed expansion of the existing golf clubhouse and associated parking lot.

The property is located at 40 Elgin Park Drive, Uxbridge, ON L9P 1N2. Existing conditions for the areas to be developed are largely grasses/landscaping but with a small area where an existing building is to be demolished to accommodate the new hotel building.

1.1 Purpose of this report

The purpose of this report is to demonstrate that the development can be graded and serviced in accordance with the Township of Uxbridge, Regional Municipality of Durham, Lake Simcoe Regional Conservation Authority (LSRCA) and Ministry of Environment and Climate Control (MOECC) development criteria.

1.2 Scope and limitations

This report: has been prepared by GHD for Wooden Sticks Golf Inc. and may only be used and relied on by Wooden Sticks Golf Inc. for the purpose agreed between GHD and Wooden Sticks Golf Inc. as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Wooden Sticks Golf Inc. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section(s) 1.1 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Background Servicing Information

In preparation of the site's stormwater management strategies, the following design guidelines and standards were used to inform the necessary requirements.

- Design Criteria and Standard Detail Drawings for Subdivision Developments and Site Plans, Town of Uxbridge (2016)
- Design Specifications for Engineering Submissions, Regional Municipality of Durham (April 2020)¹
- LSRCA Technical Guidelines for Stormwater Management Submissions, LSRCA (April 2022)²
- Low Impact Development Stormwater Management Planning and Design Guide, Credit Valley Conservation and Toronto and Region Conservation (2010)
- Phosphorus Offsetting Policy, Lake Simcoe Region Conservation Authority (May 2019)
- Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (March 2003)
- Ministry of Transportation (MTO) Drainage Management Manual (1997)

The site-specific stormwater management strategies in this report are based on data contained within the following reports:

- 11225419 - RPT1 - Geotechnical Investigation - Wooden Sticks Hotel Addition
- Site Plan produced by Marc J. Riva Architect (reference SP1.300) July 13, 2022
- Topographic Survey produced by COE FISHER CAMERON (reference 20-17-003-02) dated June 16, 2022

¹ <https://apps.durham.ca/Applications/Works/DCSpecs/List.aspx>

² <https://www.lsrca.on.ca/Shared%20Documents/Technical-Guidelines-for-Stormwater-Management-Submissions.pdf>

3. Development Site

3.1 Existing Site Arrangements

The land on which it is proposed to carry out the development is located within the wider property of Wooden Sticks Golf Course. The areas of development within the property are limited to the northern portions, around the existing parking lot and clubhouse.

The property is bound by Elgin Park Drive to the north, land used by the golf course is to the east and south, and to the west is a wooded area, and west of this woodland is a new area of development comprising of townhouses. **Figure 1** below shows an overview of the development location.



Figure 1 Site Location Plan showing two areas of development on wider property.

Table 1 below presents key details for the site:

Table 1 - Key site details.

Site Name	Wooden Sticks Golf Course
Site Address	Wooden Sticks Golf Inc., 40 Elgin Park Drive, Uxbridge, ON, L9P 1N2, P.O. Box 848
Development area (hectares)	Approx. 0.460ha for parking lot and 0.125ha for new building
Existing land use	Parking lot is located on green space, new building mostly on green space but small area occupied by current banquet hall.
Province	Ontario
Municipality	The Regional Municipality of Durham
Conservation Authority	Lake Simcoe Region Conservation Authority (LSRCA)

3.2 Development Proposals

It is proposed that two areas of the property are developed. This will provide:

- A four-storey hotel with a coverage area of approx. 1250m², 79 hotel units, 148 seat restaurant and meeting facilities
- Parking lot expansion of approx. 170 spaces with associated connecting roadway to the existing parking lot with total area of approx. 4570m²

Proposed development plans are provided in **Appendix A**.

3.3 Existing Site Condition

3.3.1 Parking lot

The proposed parking lot is located east of the existing access route to the club house from Elgin Park Drive. Elevations at the entrance to the property from Elgin Park Drive are approx. 291m (datum not stated by surveyor). Elevations on the land where the parking lot is proposed vary, from a high point of 298.65m, down to 295.50m at the southeast corner, a level change of over 3m.

A copy of the topographic survey for the property is provided in **Appendix B**.

The parking lot is proposed to be on land that currently presents a hilltop location and so elevations fall away in all directions from the parking lot centre. A view from the high point looking northwest is shown below in **Figure 2**, and **Figure 3** shows a view of the property entrance relative to the location for the new parking lot.

Approximately 30% of the area proposed for the new parking lot generally falls west, with the remainder (70%) generally falling in a more easterly direction.

3.3.2 Hotel

The proposed hotel is to be located immediately west of the existing club house. Elevations for the area to be developed range from 295.50m adjacent to the existing clubhouse, falling to 289.50m, a fall of over 6m. The majority of the elevations fall west with the exception of a small area at the south extent of the proposed building, which falls south.

Figure 4 and **Figure 5** show a view of the area of the new hotel, taken from the south. No views of the western extent were available at the time of writing.



Figure 2 View looking north west from the area of new parking lot, looking towards Elgin Park Drive. Photo taken March 2021



Figure 3 View from Elgin Park Drive towards property entrance, parking lot to be on the left. View south east. Source Google Street view (2011).



Figure 4 View of area for new hotel that is to be located, building on far left to be removed to accommodate new hotel. Photo taken looking north east. Photo taken March 2021.



Figure 5 View of area for new hotel that is to be located, building in the centre to be removed to accommodate new hotel. Photo taken looking north west. Photo taken March 2021.

In order to understand the drainage catchment of the property and areas to be developed freely available large scale elevation data was reviewed. This identified that the property occupies the crest of a hill and the two areas to be developed drain ultimately in separate directions. The approximate catchment areas are shown below in **Figure 6**.

In Section 4.1 a detailed appraisal of the runoff route of the parking lot existing land is carried out using the site-specific topographic survey. It is concluded whilst it is located on the watershed boundary the runoff ultimately all flows east.

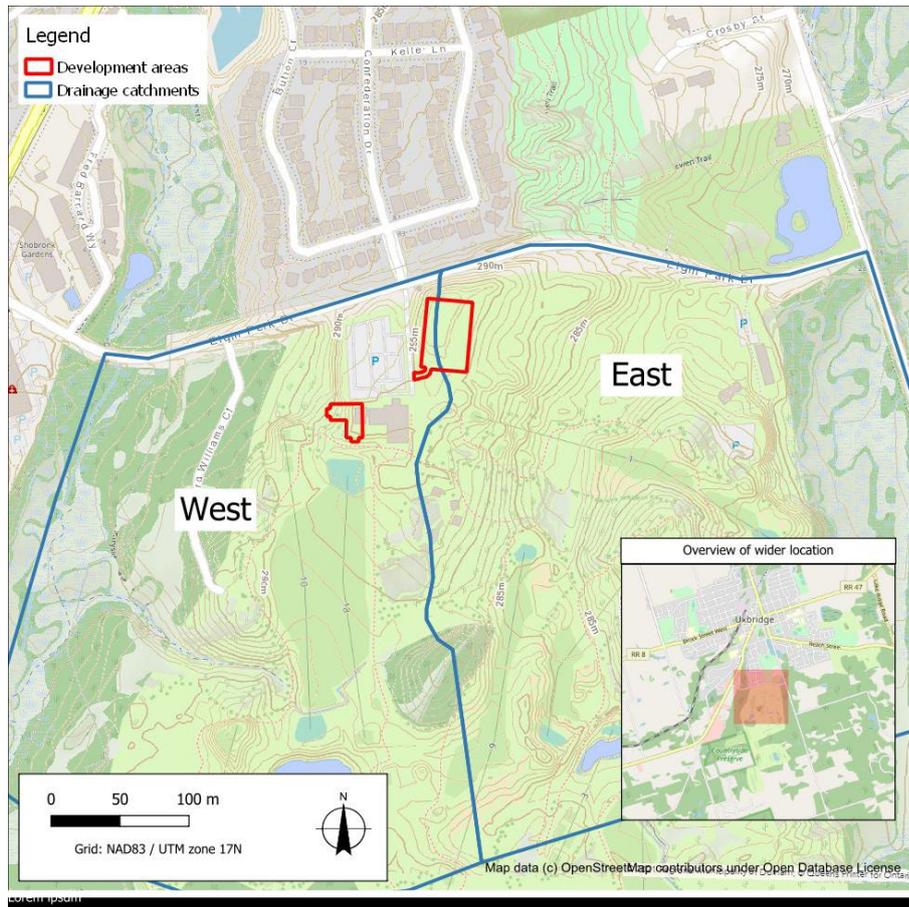


Figure 4 Widescale Catchment Areas - Watersheds

3.4 Peak Runoff Rates

Hydrologic modelling was undertaken using Visual Otthymo (VO) Version 6.0 software, using the 4-hour Chicago design storm distributions to assess predevelopment peak flow rates from the 1 in 2-year through to 1 in 100-year storms.

The proposed development is located within the Township of Uxbridge, therefore the IDF rainfall information was obtained from the Township of Uxbridge design standards. These standards do not include IDF information for the 1 in 50-year storm event, so this return period has been excluded from the analysis.

Model parameters for predevelopment conditions are included in **Appendix C**, along with hyetograph plots of rainfall used. Peak runoff rates for each storm event for the two areas is detailed below in Table 2 and Table 3.

3.4.1 Parking Lot

The parking lot has an area of 0.460 hectares. The existing peak stormwater runoff rates for this area are detailed in Table 2 below.

Table 2 - Parking lot peak stormwater runoff rates (l/s).

Return Period	Peak flow rate (litres per second)
1 in 2-year	11
1 in 5-year	22
1 in 10-year	32
1 in 25-year	43
1 in 100-year	73

3.4.2 Hotel

The hotel has an area of 0.125 hectares. The resultant existing peak stormwater runoff rates for this area are detailed in Table 3 below.

Table 3 - Hotel peak stormwater runoff rates (l/s).

Return Period	Peak flow rate (litres per second)
1 in 2-year	3
1 in 5-year	6
1 in 10-year	9
1 in 25-year	12
1 in 100-year	20

4. Proposed Site Conditions

4.1 Parking Lot

The area of the proposed parking lot is currently open green space that has a high elevation at its centre and falls in all directions to lower elevations. There are no upslope areas contributing runoff to this area, all flows will be generated by precipitation landing on the area.

The western slopes of the area will allow flows to drain towards the property entrance road. The topographic survey of the property shows that no catch basins are present along the property entrance road. Existing discharges will flow along the edge of the road, downhill towards Elgin Park Drive. These will be captured by the concrete channels at the edge of the highway and be conveyed to the double catch basin located on Elgin Park Drive, approximately level with the easternmost extent of the new parking lot. This mechanism of runoff collection applies also to the north facing slopes. A markup of this arrangement is shown below in **Figure 7**. As the catch basin is east of the property, where elevations are lower and continue to fall east, it is assumed that runoff will eventually be drained to the watercourse that flows under Concession Road 7 (approximately 500m east).

The remainder of the runoff from this development area will drain east across open green space associated with the golf course property, before eventually reaching the watercourse that flows under Concession Road 7. This flow mechanism is understood to be via overland flow and is via a single conveyance feature such as ditch or drain.

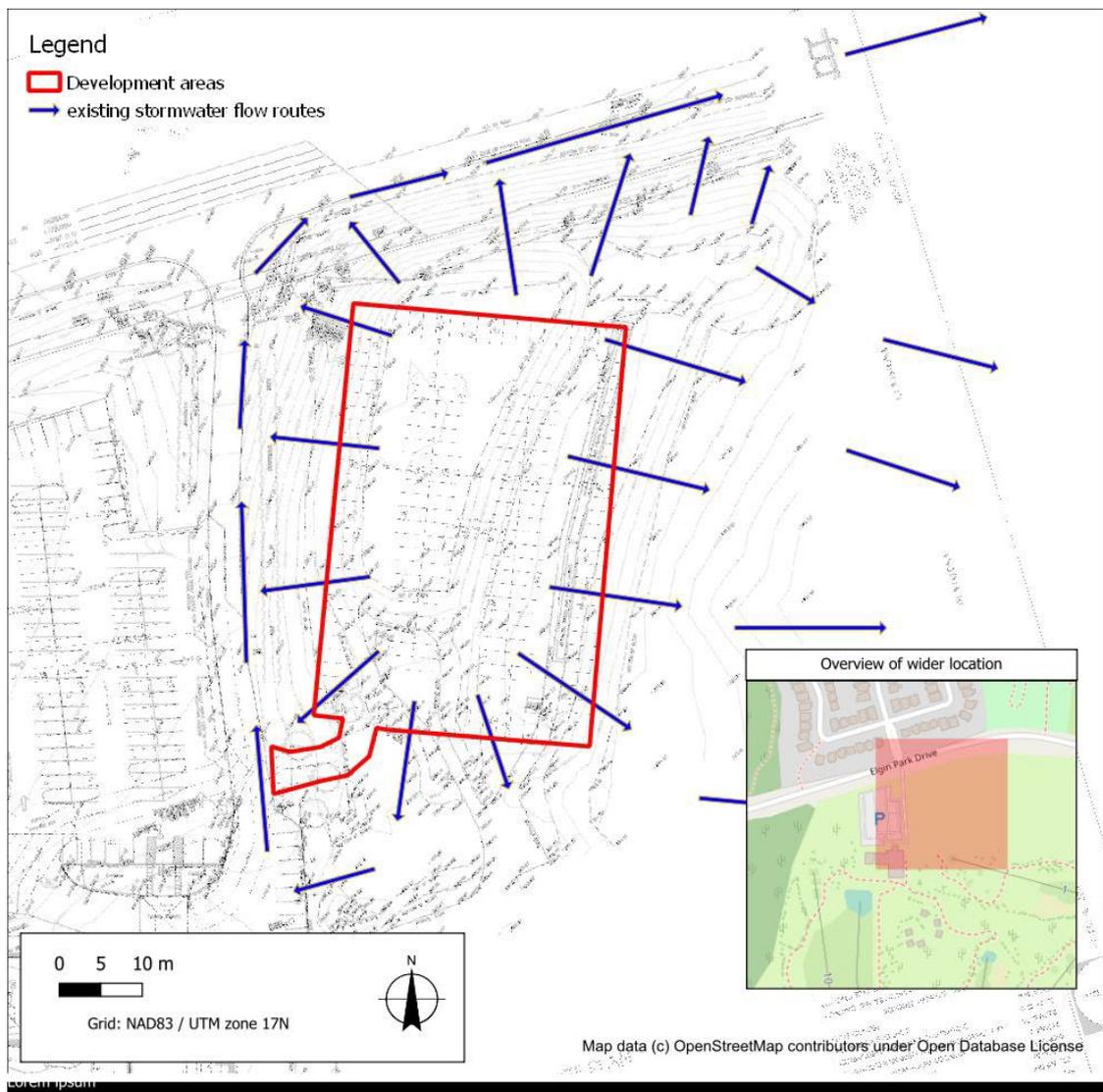


Figure 5 Existing stormwater runoff routes from development area from the north and west slopes of the parking lot area to catch basin on Elgin Park Drive.

Given the above review of elevations of both the proposed parking lot area and wider context, it is concluded that all runoff from the area of new parking lot currently drains east, away from the site. Post development, this runoff direction should be retained to help maintain water balance and flow patterns.

4.2 Hotel

The area of the proposed hotel is located on land that currently falls from east to west. Existing stormwater runoff will drain west into the woodland area and follow the natural grading towards the watercourse approximately 250m west.

It was observed during a site walkover that a new development was to take place on land to the west of the proposed hotel position. To better understand the impact of this development on stormwater runoff routes, a search of submitted documents was undertaken. The Saleville Property FSR (May 2016) identifies that an allowance for stormwater runoff from the Wooden Sticks property have been included in the design of their storm water system. This will intercept any overland flows and discharge them, via a dry pond, to the Elgin Park Drive ditch system, ultimately draining to Uxbridge Brook to the west. A site walkover in July 2022 identified that the outlet headwall from this dry pond allows flows to be conveyed under Elgin Park Drive.

Overall, it is concluded that post development stormwater runoff from the hotel should be drained in a westerly direction to maintain catchment runoff routes, and water balance.

5. Stormwater Management Plan

5.1 Criteria

Table 4 below summarises the stormwater runoff control criteria that have been established based on the design guidelines and standards listed in Section 2.

Table 4 - Stormwater Runoff Control Criteria.

Criteria	Control Measure
Quantity Control	The post-development peak flow rates are not to exceed the corresponding predevelopment peak flow rates for the 1 in 2-year, 1 in 5-year, 1 in 10-year, 1 in 25-year, 1 in 50-year and the 1 in 100-year design storm events ³
Quality Control	All new development must control 100% of the phosphorus from leaving their property ⁴
Erosion Control	As the area to be developed is less than 2 hectares, erosion control is not required ⁵
Water Budget	A water balance is required as the proposal is considered a “major development” under South Georgian Bay Lake Simcoe Region (SGBLS) Source Protection Plan (SPP) definitions due to a ground floor area over 500m ² . ⁶ Every attempt should be made to match post-development infiltration/recharge volumes to predevelopment levels on an annual basis. ⁷

5.2 Best Management Practices Selection

In accordance with the MECP Stormwater Management Planning and Design Manual (March 2003) and LSRCA Technical Guidelines for Stormwater Management Submissions (April 2022), a review of stormwater management best practices was completed using a treatment train approach. This evaluates the application and suitability of each BMP and/or LID across features from lot level, conveyance systems and end of pipe arrangements.

As part of the selection process, the following site characteristics were considered:

- The site stormwater runoff is split into two zones, the parking lot and hotel. These drain in opposite directions due to local topography. Each area will need its own BMP before ultimately discharging to their respective watercourse/ditch.
- The development areas and resultant impermeable surfaces are generally small at approx. 0.460ha for the parking lot and 0.125ha for the new hotel building.
- The Geotechnical Investigation report (June 2021) produced by GHD identifies the regional geology to consist of:
 - Quaternary deposits of glaciofluvial ice-contact deposits comprised of gravel and sand minor till includes esker, kame, end moraine, ice-marginal delta and subaqueous fan deposits.
 - Bedrock of shale, minor limestone of Blue Mountain Formation of the Upper Ordovician era. The Blue Mountain Formation consists of blue-grey, poorly fossiliferous, noncalcareous shale, fissile and is expected to be over 200 m below existing grade.
 - Boreholes drilled in support of the investigative report confirm that subsurface conditions are generally consistent with the regional geology.

³ <https://www.lsrca.on.ca/Shared%20Documents/Technical-Guidelines-for-Stormwater-Management-Submissions.pdf> - page 13

⁴ <https://www.lsrca.on.ca/phosphorus>

⁵ <https://www.lsrca.on.ca/Shared%20Documents/Technical-Guidelines-for-Stormwater-Management-Submissions.pdf> - page 23

⁶ <https://ourwatershed.ca/resources/reports-and-plans/source-protection-plan/>

⁷ <https://www.lsrca.on.ca/Shared%20Documents/Technical-Guidelines-for-Stormwater-Management-Submissions.pdf> - page 24

- Note all drilled boreholes are in proximity to the area of hotel development, no boreholes were drilled at the location of the proposed parking lot expansion.
- Groundwater monitoring in three of the drilled boreholes found that groundwater remained more than 10 meters below ground level (at the borehole locations).
 - The four groundwater monitoring positions are in proximity to the proposed hotel. No boreholes or groundwater monitoring was carried out in the area of proposed parking lot. Elevations are raised at this location and so for the purposes of this report it is assumed that groundwater will also be at least 10m below ground level.
- Based on site soil data, the soil description for the area where infiltration would occur is Silty Sand. Given the presence of sands, it is assumed that infiltration rates will be between 15mm/hr and 50mm/hr. This is to be confirmed at the detailed design stage with site specific test data.
 - For the purposes of this report and sizing of drainage features, a value of 50mm/hr has been assumed. This should be confirmed by on site specific testing (in the area of proposed LIDs) prior to detailed design or construction of any surface water management features.

5.3 BMP/LID Option Analysis

In order to better evaluate the BMP/LID measures that could be used on the property to manage the stormwater runoff a detailed analysis of a wide range of measures was undertaken. **Appendix H** summarises the suitability of a range of BMP/LID controls to manage stormwater and provides a brief reasoning to each options inclusion or exclusion from the proposed stormwater management strategy.

It was concluded of all the 24 measures considered that only two were applicable to the proposals and could be effectively implemented to help manage stormwater runoff. These two are:

- Grassed swales
- Infiltration trenches
 - It was noted that in Section 4.5.8. of the Ontario Stormwater Management Planning and Design Manual states “Similarly, infiltration trenches are not suitable for commercial parking lots since there is a high potential for dry weather spills and for chloride to enter the trench, and subsequently, the groundwater system.”
 - For that reason the infiltration trench will only be used for the area draining the hotel roof runoff and not the parking lot runoff.

Other measures and reasons for not being used as discussed in **Appendix H**.

5.4 Quantity Control

5.4.1 Parking lot

The parking lot will have a total area of 0.460ha. MTO Design Chart 1.07 identifies that runoff coefficients for impermeable surfaces, such as asphalt and concrete, ranges from 0.8 to 0.95. On the basis that the parking lot will be relatively flat (compared to natural surfaces) the more conservative value of 0.95 has been used in runoff calculations.

The note provided with the Design Chart discusses the use of scale factors for return periods above the 1 in 10-year event. As the above value is already approaching 1 (representative of a scenario whereby 100% of rainfall runoff leaves the surface) the scaling factors have not been used on this occasion. They would lead to a value greater than 1, indicating the surface was generating runoff volume, which is not possible in reality. In practice, some flow/volume is lost, as precipitation is stored in local depressions, and subsequently evaporated meaning not all rainfall volumes are conveyed to the swale. However, in order to provide a conservative design, a runoff coefficient of 1 has been used in all calculations.

Based on details in Section 5.3, it is identified that grassed swales are the preferential choice for the quantity control of stormwater runoff at the property. The swale for the parking lot was sized to accommodate the peak volume of runoff from the 1 in 2, 5, 10, 25 and 100-year rainfall events with respective allowable release rates to ensure no increase in discharge rate compared to the existing scenario.

The sizing analysis was undertaken using InnoVizyze (part of the Autodesk group) InfoDrainage software. This analyses the rainfall profile produced in VO used to calculate the existing runoff rates, receiving catchment parameters, conveyance measures, interaction with LIDs and the influence of the outfall restriction method as a dynamic model over time. This approach provides an integrated solution to confidently size LIDs with an appreciation of varying input/output flows during a storm event based on the rainfall hyetograph defined by VO. Whilst in practise, the base and sides of the swale would allow infiltration of runoff to the ground below, the model has excluded this method of discharge to ensure there is sufficient conveyance capacity under a scenario with reduced infiltration rates. Key input parameters and output results are included as part of **Appendix F**.

In order to size a suitable LID feature to manage the peak rate of runoff from the parking lot, a hydraulic model using InfoDrainage of the proposed impermeable surface and a downstream swale was created. This utilised the 0.460ha catchment area, which then has the rainfall intensity profiles for the various storm events (as generated by VO) applied to it and a runoff coefficient of 1 is used to provide a conservative estimate of runoff volumes by assuming small depressions in the car park surface are already full. The resulting runoff from the surface is then discharged to the swale as a lateral inflow, since this reflects the proposed solution where sheet flow from the parking lot will be discharged uniformly into the swale along its' length. The geometry of the swale was iteratively amended to ensure that the peak volume could be retained within the feature, without peak water elevations exceeding the top swale embankment level. Similarly, the diameter of the orifice plates used as the downstream control method, were refined to ensure that the maximum peak flow for a range of storm events is not exceeded.

The design of the swale outlet uses a two-orifice arrangement. A 125mm orifice 350mm above the bed level, and a higher 110mm orifice 450mm above the bed level. This is to ensure that release rates can be controlled for a range of storms. Having the lowest outlet 350mm above the base level provides quality management, by ensuring the attenuation of the first 25mm rainfall depths generated by the parking lot to be infiltrated (without discharge offsite). This elevated outfall provides a total volume of storage, above the grass surface and not in a stone trench due to requirements of the Ontario Stormwater Management Planning and Design Manual, see Section 5.3. The minimum required storage to achieve 25mm rainfall capture is set out in the calculations included as **Appendix F**.

The key design parameters of the swale serving the parking lot are:

- Length: 85m
- Base width: 4m
- Base material: 0.35m raised outlet above grass bed (for first 25mm retention) – no gravel trench
- Top width: 17m
- Minimum depth: 2m
- Bed gradient: 0.02%
- Side slopes: 3.25:1

The swale is to be graded at 500:1, to ensure low velocity of flow along its length. See **Appendix E** for swale arrangement drawings.

The parking lot is to be graded to fall generally east. Stormwater runoff from the parking lot will flow under gravity to the eastern boundary, where it will be intercepted by the swale, with side slopes of 3:1. The swale should be unlined to encourage infiltration into the ground.

The swale will include an outlet with a piped outfall at its downstream end to allow flows passing through the two orifices to drain to the ditch south of Elgin Park Drive, at no more than the allowable release rates. The indicative arrangement and size of these features is shown in **Appendix E**.

Table 5 below shows the maximum flow rates discharging from the swale, assuming no infiltration is achieved, during a range of simulated storm events. These rates are based on the InfoDrainage model results. During all events, the simulated off-site flows are less than the current runoff rates. The size and volume of the feature is governed by the 1 in 100-year storm event. The values shown in Table 5 are an extreme scenario where the infiltration of the ground has entirely ceased.

Table 5 - Simulated release rates - Parking Lot.

Return Period	Allowable flow rate (l/s)	Simulated flow rate (l/s)	Percentage of allowable rate
1 in 2-year	11	2.3	21%
1 in 5-year	22	6.3	29%
1 in 10-year	32	10.1	32%
1 in 25-year	43	14.2	33%
1 in 100-year	73	71.6	98%

The InfoDrainage model identified that the runoff generated by the parking lot can be managed in the swale with release rates no more than existing. A summary of key parameters of the swale during these events is listed below in Table 6. These are values at the peak of the event when the swale is at its most utilised.

Table 6 - Range of peak values for the parking lot swale

Return Period	Velocity in swale (m/s)	Depth of water (m)	Freeboard (peak water level to top retained elevation) (m)	Time to drain (min) *
1 in 2-year	1.1	0.403	1.597	<900
1 in 5-year	1.5	0.455	1.545	<945
1 in 10-year	1.7	0.487	1.513	<1140
1 in 25-year	1.9	0.524	1.476	<1170
1 in 100-year	2.7	1.981	0.019	<1440

* drain time noted as less than as the model includes the raised outlet to ensure the capture of the first 25mm of runoff from the parking lot surface. The model does not drain fully as this volume is captured and allowed to infiltrate in line with necessary guidance.

The outlet headwall and the area of ditch receiving flow from the swale should be suitable designed to manage the risk of erosion from the flow of water exiting the pipe to the ditch.

5.4.2 Hotel

The proposed hotel has a roof area of 0.125ha. It is proposed that the roof runoff is directed to the north corner of the building, via pipework and/or external filter drains as required. Flows will then discharge to a swale with an integrated infiltration trench in the base.

In order to size a suitable LID feature to manage the peak rate of runoff from the hotel roof, a hydraulic model using InfoDrainage of the proposed impermeable surface and a downstream swale was created. This utilised the 0.125ha catchment area, which then has the rainfall intensity profiles for the various storm events (as generated by VO) applied to it and a runoff coefficient of 1 is used to provide a conservative estimate of runoff volumes by assuming any small depressions in the roof surface were already full. The resulting runoff from the surface is then discharged to the swale as a point inflow, since this reflects the proposed solution where runoff is directed via downspouts to pipework before being conveyed to the swale inlet. The geometry of the swale was iteratively amended to ensure that the peak volume could be retained within the feature, without peak water elevations exceeding the top swale embankment level. Similarly, the diameter of the orifice plate used as the downstream control method, were refined to ensure that the maximum peak flow for a range of storm events is not exceeded, where possible.

The sizing and design of the swale serving the hotel has assumed infiltration will not occur, ensuring that the design is appropriately sized for instances where infiltration may have failed or not be possible. There is to be an outlet to the north (where the existing parking lot discharges) that will ensure that events in excess of the 25mm rainfall depth can be safely drained off site.

The key design parameters of the swale serving the hotel are:

- Length: 44m
- Base width: 4m
- Base material: 0.45m deep gravel trench (for first 25mm retention) with grass covering
- Top width: 12.1m
- Minimum depth: 1.35m
- Bed gradient: 0.02%
- Side slopes: 3:1

To size the LID, an InfoDrainage model was developed to simulate the flow through the swale and the effect of the outlet on water levels, over the duration of the storm event. This identified that a swale graded at 500:1 with a 4m wide base, 2.5:1 slopes and a 75mm outlet orifice will control the release rates to those recorded in Table 7. It can be seen that rates for all but the 1 in 2-year event are well below the allowable release rate. The MOE Stormwater Management Planning and Design Manual (March 2003) states the minimum orifice diameter to be used to control discharge is 75mm. Due to the small area being drained and the requirement for a minimum orifice size of 75mm, the existing 1 in 2-year release rate cannot be achieved for the proposals. During this event, there would be a small increase in total flows leaving the areas compared to existing. However, for all other events, there is a significant reduction in release rates compared to existing.

Table 7 - Simulated release rates - Hotel.

Return Period	Allowable flow rate (l/s)	Simulated flow rate (l/s)	Percentage of allowable rate
1 in 2-year	3	4.7	157%
1 in 5-year	6	5.3	88%
1 in 10-year	9	5.7	63%
1 in 25-year	12	6.1	51%
1 in 100-year	20	13.7	69%

The arrangement and size of this feature is shown in **Appendix E**, and outputs from the sizing included as **Appendix F**.

The InfoDrainage model identified that the runoff generated by the hotel roof can be managed in the swale with release rates no more than existing, where possible. A summary of key parameters of the swale during these events is listed below in Table 8. These are values at the peak of the event when the swale is at its most utilised.

Table 8 - Range of peak values for the hotel swale

Return Period	Velocity leaving swale (m/s)	Depth of water at downstream (m)	Freeboard (peak water level to top retained elevation) (m)	Time to drain (min)
1 in 2-year	0.3	0.147	1.203	330
1 in 5-year	0.3	0.193	1.157	350
1 in 10-year	0.3	0.222	1.128	370
1 in 25-year	0.4	0.254	1.096	395
1 in 100-year	0.6	1.350	0	1130

The design of the swale has been sized to operate in the event that infiltration is not possible through the base and sides. The swale has been positioned such that any exceedance of the top water level, such as in events in excess of the 1 in 100-year event, flow can spill over the downstream end in a controlled manor where retained elevations are lowest.

The outlet headwall and the area of land receiving flow from the swale should be suitable designed to manage the risk of erosion from the flow of water exiting the pipe.

5.5 Quality Control

An “Enhanced” level (80% TSS removal) will be achieved using infiltration to remove sediment from stormwater outflows. From Table 3.2 of the MOE Stormwater Management Planning and Design Manual (March 2003), page 3-10, an Enhanced level of suspended solids removal using infiltration requires 40 m³/ha of infiltration volume. This is based on an imperviousness of 85%. The development at this property is limited only to the new parking lot and hotel, both which will have a high percentage of their areas as impervious. Therefore, the highest value available was used to inform quality requirements.

5.5.1 Parking lot

Stormwater runoff from the parking lot will be drained over the surface of the parking lot to a swale that will be located adjacent to the eastern edge of the parking lot. The sides and base of the swale will be grass lined. In line with Ontario Stormwater management plan and SWMP design (section 4) a depth of stone below the swales was not included as this would be classified as an infiltration trench. It is stated in the design guidance that *“infiltration trenches are not suitable for commercial parking lots since there is a high potential for dry weather spills and for chloride to enter the trench, and subsequently, the groundwater system”*.

In accordance with section 3.2.4 of the LSRCA guidelines, new developments *“shall capture and retain / treat on site, the post-construction direct runoff volume from 25 mm of rainfall from all impervious surfaces”*. The volume of the swale serving the parking lot is sized to accommodate and infiltrate within 24⁸ hours, the volume generated by the first 25mm of rainfall whilst also safely conveying the 1 in 100-year design storm flows.

Calculations (**Appendix F**) show that the first 25mm of a rainfall across the 0.460ha will generate approx. 115m³ of runoff. The base area of the swale needed to infiltrate this volume of water in no more than 24 hours, with a rate of 50mm/hr and subject to a 2.5 safety factor⁹, should be a minimum of approx. 96m².

By designing the swale for quantity control for the 1 in 100-year event, the total base area is greater than what is required for quality control. The swale is proposed to have a base of 85m long by 4m wide, providing 340m² of plan area. Using the adjusted infiltration rate (20mm/hr) and the 24-hour drawdown requirement, the peak depth of water needing to be contained to manage the 115m³ is 350mm. The proposed storage depth, measured as water above the base of the swale is 350mm, providing a total of 119m³. This storage depth will be ensured by placing the lowest outlet from the swale a minimum of 350mm above the bed level.

The parking lot has an area of 0.460ha and so based on the requirements to infiltrate 40 m³/ha this area would need to infiltrate 18.4m³ to achieve the 80% TSS removal criteria. As detailed above 119m³ of infiltration volume will be provided as part of the design and so it is considered that 80% TSS removal will be achieved by this area.

5.5.2 Hotel

Stormwater runoff from the hotel will be drained via downspouts and directed towards a swale in the open areas to the north. The sides of the swale will be grass lined and the base include a depth of stone to act as an infiltration trench (with 40% void ratio), with runoff volumes passed from the bed of the swale into the stone below, prior to infiltration.

Calculations (**Appendix F**) show that the first 25mm of a rainfall across the 0.125ha will generate approx. 31.3m³ of runoff. The base area of the swale needed to infiltrate this volume of water in no more than 24 hours, with a rate of 50mm/hr and subject to a 2.5 safety factor, should be a minimum of approx. 65m². Based on the adjusted infiltration rate (20mm/hr) and the 24-hour drawdown requirement, the peak depth of water in the stone below the base of the swale is less than 500mm. The proposed storage depth is 450mm and the base area is approximately 176m² to ensure suitable infiltration can occur.

⁸ LSRCA - Technical Guidelines for Stormwater Management Submissions – April 2022. Appendix B, Table 2 (page 71/157)

⁹ LSRCA - Technical Guidelines for Stormwater Management Submissions – April 2022. Appendix B, Table 2 (page 70/157)

The hotel has an area of 0.125ha and so based on the requirements to infiltrate 40 m³/ha this area would need to infiltrate 5m³ to achieve the 80% TSS removal criteria. As detailed above 31.7m³ of infiltration volume will be provided as part of the design and so it is considered that 80% TSS removal will be achieved by this area.

5.6 Water Balance

The development on the property is small in nature with a total footprint area of 0.582ha. Infiltration will be used to help manage stormwater runoff and provide quality control.

To understand the potential impacts that may occur in the recharge/discharge characteristics related to the proposed development, a preliminary evaluation of the water balance was completed. This evaluation is based on the Site Plan produced by Marc J. Riva Architect (dated July 13, 2022). The objective of the water balance is to illustrate that post-development infiltration within the developable area can meet, or be close to, predevelopment values. The assessment has used detailed parameters such as precipitation, regional evapotranspiration, infiltration, and runoff.

Weather data from Udora was selected, as it was the closest weather station to the site at approximately 18.74 km. While closer weather stations are available, these provide either short or incomplete records of data. To ensure an accurate and full data set was used, the Normals and Averages (1981 – 2010) station results were used for the closest weather station.

The detailed calculations can be reviewed in **Appendix D**.

5.6.1 Predevelopment Water Balance

The predevelopment water balance incorporated the existing soils, slope, and ground cover areas.

The infiltration factor for the area was calculated from data contained within *Hydrogeological Technical Information Requirements for Land Development Applications* (MOE, 1995). The infiltration factor is determined by summing a factor for:

- Topography,
- Soils,
- Cover.

The slopes on this site are generally steep, with slope in the areas of development ranging from 4:1 to 10:1. This means a topography factor of 0.1 (Hilly Land, average slope 28 m to 47 m/km) is considered most appropriate for the development.

The soil conditions encountered within the boreholes sampled, as discussed in **Appendix C**, included “*Sands, Sandy Loams and Gravels overlaying sand, gravel or limestone bedrock, imperfectly drained*” without evidence of clay subsoils or bedrock being encountered. This means a soil factor of 0.4 (Open Sandy loam) is considered most appropriate for the development.

The existing cover in the area of the two developments on the site is considered to be managed grassland, most closely defined here as ‘Cultivated Land’. Woodland is the only alternative cover classification and it can be seen that all areas of development remain beyond woodland extents. This means a cover factor of 0.1 is most relevant to the areas of development.

The total infiltration factor is the sum of the three values listed above: 0.6. This value will inform the proportion of runoff that is able to be infiltrated to the ground, with the remainder, 0.4 flowing overland.

Table 9 below provides a summary of the existing site water balance arrangements and shows that there is approximately 1,031m³ infiltrated per year on the site and approximately a further 687m³ that runs off the site area downslope.

Infiltration rate (mm/yr) is defined in relation to water balance as the volume infiltrated per year (m³) divided by the area generating the runoff (m²) multiplied by 100.

Table 9 - Summary of existing site water balance assessment – values relate to annual volumes and depths.

Area considered in water balance	0.58ha
Total annual precipitation depth (mm)	886.3
Adjusted Evapotranspiration value (mm)	589.9
Total surplus (mm)	296.3
Volume generated by total surplus (m ³)	1,718.54
Infiltration factor	0.6
Volume infiltrated (m ³)	1,031.12
Infiltration rate (mm/year)	17.78
Remaining volume not infiltrated (m ³)	687.42

The development occupies an area of approximately 0.58 hectares. The land is currently shown to comprise of 90% green pervious surfaces and 10% impervious surfaces. Due to the small scale of the impervious surfaces, the lack of any mapped or surveyed stormwater collection infrastructure and the presence of pervious areas immediately adjacent, it is assumed that all runoff produced by approx. 582m² of impervious surface will have the opportunity to be infiltrated into the pervious areas surrounding them. The banquet hall roof drainage arrangements were observed to use downspouts that discharge directly onto pervious areas and not into a stormwater collection network. Therefore, all predevelopment roof runoff from this building would have an opportunity to infiltrate and contribute to the total water balance.

The total volume infiltrated per year is 1,031m³, based on an area of 0.58ha, a precipitation surplus value of 296.3mm (see **Appendix D** for details) and an infiltration factor of 0.6 as set out above. The remained of the stormwater generated but not infiltrated (1 minus the infiltration factor) is 40% of the total, equivalent to 687.4m³.

5.6.2 Post Development Water Balance (No Enhancements)

The assessment of the water budget was repeated for the proposed development, assuming no mitigation techniques. That is, runoff from impervious surfaces is unrecoverable and not infiltrated into the ground. This scenario assumes the LID features have a piped outlet to the respective ditch outlets.

The anticipated impact of the development is related to increased runoff from imperious surfaces such as building roof tops, asphalt paved access and parking areas. The impervious surfaces have zero infiltration capacity in this assessment.

The area generating runoff post development is the full 0.58ha, with an infiltration factor of 0 since all water will be passed to the LID features and downstream, not into the ground below. The precipitation surplus, the depth of rainfall in excess of what will be lost to evapotranspiration, has a value at the site of 296.3mm. Over the area of 0.58ha this would generate 1,718.54m³ per year to be conveyed off site. This is summarised below in Table 10.

Table 10 - Post development - no infiltration - water balance summary.

Area considered in water balance	0.58ha
Volume of above ground runoff	1,718.54
Infiltration rate (mm/year)	0
Percentage change in infiltration	100% reduction (i.e., no infiltration to ground)
Percentage change in discharge	66.6% increase (i.e., volume increase by 687.42 (m ³))

Based upon this scenario, mitigative strategies are required to minimise infiltration losses and reduce storm water runoff as this could increase the risk of flooding downstream compared to the existing conditions. The following section discusses the water balance after considering infiltration options.

5.6.3 Post Development Water Balance (With Infiltration)

The post-development water budget assessment was repeated considering the use of infiltration options within the LIDs proposed for the site. These options are detailed in Section 5.3. The shallow subsurface soils were described in borehole records as, gravelly sand, compact, light brown, moist, silty sand, medium grained, trace gravel, brown, trace clay.

LIDs can work in any soil type, but the presence of sand/gravel helps to promote infiltration and to move water from impervious surfaces to areas where infiltration can occur.

The post-development water balance was assessed on the basis that all runoff from the parking lot and parts of the hotel roof would be directed to their own respective swales, which would be unlined to ensure infiltration could occur.

The proposed LIDs have been sized to ensure they capture and are able to infiltrate the smaller storm events. This is based on the LSRCA volume control regulations that state *“New, nonlinear developments, on sites without restrictions, shall capture and retain / treat on site, the post-construction direct runoff volume from 25 mm of rainfall from all impervious surfaces”*.

This depth of rainfall equates to the 90th percentile storm event. Simply put, it is equivalent to 90% of the annual runoff producing events for the LSRCA watershed¹⁰. The remaining 10% of storm events drained off site will be via local ditches/watercourse (assuming no further infiltration through swale base/sides). Overall, there will be an increase in the volume of water entering the ground compared to existing, which gives a positive water balance. Given the distance from the property boundary, the distance and fall in elevations to the nearby development areas, this small additional volume will not have any measurable effect on watershed-wide water balance and will offer an opportunity to manage water quality requirements with respect to phosphorus. The post development water balance summary is shown in Table 11.

Table 11 - Post development - infiltration of all runoff volume – water balance summary.

Area considered in water balance	0.58ha
Volume of runoff generated and infiltrated (m ³)	1,546.69
Percentage of runoff infiltrated	90%
Infiltration rate (mm/year)	26.67
Volume of runoff generated and discharged (m ³)	171.85
Percentage change in infiltration volume	50% increase (i.e. volume increase by 515.69 (m ³))
Percentage change in discharge volume	75% reduction (i.e. volume decrease by 515.62 (m ³))

The predevelopment scenario identified that based on slope, land cover and soil types, a 0.6 infiltration coefficient was relevant to the site. Post development, to maintain the water balance, it would be necessary to replicate this arrangement, as the total area of runoff remains constant, and ensure that only 60% of the runoff volume generated each year is discharged to the ground via infiltration.

Given the use of infiltration to manage the export of phosphorus (discussed in more detail below) there is a need to increase the volume of water infiltrated into the ground compared to existing. This will allow the proposals to work towards the net zero phosphorus export requirements of the LSRCA guidance.

5.6.4 Third party Water Balance assessment

Separate to the above water balance assessment R.J. Burnside & Associates Limited carried out a water balance assessment for the wider property area. This is documented in “Hydrogeological Assessment and Water Balance” published November 2022, document reference 300050985.0001.

This assessment considers the impact to the full property area (approx. 4.1 hectares) and is summarised as *“The calculations show that with no mitigation measures, the proposed development has the potential to reduce infiltration*

¹⁰ Runoff Volume Control Targets for Ontario (October 27 2016). Accessed via http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2017/012-9080_Runoff.pdf (last accessed September 2022)

by approximately 1,200 m³/year in the study area. As part of the stormwater management plans, it is proposed to direct runoff from the new parking lot and the hotel roof to infiltration swales, which will be designed to infiltrate the 25 mm storm event. With the implementation of these low impact development (LID) measures, the water balance calculations show a potential 40% increase (2,400 m³/year) in infiltration from pre-development conditions.”

It can be concluded that in both assessments an overall increase in infiltration volume will occur post development.

5.7 Phosphorus Removal

The LSRCA Technical-Guidelines-for-Stormwater-Management-Submissions, requires the removal of 100% (zero export target) of the annual TP load from all new or redevelopment, as per the Phosphorus Offsetting Policy (P.O.P.).

The LSRCA Guidelines identify that “*phosphorus levels in Lake Simcoe have led to excessive growth of plants and algae. Stormwater contributes a significant amount of phosphorus into the tributaries and the lake and therefore this loading needs to be controlled.*”

To understand the Phosphorus budget for the site pre and post development, the M.O.E. Lake Simcoe Phosphorus Budget Tool (January 2012) was reviewed. This identifies (in Table 2) that the Pefferlaw/Uxbridge Brook sub watershed has a Phosphorus export value of 0.02 kg/ha/yr for Sod Farm and Golf Course land uses. These are the descriptors which are the closest match to the proposed development site.

The site area is 0.58ha in total, meaning a predevelopment Phosphorus export of 0.012kg per year.

For the proposals, the nearest land use classification in the Budget Tool is ‘commercial/industrial’ (as parking lot use will be high and a large number of people may attend the property each day). This has an export value of 1.82 kg/ha/yr. The post development Phosphorus export value is therefore 0.45kg per year, an annual increase of 0.438kg of Phosphorus.

Based on Figure B1 (Appendix B of the Lake Simcoe phosphorus reduction strategy) removal efficiencies for total phosphorus have been identified for a range of LID measures¹¹. This identifies median TP removal efficiencies for the following measures:

- Dry Pond – 20%
- Wet Pond – 52%
- Wetland – 48%
- **Filtering practises – 59%**
- Bioretention – 5%
- Infiltration practises – 65%
- **Open channel – 24%**

Both areas of the site use infiltration in the base of the proposed swales. The method of entry to each swale varies slightly. The parking lot runoff enters the swale as sheet flow down the side slope, whereas the hotel runoff is piped to a formal inlet. As flow travels across the surface of the grassed swale feature, this will provide filtering to runoff, during shallow flows but as depth increase this will be better represented by open channel flow. Once water is within the swale infiltration will be used to provide management to water quality for the smaller events (rainfall depths up to 25mm, 90% of the annual runoff producing events for the LSRCA watershed¹²) with the remainder draining off site via pipework to the downstream outfalls respectively.

To provide a conservative estimate of Phosphorus removal prior to infiltration, the filtering practises and open channel removal efficiencies were averaged. It is generally accepted that 90% of rainfall events have a rainfall depth of less than 25mm, and for these events, storm water volumes will be discharged via infiltration. However, for larger events, open channel flow is a more appropriate representation of treatment opportunities. The average value of Phosphorus removal prior to infiltration is 41.5%.

Of the 0.45kg TP/yr generated by the development, 41.5% removal will be provided to all runoff by a combination of the filtration and open channel flow in the swale. This will remove 0.187kg Phosphorus per year, with 0.263kg

¹¹ Center for Watershed Protection (2007) *National Pollutant Removal Performance Database – Version 3*

¹² Runoff Volume Control Targets for Ontario (October 27 2016). Accessed via http://www.downloads.ene.gov.on.ca/envision/env_reg/er/documents/2017/012-9080_Runoff.pdf (last accessed September 2022)

Phosphorus per year subsequently discharged through a combination of infiltration and direct discharge to watercourses.

Of this 0.263kg discharged, 90% of the disposal method will be via infiltration, as discussed in the water balance section and supported by designs of LID to attenuate and infiltrate events with rainfall depths of 25mm. The remaining 10% will be via discharge down pipes off the property.

As identified above, infiltration offers a 65% removal of Phosphorus. Discharge of runoff without infiltration will have no further treatment.

With 65% removal of the remaining Phosphorus (0.263kg) this will remove a further 0.171kg per year. The total mass mitigated by the LID measures is therefore 0.358kg Phosphorus per year. From the annual export value of 0.45kg, only 0.092kg Phosphorus per year will remain untreated and be passed downstream. This is an increase compared to the predevelopment scenario (0.012kg/yr) of 0.08kg Phosphorus per year.

There is no further opportunity to include more LID measures that could treat the increased Phosphorus loading generated by the development within the property boundary. Therefore, it is proposed that the client will agree a Phosphorus Offsetting fee with LSRCA for the 0.08kg not able to be mitigated.

6. Sanitary Sewer System

The project site can be serviced by utilizing the existing 200mm diameter sanitary sewer on Elgin Park Drive, located west of the site. The existing sanitary sewer crosses the Elgin Park Drive right-of-way and flows from south to north, draining north through an easement, towards an existing development (Estates of Wooden Sticks, Phase 3) north of Elgin Park Drive.

6.1 Design Parameters

The proposed sanitary sewer system is designed using the Region of Durham design specifications for sanitary sewers. To calculate the approximate peak sanitary flows for design, the following design parameters have been utilized:

- 364 L/person/day (0.0042 L/person/sec) average daily design flow generation rate for residential use.
- 0.26 L/ha/s average infiltration rate when foundation drains are not connected to the sanitary sewer.
- Harmon's formula is utilized for determination of peaking factor. Accordingly, the maximum peaking factor of 3.80 is used.
- Population density of 1.5 persons per unit is used, based on Region of Durham sanitary design criteria.

6.2 Proposed Sanitary Sewer

The proposed hotel will be serviced by proposed 200mm diameter PVC sanitary sewers as shown in drawing 11225804-FSGP. The proposed 200mm sanitary sewer system will connect to an existing 200mm sanitary sewer located in the south boulevard of Elgin Park Drive, northwest of the site boundary.

The sanitary sewer design sheet uses Manning's formula for calculation of pipe capacity on the basis of sewer pipe flowing full. The design is based on the following parameters:

- Manning's roughness coefficient of 0.013 is used.
- The minimum grade of 1% is used for the first upstream leg.
- Minimum pipe size of 200 mm is utilized for the development.
- The velocity in the sewer is greater than the self-cleaning velocity of 0.6m/s and less than the maximum permissible velocity of 3.65 m/s.
- The onsite sanitary sewer peak flow is less than 80% full pipe capacity.

The proposed development will contribute a flow of 1.35 L/s to the existing 200 mm diameter sanitary sewer on Elgin Park Drive. The sanitary sewer system for the proposed development is shown on Drawing 11225804-FSGP (**Appendix E**). CCTV review of the existing sanitary sewer will be required for the Elgin Park Drive sewer.

Refer to Drawing 11225804-FSGP for more details and **Appendix G** for the sanitary sewer design sheet.

7. Water Distribution Network

The proposed development will be serviced by the existing 300mm diameter watermain on Elgin Park Drive. A 150mm diameter PVC domestic watermain, and a 200mm diameter PVC firemain have been proposed to satisfy the water distribution requirements for the site. These water services will be directly connected to a water meter room with a backflow prevention device, located north of the existing parking lot, per Region of Durham standards.

Existing fire hydrants on Elgin Park Drive will not provide sufficient fire protection for the proposed hotel building, therefore a fire hydrant has been proposed within the existing parking lot.

The adequacy for fire protections will be ascertained by the building mechanical consultant. The proposed layout of the watermain system for this hotel development is shown on Drawing 11225804-FSGP, located in **Appendix E**.

8. Sediment and Erosion Control

Sediment and erosion control practices during construction will include, but will not be limited to, standard devices such as:

- silt fences,
- catch basin buffers and
- mud mats

Sediment and erosion controls will be provided throughout all phases of development to ensure that the potential impacts to down gradient properties and the existing storm sewer system are minimized. A detailed Sediment and Erosion Control Plan will be provided at the detailed design stage of this project. Regular maintenance of the erosion/ sediment control measures will be carried out for the duration of construction.

9. Conclusions

This report has been prepared in support of a proposed development at Wooden Sticks Golf Course for the creation of a parking lot and hotel.

The existing runoff arrangements for the areas of the property to be developed have been investigated and found that each of the two areas falls in a different direction due to the property being located at the top of the landscape.

Existing runoff rates have been calculated using VO (V6) for the Chicago 4-hour storm duration. Infiltration of stormwater runoff is understood to be possible on the property with an estimated value of 50mm/hr used to inform LID/BMP sizing. On site confirmation of this rate will be required prior to any construction taking place.

Swales have been proposed to manage the runoff from the two new areas of development, with infiltration in the base to manage water quality and Phosphorus loading to the wider watershed. Sizing calculations have informed the base area required to capture and retain the 25mm depth storm events on site, to be disposed of via infiltration. InnoVize InfoDrainage modelling software has been used to size the two swales proposed for storms up to the 1 in 100-year event. Both swales include an outfall to their respective watercourse/ditches downstream with release rates controlled by orifice plates.

Water balance has been investigated and it was found that the currently approximately 60% of the runoff generated by the areas of development will be infiltrated and contribute to the water balance. To manage water quality and phosphorus loading, there is a higher requirement for infiltration volumes over water balance alone. As such, the overall water balance will be positive.

The existing sanitary sewer system downstream of the subject site will provide sufficient capacity to accept the proposed hotel populations contribution. A CCTV review of the existing sanitary sewer on Elgin Park Drive will be required prior to connecting. The proposal is to connect the new area of development to the existing 200mm diameter sanitary sewer located northwest of the development, beyond the property boundary.

The existing 300mm diameter watermains located on Elgin Park Drive will be adequate to service the proposed development.

Sediment and Erosion Control practices will be implemented during construction to ensure that the potential impacts to down gradient properties and the existing storm sewer system are minimized.

Respectfully Submitted,

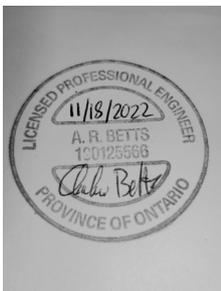
GHD



Duncan Nicholls, B.Sc., M.Sc.
Senior Flood Risk Consultant



Ayesha Deb, E.I.T.
Land Development Designer



Andrew Betts, P. Eng.
Integrated Water Management Engineer

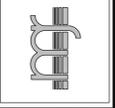


Darren M. Marks, P. Eng.
Project Manager, Urban Planning & Land Development

Appendices

Appendix A

Proposed Development Plans



PROJECT
 PROPOSED RESORT HOTEL
 40 ELGIN PARK DRIVE
 L'VRIDGE, ON

CLIENT
 WOODEN STICKS GOLF

DEVISIONS

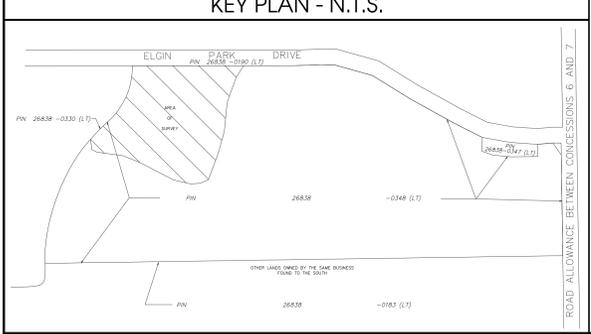
DEVISIONS

DEVISIONS

DEVISIONS

PRELIMINARY

A01



SITE PLAN
 SCALE - 1 : 300

SITE DATA		EXISTING ZONING	OS-11
EXISTING FACILITIES DATA			
GOLF COURSE			18 HOLE
CLUBHOUSE COVERAGE			1,126.1 m ²
CLUBHOUSE GROSS FLOOR AREA			2,252.2 m ²
CLUBHOUSE BUILDING HEIGHT			1 STOREY + BSMT
PARKING SPACES PROVIDED (EXISTING)			194
PROPOSED HOTEL DATA			
PROPOSED HOTEL COVERAGE			1,246.4 m ²
HOTEL GROSS FLOOR AREA (BSMT INCLUDED)			5,398.9 m ²
NUMBER OF HOTEL UNITS			79
HOTEL BUILDING HEIGHT			4 STOREY (17.2 m)
LOADING SPACES			
LOADING SPACES REQ'D - SECT. 50F ZONING BY-LAW			2 SPACES
LOADING SPACES PROVIDED			2 SPACES
REQUIRED PARKING CALCULATIONS			
GOLF COURSE			48 SPACES
CLUBHOUSE PRO SHOP			2 SPACES
CLUBHOUSE DINING AREA (148 SEATS/4)			37 SPACES
CLUBHOUSE BANQUET HALL (391 OCCUPANCY/4)			98 SPACES
CLUBHOUSE STEAM ROOM/LOCKERS			4 SPACES
CLUBHOUSE OFFICE SPACE			12 SPACES
HOTEL SUITES (79 x 1)			79 SPACES
TOTAL NO. OF PARKING SPACES REQUIRED			280 SPACES
TOTAL NO. OF PARKING SPACES PROVIDED			328 SPACES
BARRIER-FREE PARKING SPACES REQUIRED			4 SPACES
BARRIER-FREE PARKING SPACES PROVIDED			9 SPACES
TOTAL PAVED AREAS			11,848.7 m ²

Appendix B

Topographic Survey

REGISTERED BLOCK 71 PART 1 PLAN 4DR 17204 CONFEDERATION DRIVE 40M BLOCK 70 -2151

ELGIN PARK DRIVE
DEDICATED AS PUBLIC HIGHWAY BY-LAW 2001-064, AS IN DR26636
SUBJECT TO EASEMENT AS IN INST. 17753900
PIN 26838
PART 9, PLAN 4DR -17204

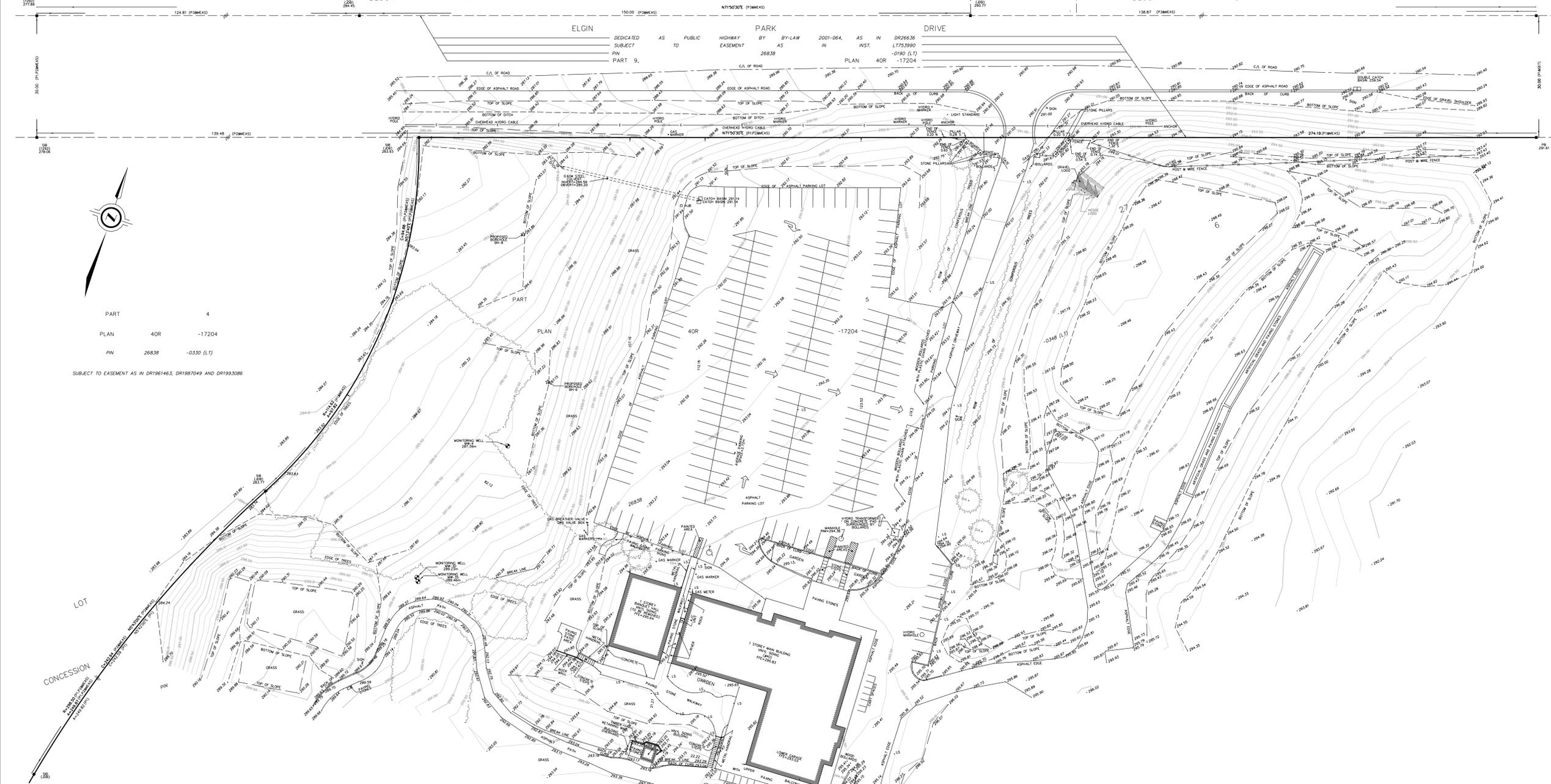
TOPOGRAPHIC SURVEY OF
PART OF LOT 27
CONCESSION 6
TOWNSHIP OF UXBRIDGE
REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 300
COE FISHER CAMERON, A DIVISION OF J.D. BARNES LIMITED
© COPYRIGHT 2022
METRIC DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048



PART 4
PLAN 4DR -17204
PIN 26838 -0330 (L.T.)

SUBJECT TO EASEMENT AS IN DR1961463, DR1987049 AND DR1993086



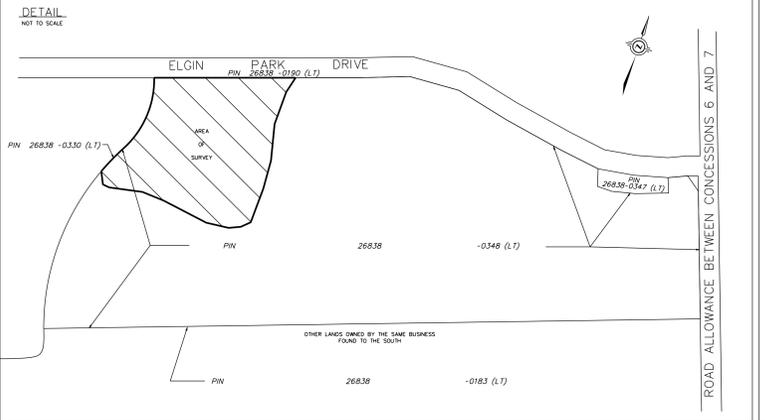
LEGEND
 ■ DENOTES SURVEY MONUMENT FOUND
 ○ DENOTES SURVEY MONUMENT SET
 ○ DENOTES PLASTER BIL
 P1 DENOTES PLAN FOR 17204
 P2 DENOTES REGISTERED PLAN 40M-2151
 P3 DENOTES DATES APRIL 21, 2021 JOB 19-25-721-00
 W1 DENOTES WELLS
 M1 DENOTES MEASUREMENT
 OLS DENOTES O.L.S.
 O.L.S. DENOTES W. F. BARNETT SURVYING LTD. O.L.S.
 F.E.L. DENOTES FINISHED FLOOR ELEVATION
 * LS DENOTES LIGHT STANDARD

ALL SET OR MONUMENTS WERE USED DUE TO LACK OF OVERLAP AND/OR PROXIMITY OF UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF GEOGRAPHY

NOTES
 BEARINGS ARE UTM GRID, DERIVED BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS/2010).
 FOR BEARING COMPARISONS, A ROTATION OF 0110° COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON PLANS P1 AND P2, AND A ROTATION OF 0110° COUNTER-CLOCKWISE WAS APPLIED TO BEARINGS ON P3 TO CONVERT TO GRID BEARINGS.
 DISTANCES SHOWN ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999833.

ELEVATIONS
BENCHMARK
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODESIC DATUM AND ARE DERIVED FROM THE BENCH MARK/S IN 0881977848 HAVING A FINISHED ELEVATION OF 267.90 METRES.
T.B.M.
 ELEVATIONS SHOWN HEREON ARE GEODESIC DERIVED BY GPS OPERATIONS AND ARE REFERRED TO A TEMPORARY SITE BENCHMARK, BEING THE FINISHED FLOOR ELEVATION OF THE MAIN BUILDING, HAVING AN ELEVATION OF 268.85 METRES.

REVISION TO 20-17-033-01
 MAY 18, 2022 - ADDITIONAL TOPOGRAPHICAL INFORMATION OBTAINED TO THE EAST BY ENTRANCE. SEE PLAN FOR SURVEYORS CERTIFICATE AND SIGNATURE.



COE FISHER CAMERON SURVEYING
 LAND SURVEYORS
 A DIVISION OF J.D. BARNES ENGINEERING
 13 COMMERCE PLACE, UNIT 201, LINDSAY, ONTARIO
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DRAWN BY	QC	CHECKED BY	M.A.H.	REFERENCE NO.	20-17-033-02
POSTED	6/7/2022			DATE	06/09/2022

FILE: C:\20-17-033\02\Drawings\20-17-033-02.dwg

Appendix C

**Visual OTTHYMO (V6) Input Parameters
and hyetographs**

Ground conditions

The Visual OTTHYMO modelling requires a number of input parameters to provide runoff rates/volumes. A large variable that can influence these values is the underlying ground conditions of the site. In order to better understand the ground conditions in the two areas of the site the Geotechnical Investigation report produced by GHD (June 2021) was reviewed.

This includes a number of boreholes in the existing parking lot and in proximity to the proposed hotel. There are no boreholes in the area of proposed parking lot.

The nearest boreholes, where ground condition data can be sampled from, are BH-7 and BH-2. BH-7 is located on the western boundary of the existing parking lot. BH-2 is located immediately north of the existing building to be removed to make way for the hotel development.

These boreholes can be summarised as:

- BH-7: 6.6m deep overall, for approx. the first 3.75m described as Fill, GRAVELLY SAND, compact, light brown, moist, Silty Sand, medium grained, trace gravel, brown, Trace clay. Thereafter down to 6.6m description is stated as Native, SM - SILTY SAND, very loose, dark brown, moist to wet.
 - Laboratory results show that for tests of material from 3 to 3.5m the composition is 87% sand and 13% clay and silt.
- BH-2: 12.6m deep overall, for approx. the first 1.5m described as Fill, SILTY SAND with gravel, fine grained, compact, light brown, moist Gravel: 6%, Sand: 55%, Silt: 29%, Clay: 10%. Thereafter to 12.6m the description is Native, SM - SILTY SAND, fine to medium grained, poorly graded, loose, light brown, moist, Trace gravel, compact, Stratified layers, loose.
 - Laboratory results shown that for tests of material from 0.8 to 1.2m the composition is 6% gravel, 55% sand and 39% clay and silt.

Comparing this data to Design Chart 1.08 in Part 4 of the MTO Drainage Manual, identifies the Hydrologic Soil Group as being most closely matched to "AB". This is defined (based in soil texture) as "*Sands, Sandy Loams and Gravels overlaying sand, gravel or limestone bedrock, imperfectly drained*". Ratings of "B" were considered, however without any evidence of substantial clay subsoils or bedrock being encountered, this was not considered to be a reasonable classification for the site area.

In the event that further testing is carried out to better explore soil texture, including in the area of the proposed parking lot, the above value of AB may need to be updated as part of the detailed design work.

Curve Numbers

Curve Numbers (CN) values have been based on Design Chart 1.09 of the MTO Drainage Manual, Part 4. This identifies for a classification of "AB" on land uses covering "*Crop and other improved land*" the value to be used is 70. This is listed as a value based on the mean of AMC II and AMC III.

The value of 70 has been used to inform the existing site runoff regime and to ultimately produce the existing runoff rates in VO. The CN number has no intrinsic meaning but is only a non-linear transformation of S, which is a storage parameter. Simply put it relates the volume of rainfall to the volume of runoff generated by an area. It does not affect the rainfall hyetograph produced by VO.

Post development the runoff from the parking lot and hotel roof have been simulated to generate 100% runoff through the use of a runoff coefficient of 1 in the InfoDrainage model. As the areas generating runoff are all impermeable there is no requirement to update or alter the CN value for the post development arrangement.

Initial Abstraction Values

Initial Abstraction (IA) figures have been based on the values set out in Table 2 of the LSRCA SWM Guidelines (April 2022). This states a figure of 5mm for pervious areas such as lawns, which is the most similar classification to the existing land use on the site.

Time to Peak

Time to Peak (TP) is defined in the LSRCA SWM Guidelines (April 2022) as $t_p = 0.67 t_c$, where t_c is the time of concentration.

The time of concentration for the two areas of the site is extremely short, as the proposed parking lot is located at the highest point in the surrounding landscape, and the hotel is within approximately 50m of the top of the catchment. As the Uplands Method requires the velocity of runoff to be established based on slope, which is steep for both areas, the time of concentration is considered to be only a few minutes for each. The default value for TP of 0.2hrs listed in Visual OTTHYMO has been halved to 0.1hrs (6 minutes) for this assessment.

A, B and C parameters

The values used in Visual OTTYHMO to derive the Chicago 4 hour storm profiles used the following formula:

$I = A/(t+B)^C$

Input data for A, B and C was taken from the Uxbridge Standards as shown below. These have been tabulated below in Table 12 for ease of reference.

Table 12 - Uxbridge IDF input values per storm - Chicago 4hr storm

	A	B	C
1 in 2 year	645	5	0.786
1 in 5 year	904	5	0.788
1 in 10 year	1065	5	0.788
1 in 25 year	1234	4	0.787
1 in 100 year	1799	5	0.810

1. EQUATION FOR TYPICAL INTENSITY-DURATION-FREQUENCY CURVES: T-TIME(MINUTES)
I - INTENSITY (mm/hr)

$$I_2 = \frac{645}{(T+5)^{0.786}} \quad I_5 = \frac{904}{(T+5)^{0.788}} \quad I_{10} = \frac{1065}{(T+5)^{0.788}} \quad I_{25} = \frac{1234}{(T+4)^{0.787}} \quad I_{100} = \frac{1799}{(T+5)^{0.810}}$$

2. THE ABOVE EQUATION ARE ONLY VALID FOR T=10 MINUTES TO 1440 MINUTES

Table 13 - Summary of Visual Otthymo parameters used.

Subcatchment	East (Parking lot)	West (Hotel)
Description	Parking lot	Hotel
DT (minutes)	5	5
Area (hectares)	0.460	0.125
CN	70	70
IA (mm)	5	5
TP (hr)	0.1	0.1

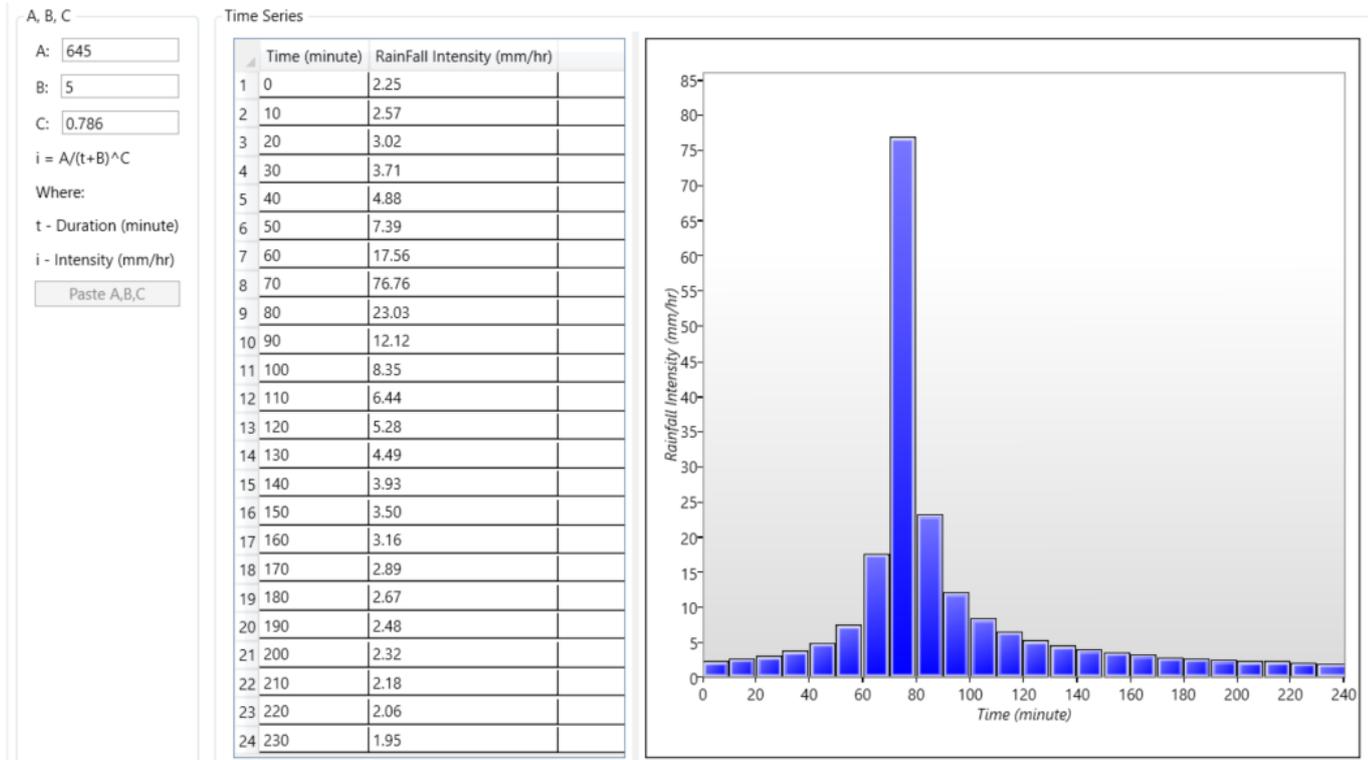


Figure C-1: 1 in 2 year hyetograph exported from Visual Otthymo

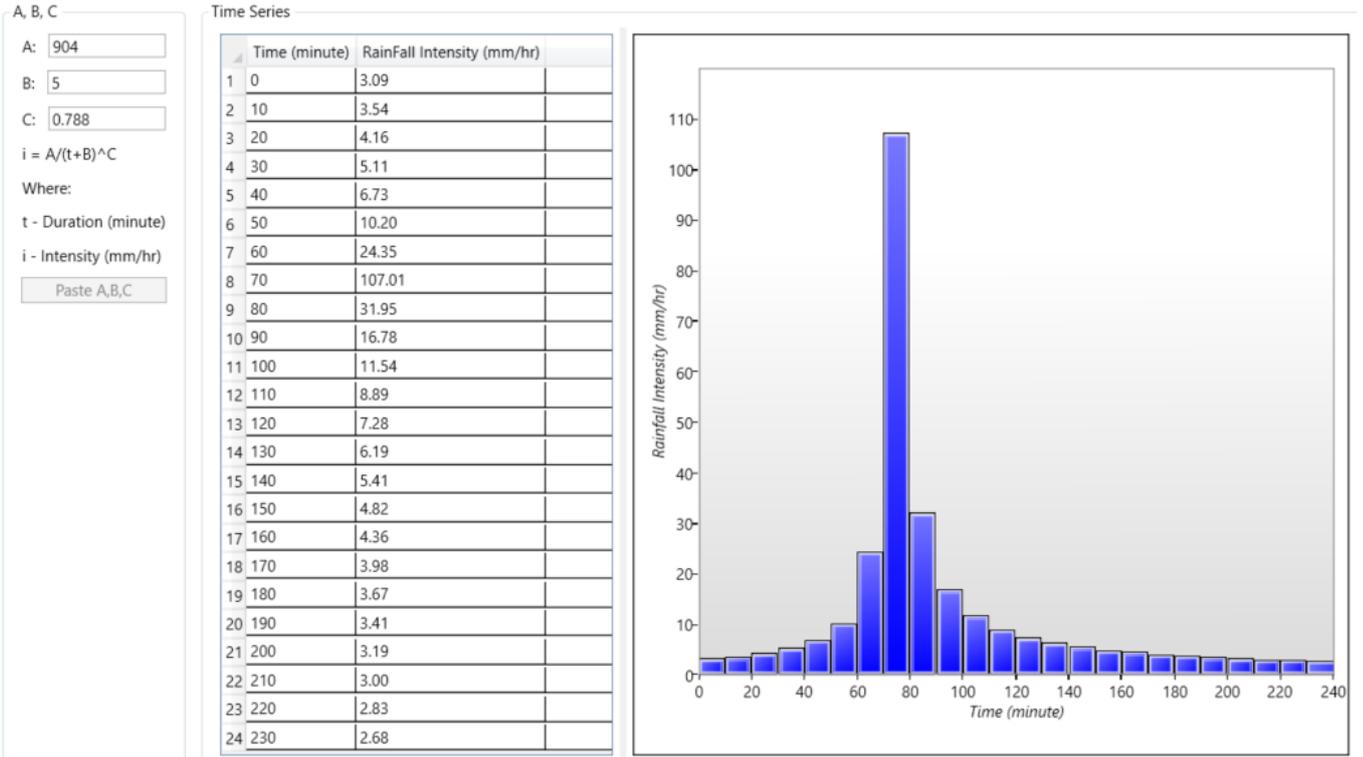


Figure C-2: 1 in 5 year hyetograph exported from Visual Otthymo

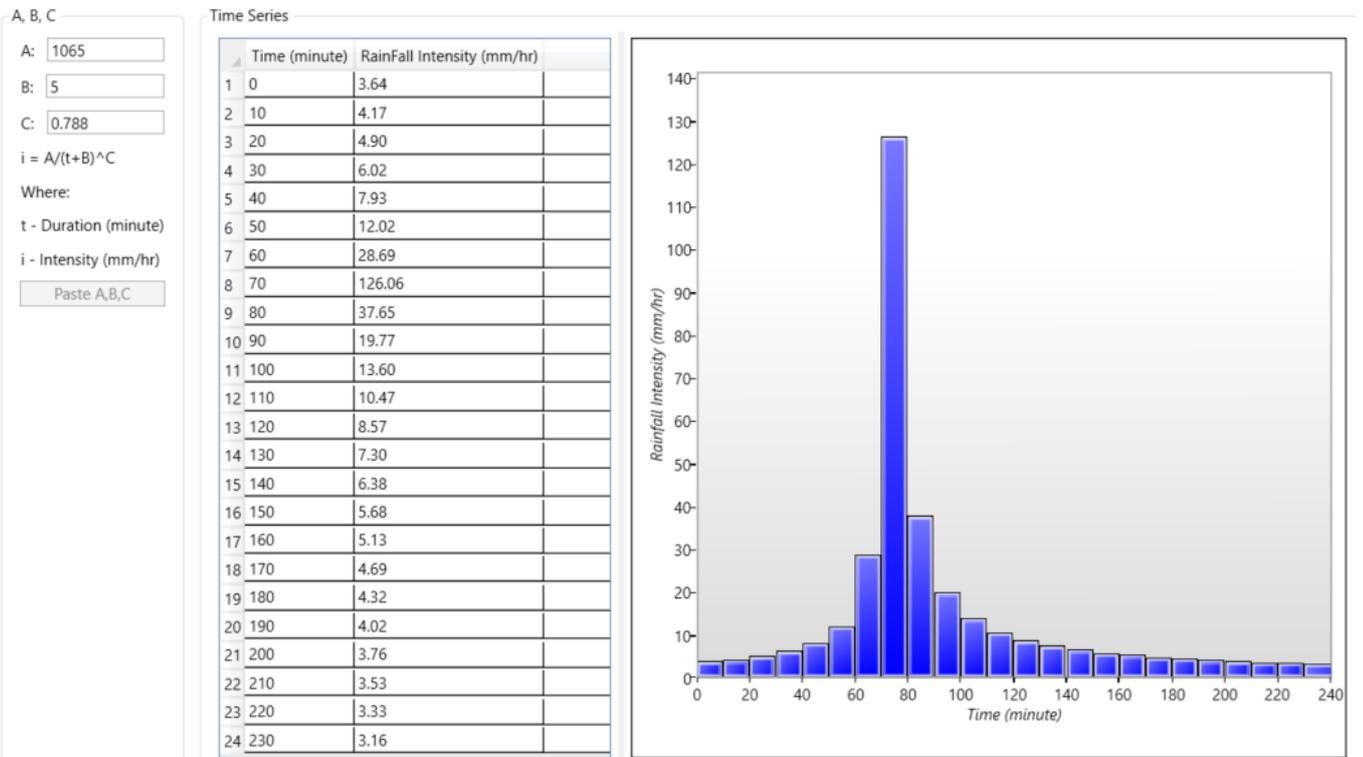


Figure C-3: 1 in 10 year hyetograph exported from Visual Otthymo

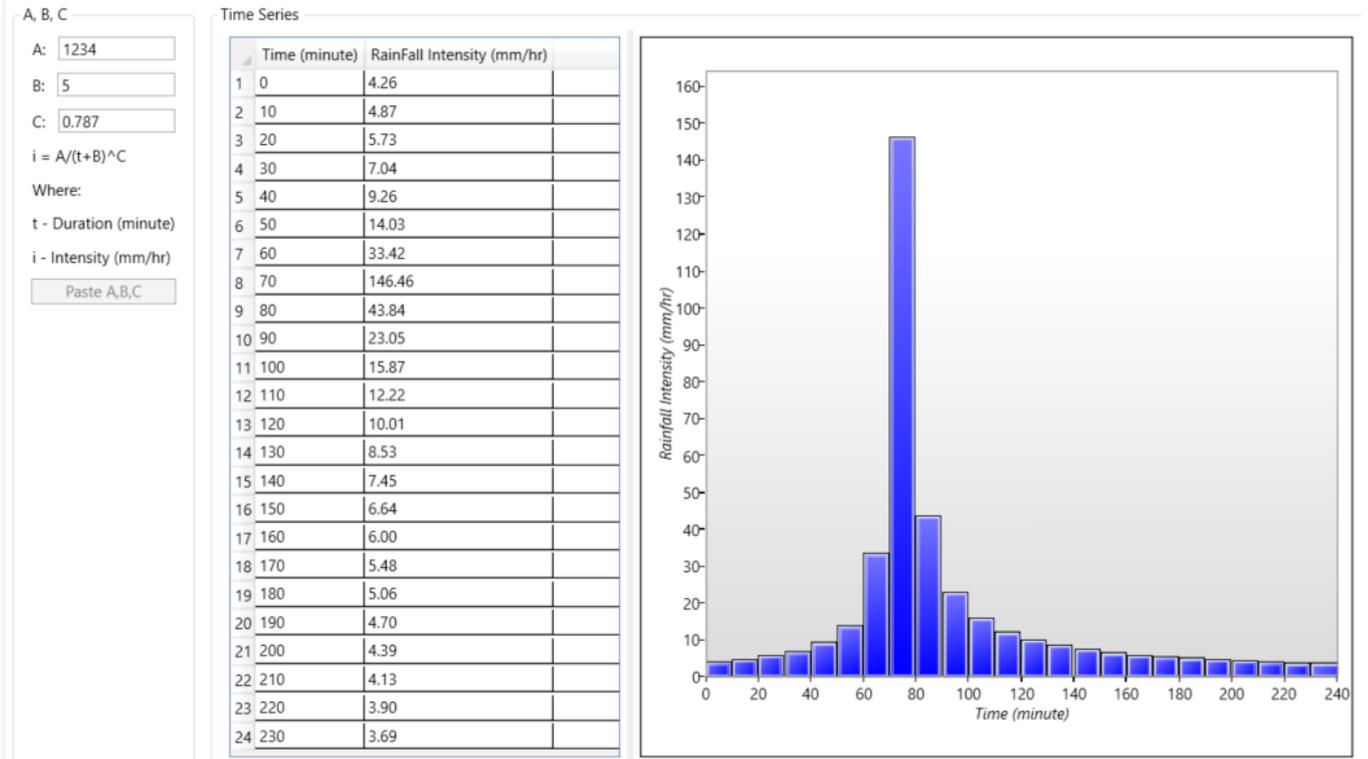


Figure C-4: 1 in 25 year hyetograph exported from Visual Otthymo

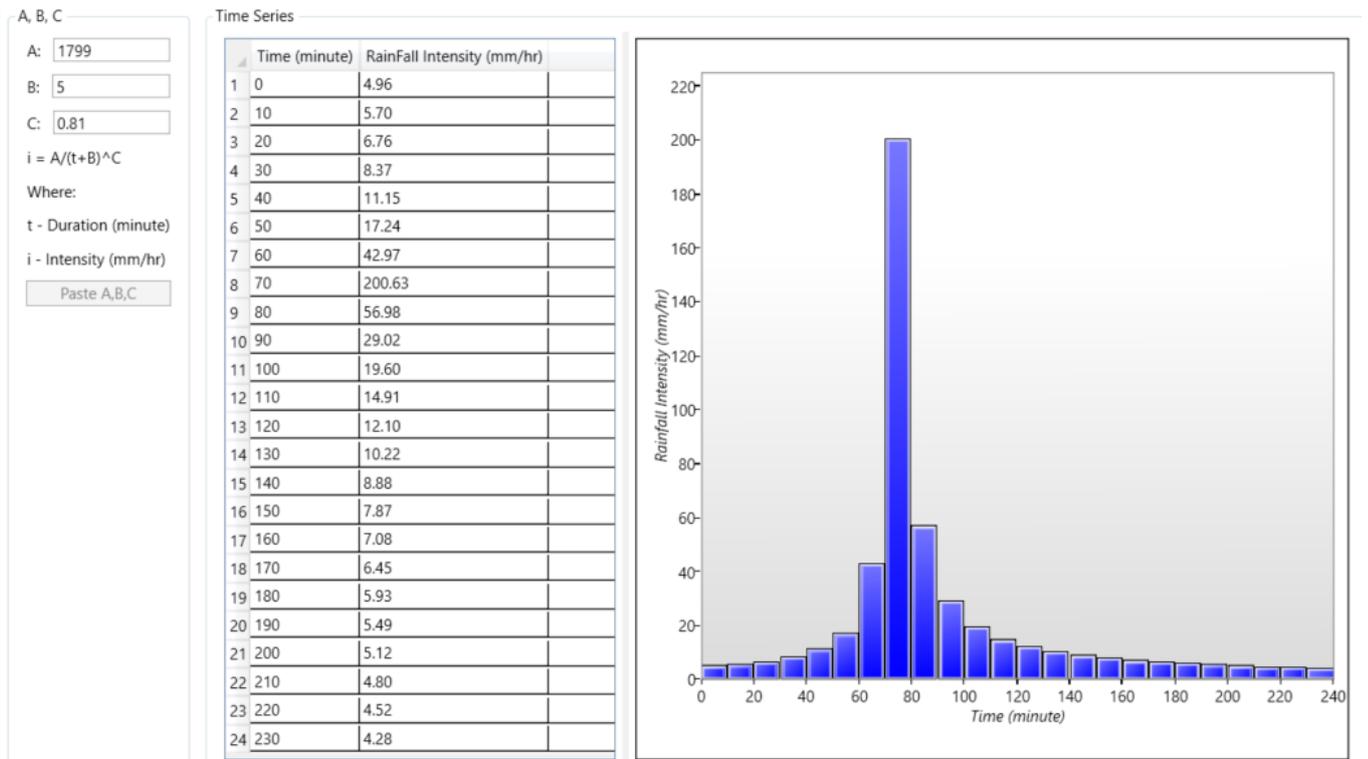


Figure C-5: 1 in 100 year hyetograph exported from Visual Otthymo

Appendix D

Water Balance Calculations

Month	Mean temperature (degrees C)	Heat index	Potential ET (mm)	Daylight Correction Factor	Adjusted ET (mm)	Total precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-7	0	0	0.81	0	64.9	64.9	0
February	-6.6	0	0	0.82	0	45.9	45.9	0
March	-1.3	0	0	1.02	0	53.1	53.1	0
April	5.7	1.22	26.28	1.13	29.70	67.9	38.2	0
May	12.2	3.86	59.15	1.27	75.12	82.1	7.0	0
June	18	6.95	89.54	1.29	115.51	106.6	0	8.91
July	19.9	8.10	99.65	1.30	129.55	86.4	0	43.15
August	19.3	7.73	96.45	1.20	115.74	73.9	0	41.84
September	15.1	5.33	74.25	1.04	77.22	87.3	10.1	0
October	8.6	2.27	40.74	0.95	38.70	74.9	36.2	0
November	2.4	0.33	10.45	0.80	8.36	83.2	74.8	0
December	-4	0	0	0.76	0	60	60.0	0
Total	6.9	35.8	496.51		589.9	886.3	390.2	93.9

TOTAL SURPLUS = 296.3 mm

Udora weather station data used. Location: 44°15'45.000" N , 79°09'41.004" W

Values adjusted for latitude and daylight¹³

Surplus calculated by subtracting adjusted ET from total precipitation. Negative values indicate deficit.

Formulas used include:

$$I = (T/5)^{1.514}$$

E = 0 when T is less than 0 degrees C

E = 16(10T/I)^a when T between 0 and 26 degrees C

E = -415.85+32.24T-0.43T² when T greater than 26 degrees C

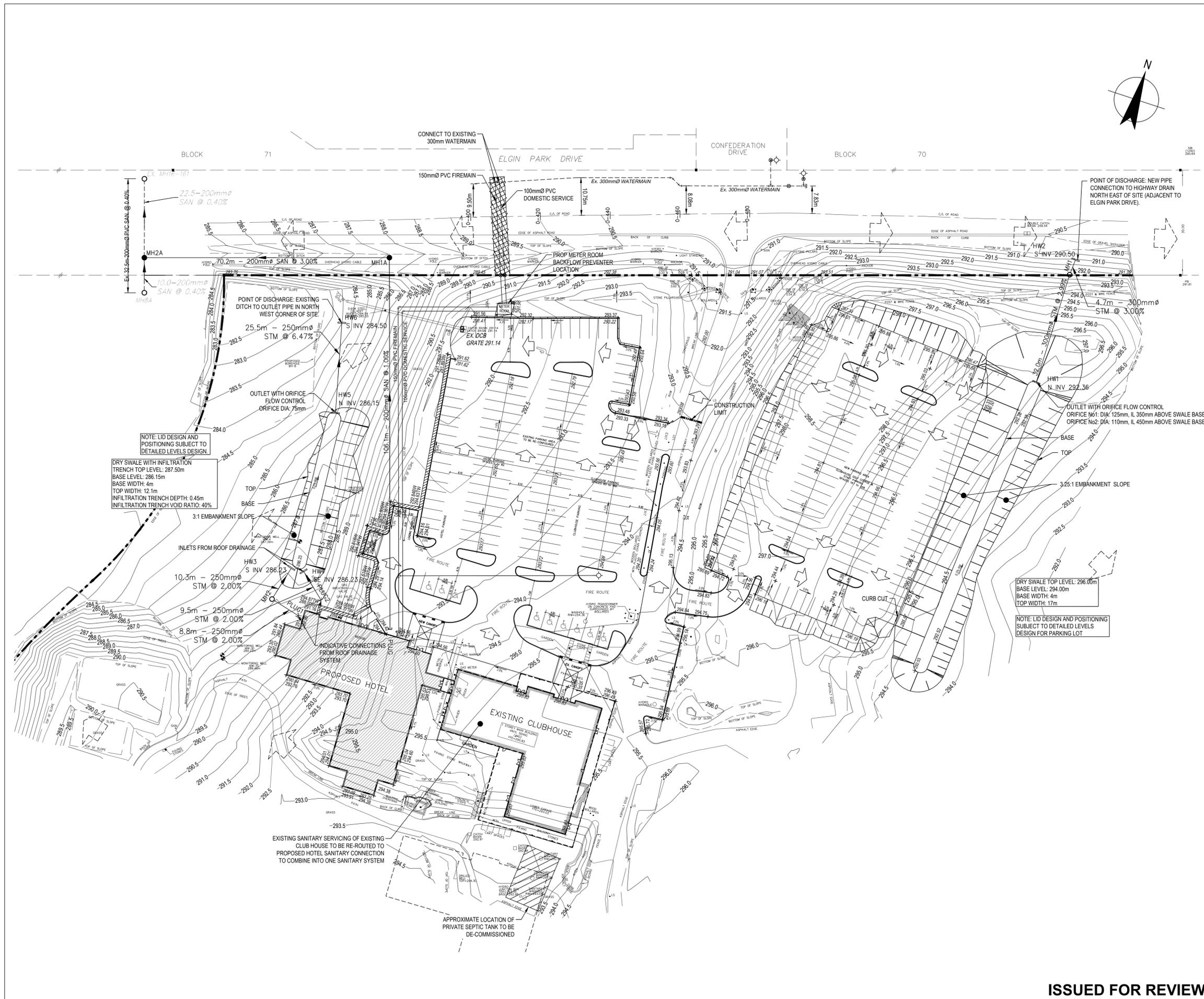
$$a = a = (6.75 \cdot 10^{-7} \cdot I^3) - (7.71 \cdot 10^{-5} \cdot I^2) + (0.01792 \cdot I) + (0.49239)$$

$$= 1.0661$$

¹³ <https://cpb-us-w2.wpmucdn.com/sites.uwm.edu/dist/4/288/files/2016/11/exer4551-2fr2mk6.pdf> - page 6

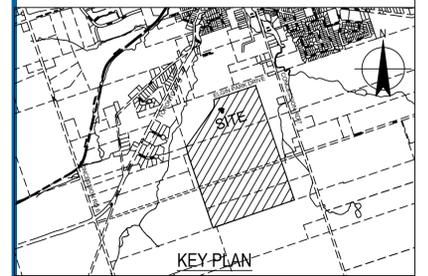
Appendix E

**Functional Servicing and Grading Plan
(FSGP)**



LEGEND

PROPOSED	EXISTING	DESCRIPTION
●	●	SANITARY MANHOLE
○	○	STORM MANHOLE
□	□	DOUBLE CATCHBASIN
+	+	FIRE HYDRANT
⊕	⊕	WATER VALVE
⊕	⊕	SIAMESE CONNECTION
+	+	ELEVATION
±	±	GRADE
---	---	EXISTING GROUND CONTOUR
---	---	DEPRESSED CURB
---	---	EXISTING OVERLAND FLOW ROUTE
---	---	PROPOSED OVERLAND FLOW ROUTE
---	---	3:1 SLOPING
---	---	PROPOSED RETAINING WALL
---	---	SAW-CUT TRENCHING



No.	Revision	Drawn	Job Manager	Project Director	Date
<p>Drawing Revisions</p> <p>Note: * Indicates signatures on original issue of drawing or last revision of drawing</p> <p>GHD Inc.</p> <p>Conditions of Use: This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.</p>					



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Client **WOODEN STICKS GOLF**

Project **40 ELGIN PARK DRIVE**

Title **FUNCTIONAL SERVICING AND GRADING PLAN**

Scale: 1:500m	DO NOT SCALE
Drawn: A.DEB	
Design: A.DEB	
Drafting: G.BECKER	
Check:	
Design Check: D.MARKS	
Approved (Project Director): D.MARKS	
Date: NOVEMBER 2022	

This Drawing must not be used for Construction unless signed as Approved

Drawing No. **11225804-FSGP** Original Size **Arch D**

Rev. **1.0**

ISSUED FOR REVIEW

Appendix F

Sizing Calculations

F-1 Infiltration sizing



CALCULATIONS

Project Name	Wooden Sticks Golf Course Expansion
Project #	11225804
Infiltration Gallery Sizing	

	Hotel	Parking lot	
A_{imp} = Impervious Area	1250	4600	m ²
Rainfall Depth Captured	25	25	mm
V_{req} = Volume Required	31.3	115.0	m ³
P = Measured Infiltration Rate	50	50	mm/hr
S = Safety Correction Factor	2.5	2.5	
P_{des} = Design Infiltration Rate	20	20	mm/hr
n = Void Ratio	0.4	1	
t = Retention Time	24	24	hr
$A_{req} = V/(P*n*t)$ = Bottom Area Required	65.1	95.8	m ²
L = Proposed Length	44.0	85.0	m
W = Proposed Width	4.0	4.0	m
A = Bottom Area Provided	176.0	340.0	m ²
Impervious Area:Footprint Ratio	7.1:1	13.5:1	
$d_{max} = (P*t)$ = Max Allowable Depth	0.48	0.48	m
d = Proposed Depth	0.45	0.35	m
V = Volume Provided	31.7	119.0	m ³

F-2 Parking lot swale sizing

Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflows Storm Phase: Phase	Company Address:			



Catchment Area

Type : Catchment Area

Area (ha)	0.443
-----------	-------

Dynamic Sizing

Runoff Method	Time of Concentration
Volumetric Runoff Coefficient	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junctions Storm Phase: Phase	Company Address:			

Name	Junction Type	Easting (m)	Northing (m)	Cover Level (m)	Depth (m)
MH10	Manhole	650413.370	4884263.758	294.500	1.200
MH11	Manhole	650424.709	4884263.041	294.100	1.200

Name	Invert Level (m)	Chamber Shape	Diameter (m)	Manhole Locked
MH10	293.300	Circular	1.200	<input checked="" type="checkbox"/>
MH11	292.900	Circular	1.200	<input checked="" type="checkbox"/>

Inlets

Junction	Inlet Name	Incoming Item(s)	Bypass Destination	Capacity Type
MH10	Inlet	Pipe (1)	(None)	No Restriction
MH11	Inlet	Pipe	(None)	No Restriction

Outlets

Junction	Outlet Name	Outgoing Connection	Outlet Type
MH10	Outlet	Pipe	Free Discharge

Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:			



Swale

Type : Swale

Swale

Exceedence Level (m)	296.000
Depth (m)	2.000
Base Level (m)	294.000
Top Width (m)	17.000
Side Slope (1:x)	3.25
Base Width (m)	4.000
Freeboard (mm)	0
Length (m)	85.000
Long. Slope (1:x)	500.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	1785.000

Inlets

Inlet

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

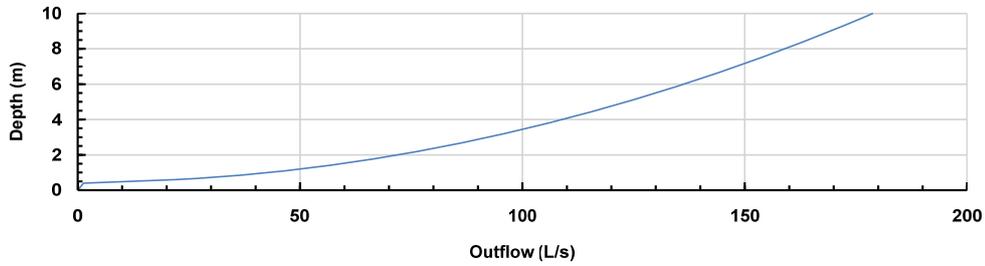
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Controls Storm Phase: Phase			Company Address:	

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Multiple
Invert Level (m)	294.000

Combined Outflow



Orifice

Diameter (m)	0.125
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.350

Orifice

Diameter (m)	0.110
Coefficient of Discharge	0.600
Depth Above Invert (m)	0.450

Advanced

Swale

Porosity (%)	100
--------------	-----

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		



Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
Pipe	11.362	Pipe	28.404		0.6	450	294.500	293.300
Pipe (1)	6.442	Pipe	9.203		0.6	450	296.170	294.000

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Flow Restriction (L/s)
Pipe	294.100	292.900	
Pipe (1)	294.500	293.300	72.0

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address:		



Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Swale		Time of Concentration	0.443	100	0	100	0.443
TOTAL		0.0		0.443				0.443

Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address:			

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
MH11	Free Discharge		

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.44	1480.1	2217.172

Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:			



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.44	180.1	286.610

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.44	155.0	246.058

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.44	131.6	209.177

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.44	94.4	151.068

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH10	294.500	293.300	293.415	0.115	71.6	0.130	0.000	71.6	2101.868	OK
MH11	294.100	292.900	293.004	0.104	71.6	0.000	0.000	71.6	2101.868	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH10	294.500	293.300	293.349	0.049	14.2	0.055	0.000	14.2	173.264	OK
MH11	294.100	292.900	292.947	0.047	14.2	0.000	0.000	14.2	173.264	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH10	294.500	293.300	293.341	0.041	10.1	0.046	0.000	10.1	132.960	OK
MH11	294.100	292.900	292.940	0.040	10.1	0.000	0.000	10.1	132.960	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH10	294.500	293.300	293.333	0.033	6.3	0.037	0.000	6.3	96.593	OK
MH11	294.100	292.900	292.932	0.032	6.3	0.000	0.000	6.3	96.593	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH10	294.500	293.300	293.320	0.020	2.3	0.022	0.000	2.3	38.920	OK
MH11	294.100	292.900	292.920	0.020	2.3	0.000	0.000	2.3	38.920	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Swale	295.981	295.981	1.811	1.981	1480.1	1638.656	0.000	0.000	71.6	2101.883	8	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Swale	294.524	294.524	0.354	0.524	180.1	203.558	0.000	0.000	14.2	173.271	89	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Swale	294.487	294.487	0.317	0.487	155.0	182.283	0.000	0.000	10.1	132.966	90	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Swale	294.455	294.455	0.285	0.455	131.6	164.556	0.000	0.000	6.3	96.599	91	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Swale	294.403	294.403	0.233	0.403	94.4	137.111	0.000	0.000	2.3	38.923	92	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	Pipe	MH10	MH11	294.5	293.415	0.109	2101.868	2.4	0.12	71.6	OK
Pipe (1)	Pipe	Swale	MH10	296.2	295.896	0.100	2101.877	2.7	0.07	71.6	Surcharged

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		




Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	Pipe	MH10	MH11	294.5	293.349	0.048	173.264	1.6	0.02	14.2	OK
Pipe (1)	Pipe	Swale	MH10	296.2	294.439	0.042	173.267	1.9	0.01	14.2	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	Pipe	MH10	MH11	294.5	293.341	0.041	132.960	1.4	0.02	10.1	OK
Pipe (1)	Pipe	Swale	MH10	296.2	294.402	0.036	132.964	1.7	0.01	10.1	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		




Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	Pipe	MH10	MH11	294.5	293.333	0.032	96.593	1.2	0.01	6.3	OK
Pipe (1)	Pipe	Swale	MH10	296.2	294.370	0.028	96.597	1.5	0.01	6.3	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		




Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	Pipe	MH10	MH11	294.5	293.320	0.020	38.920	0.9	0	2.3	OK
Pipe (1)	Pipe	Swale	MH10	296.2	294.318	0.018	38.922	1.1	0	2.3	OK

Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



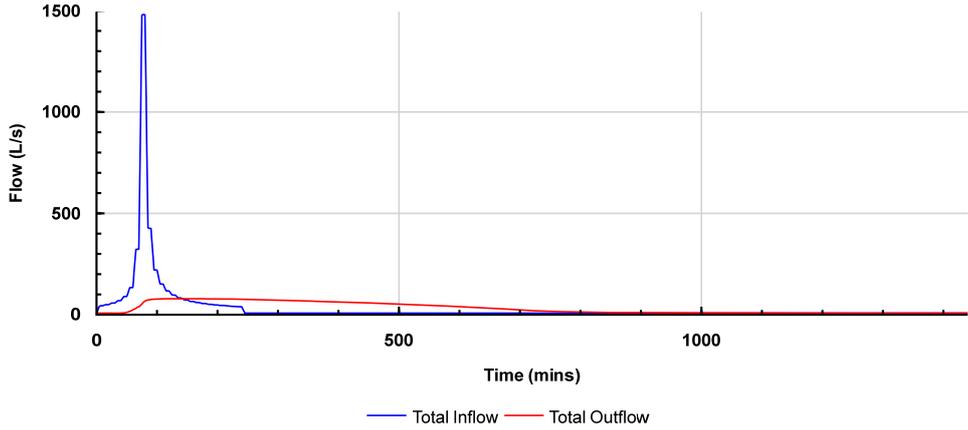
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Tables

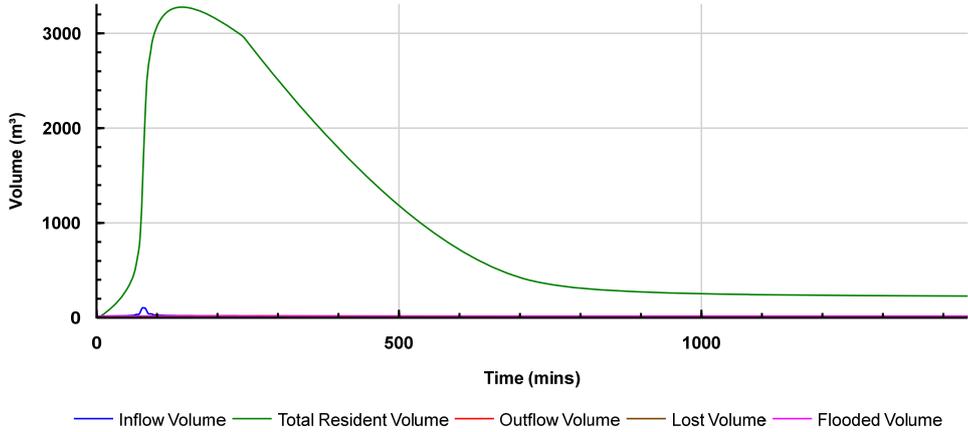
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
MH11			71.6	2101.868
TOTAL	1480.1	2217.172	71.6	2101.868

Graphs

Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



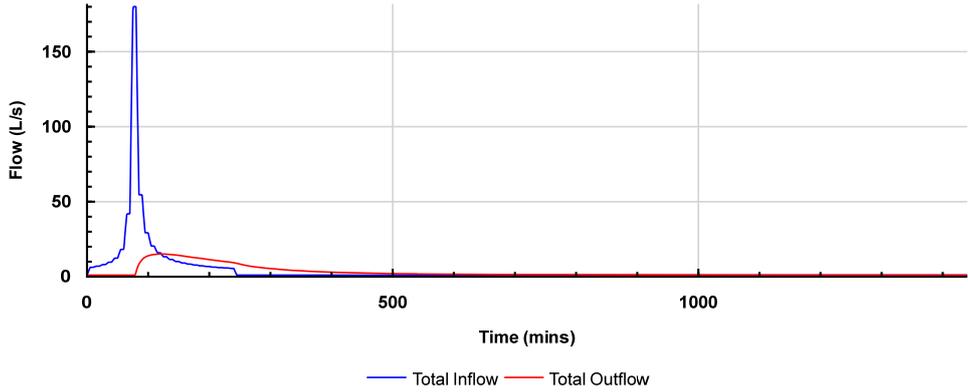
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Tables

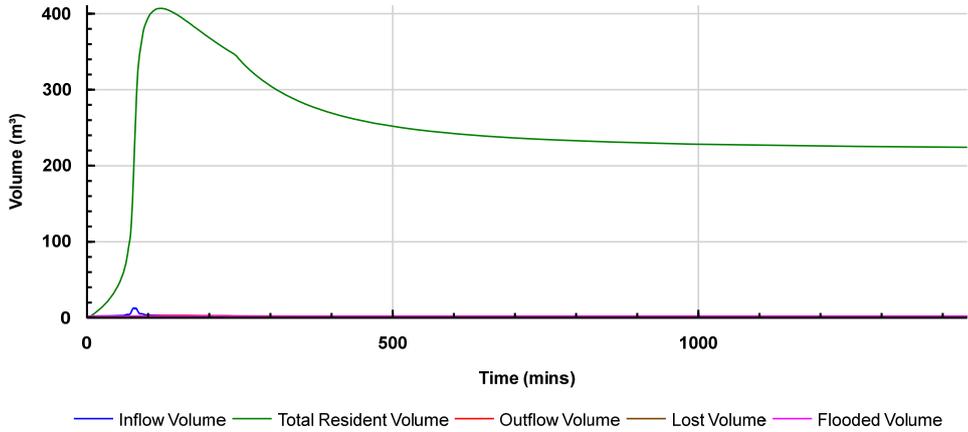
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
MH11			14.2	173.264
TOTAL	180.1	286.610	14.2	173.264

Graphs

Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		

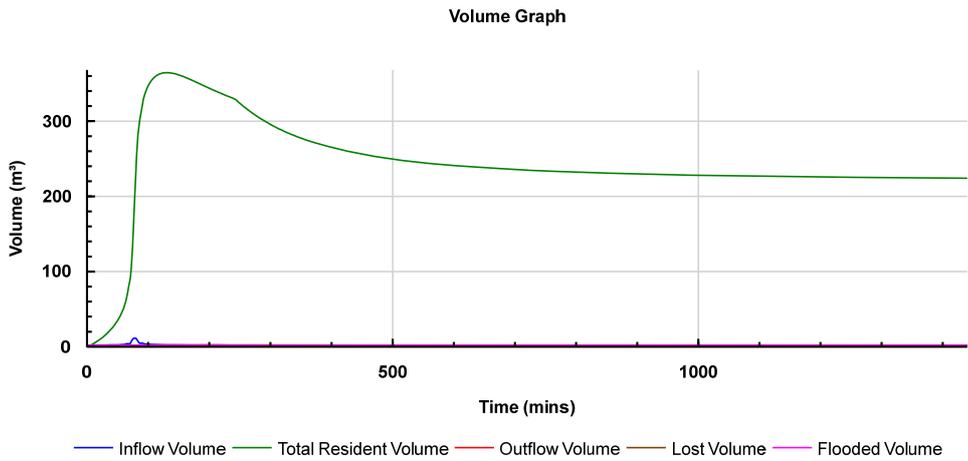
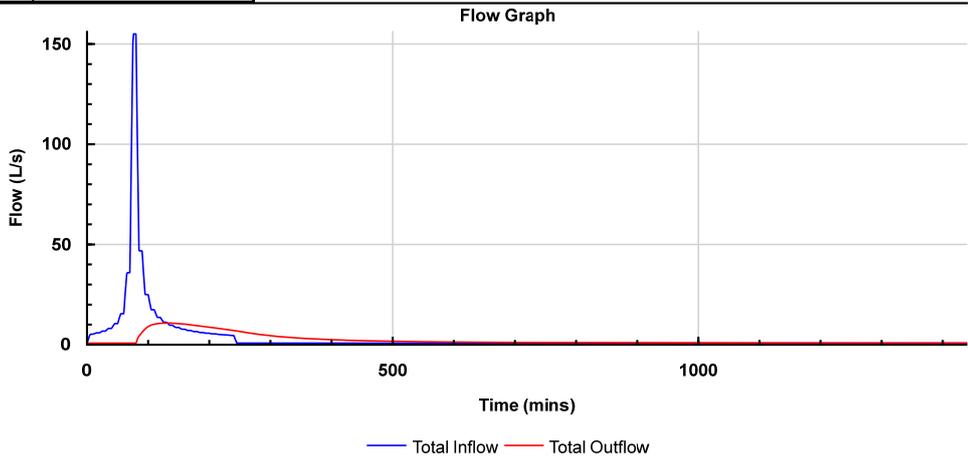


Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
MH11			10.1	132.960
TOTAL	155.0	246.058	10.1	132.960

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



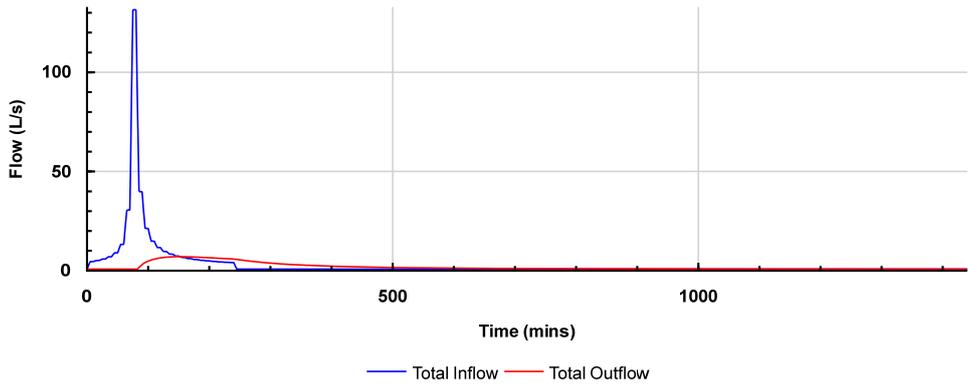
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Tables

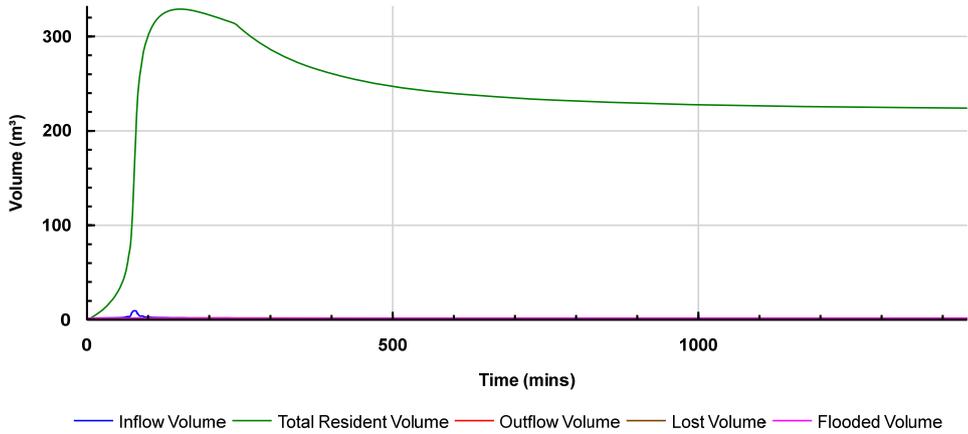
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
MH11			6.3	96.593
TOTAL	131.6	209.177	6.3	96.593

Graphs

Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



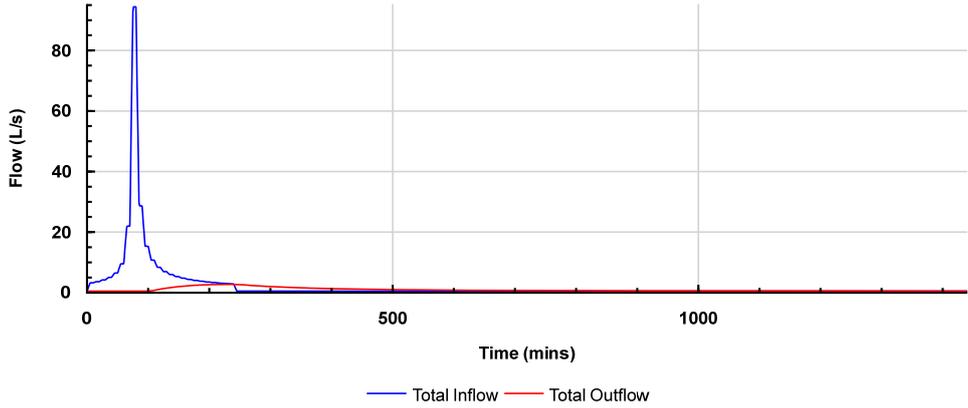
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Tables

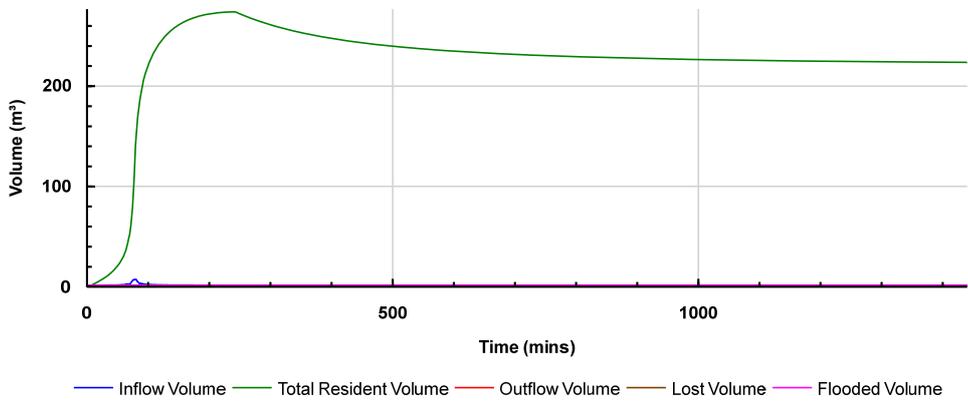
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
MH11			2.3	38.920
TOTAL	94.4	151.068	2.3	38.920

Graphs

Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:			



Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

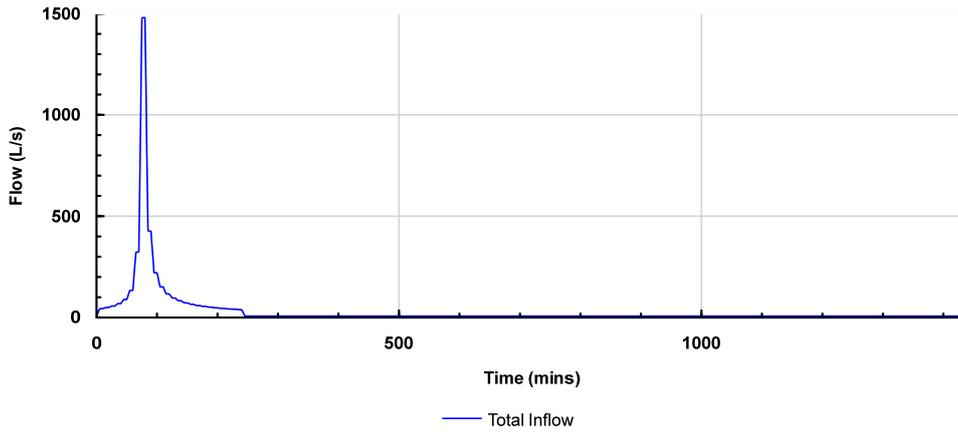
Type : Catchment Area

Inflow

Max. Inflow (L/s)	1480.1
Total Inflow Volume (m³)	2217.172

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

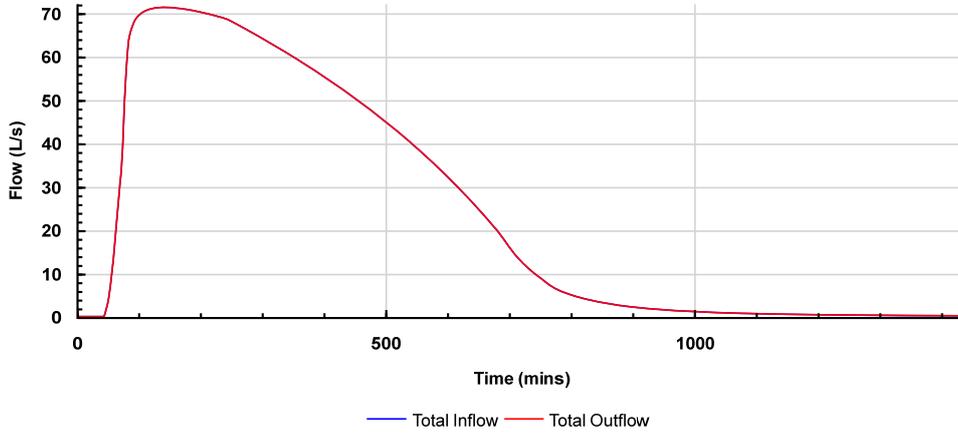


MH10
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

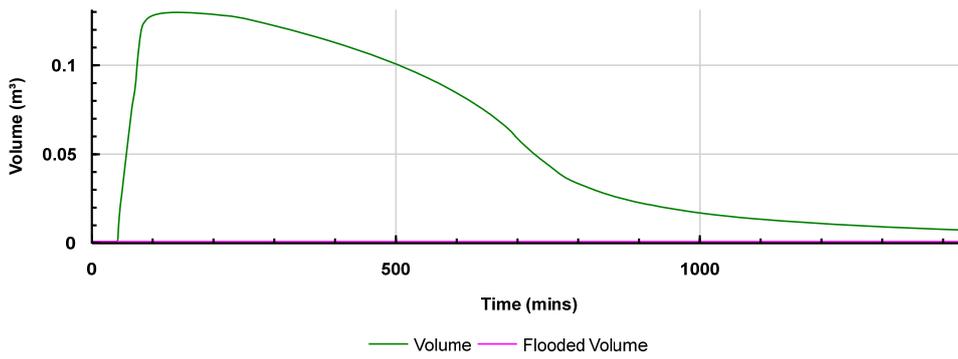
Type : Manhole

Graphs

Flow Graph

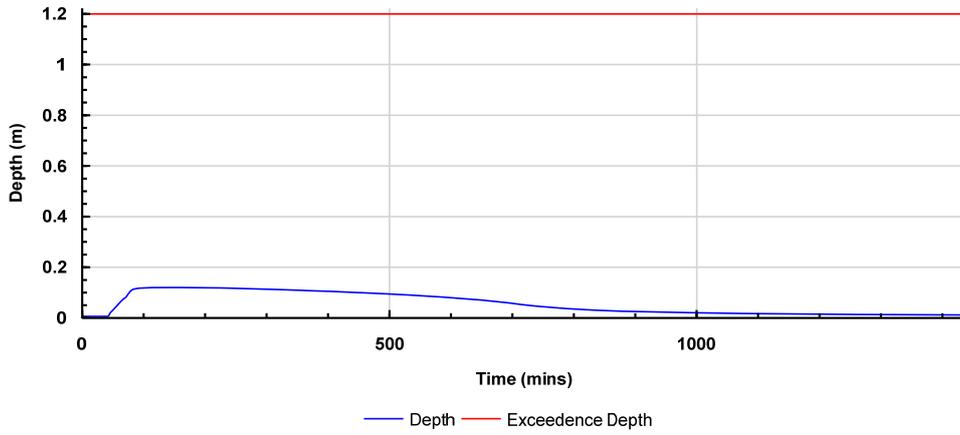


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



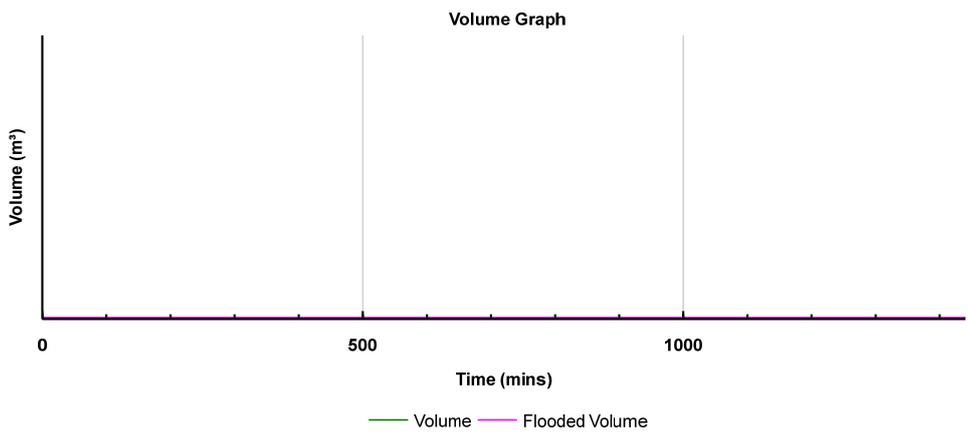
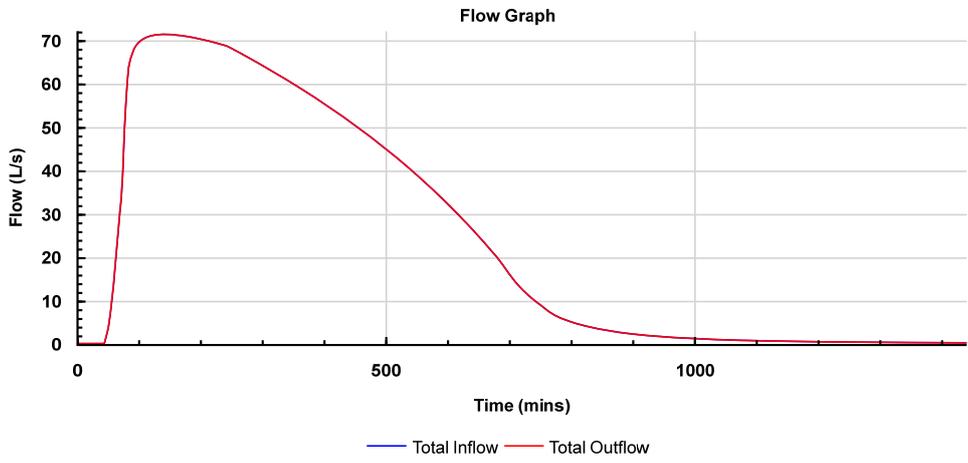
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			



MH11
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

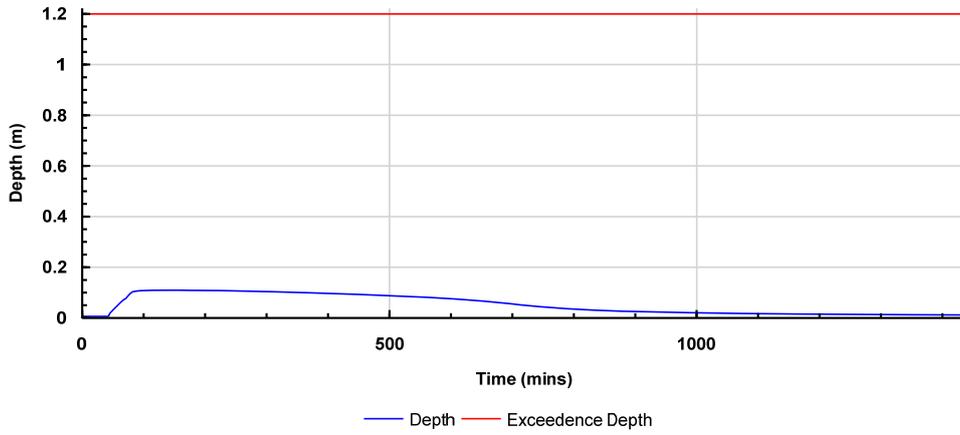
Type : Manhole

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

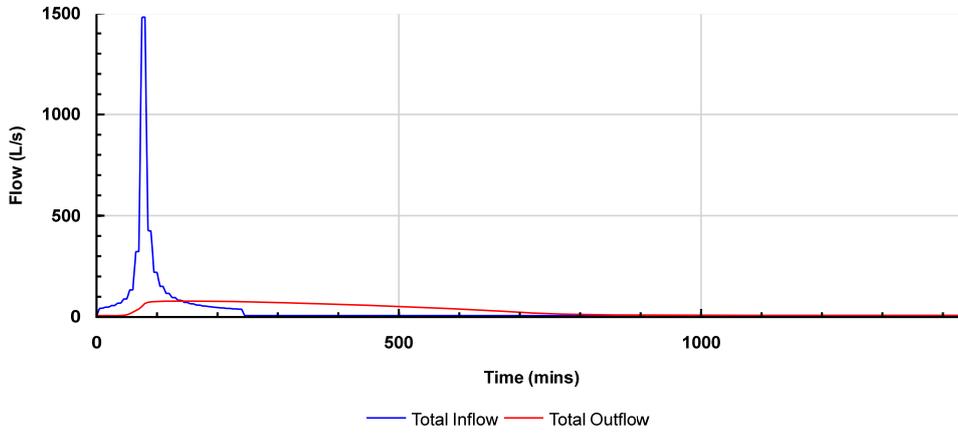


Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

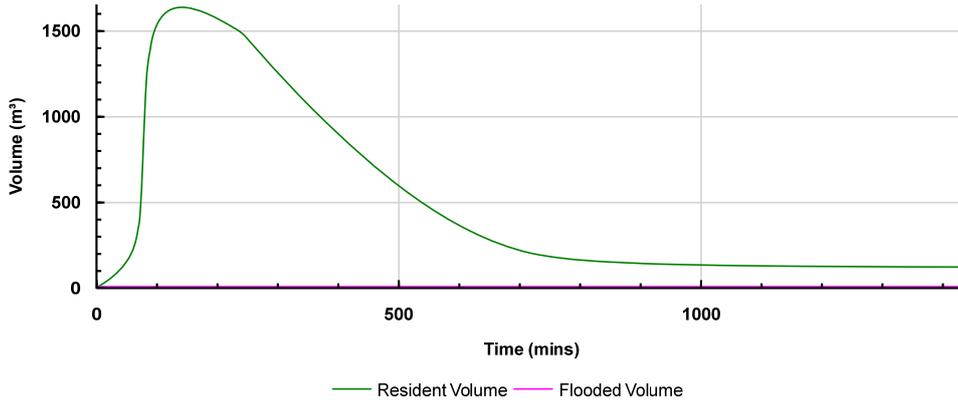
Type : Swale

Graphs

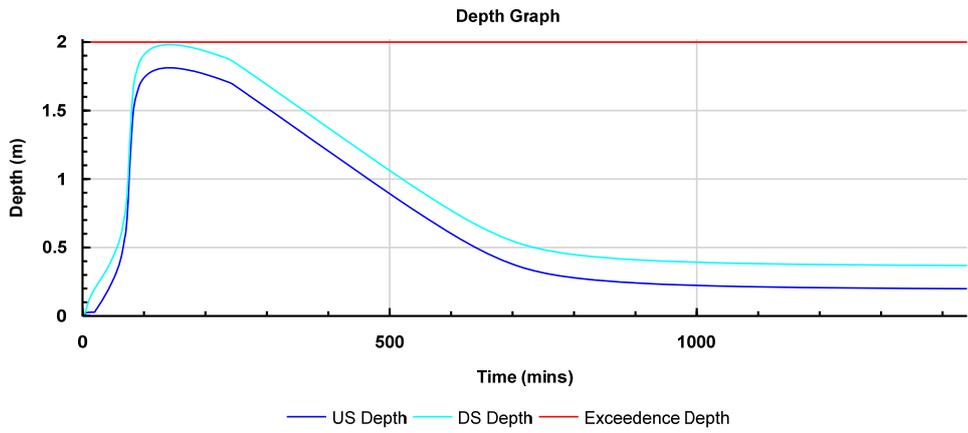
Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			



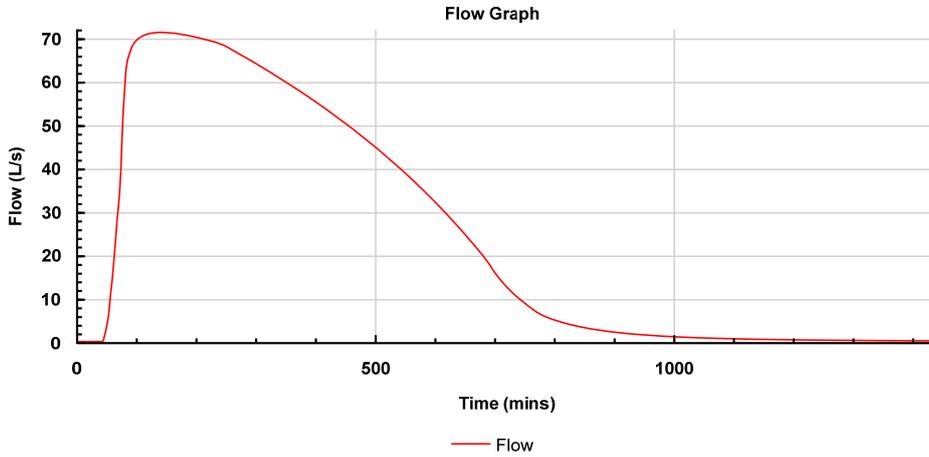
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs



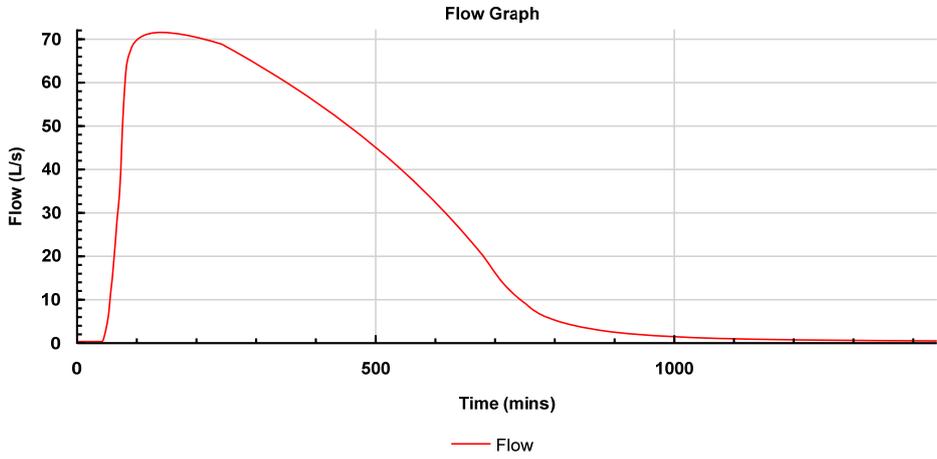
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:			



Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

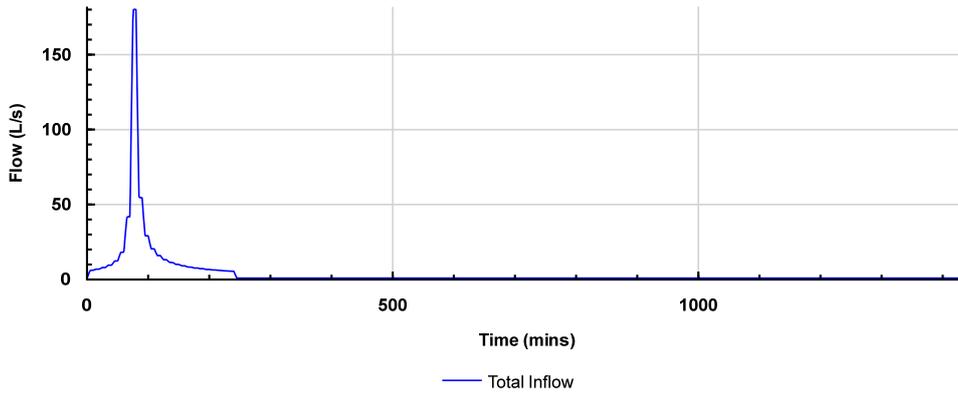
Type : Catchment Area

Inflow

Max. Inflow (L/s)	180.1
Total Inflow Volume (m³)	286.610

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

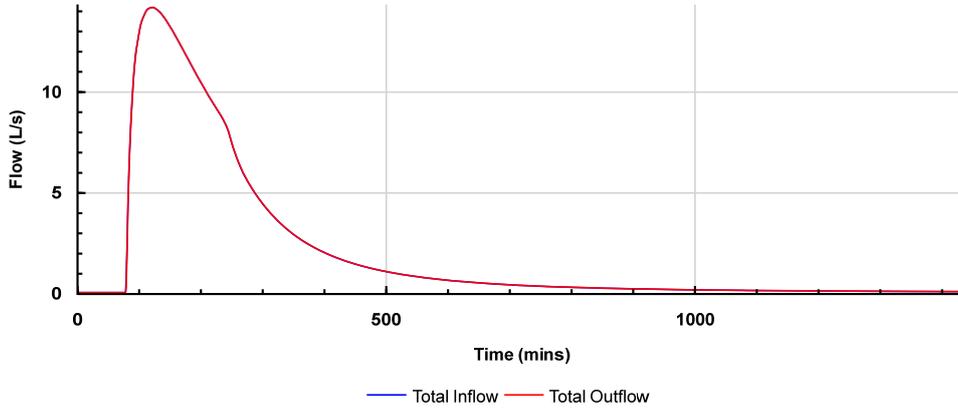


MH10
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

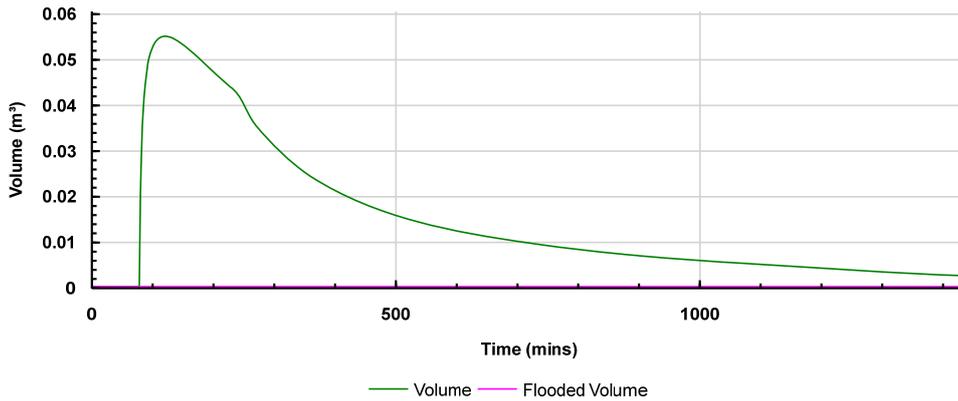
Type : Manhole

Graphs

Flow Graph

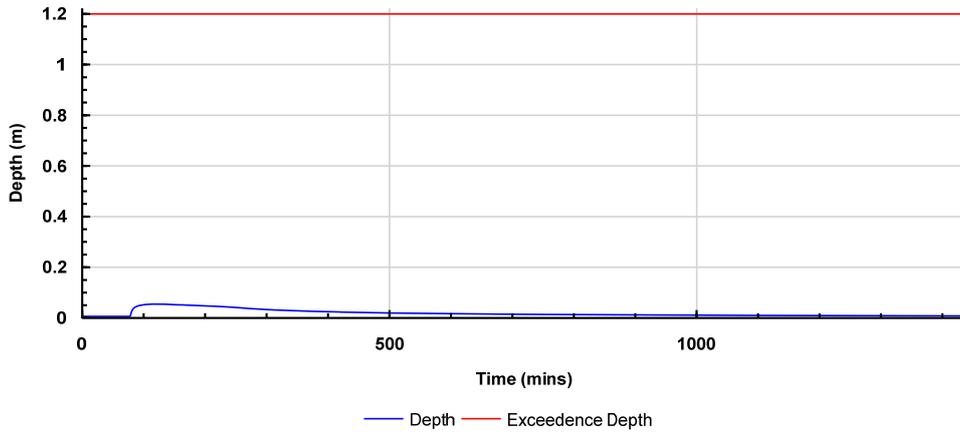


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

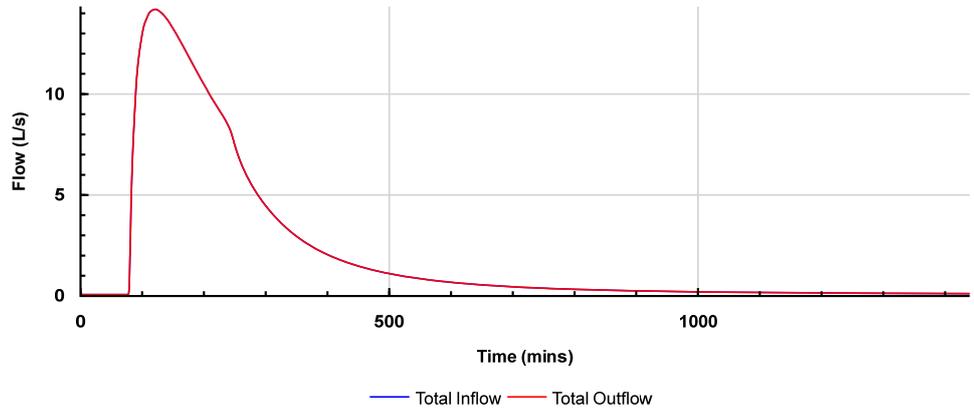


MH11
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

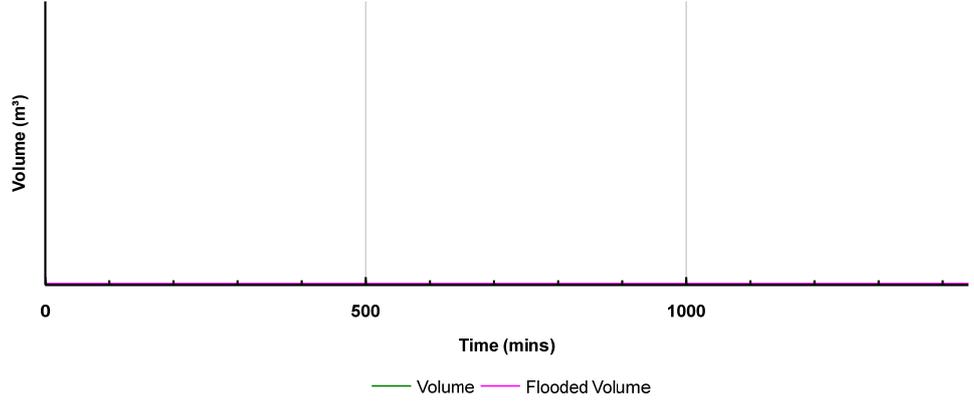
Type : Manhole

Graphs

Flow Graph

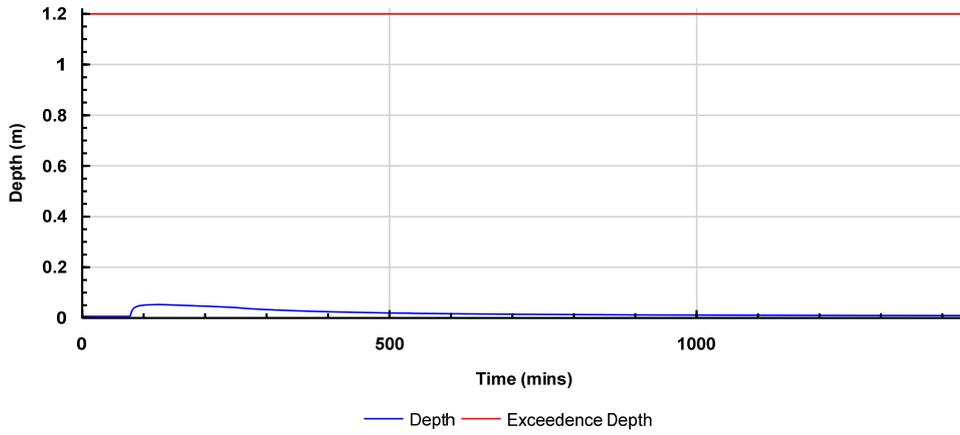


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

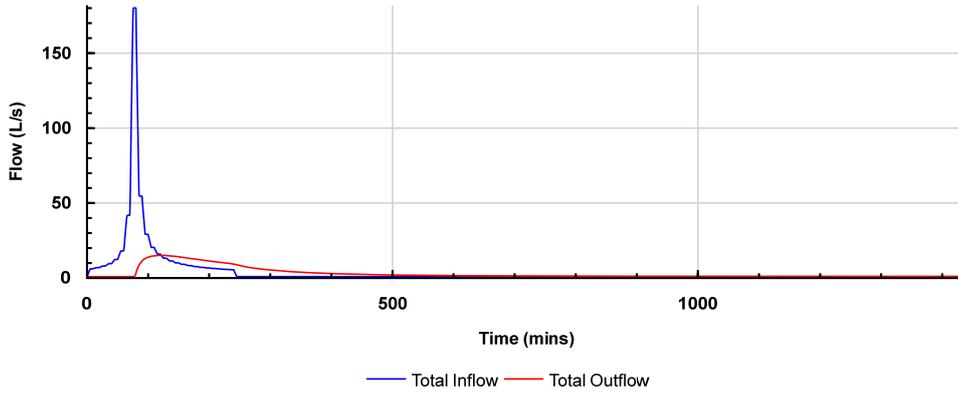


Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

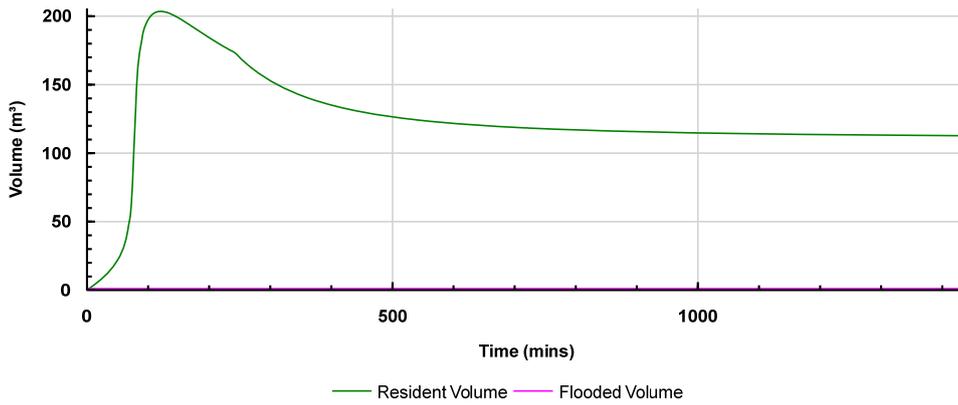
Type : Swale

Graphs

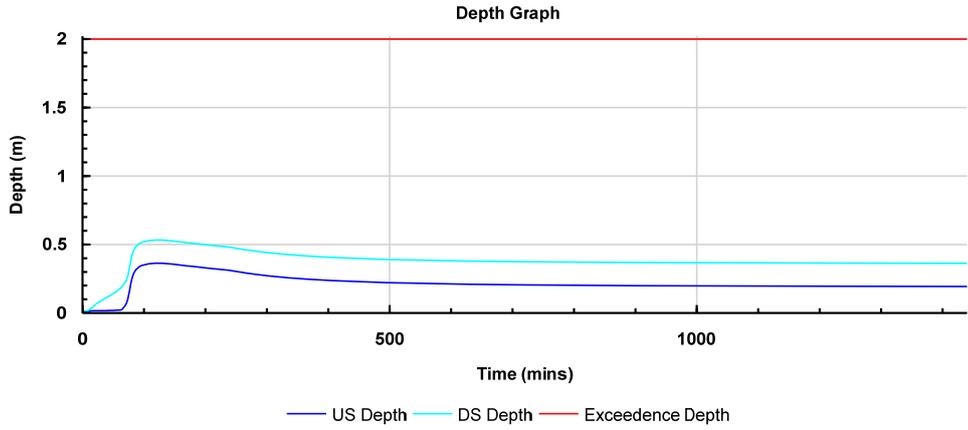
Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			



Wooden Sticks: Parking Lot	Date: 15/09/2022			
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Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			

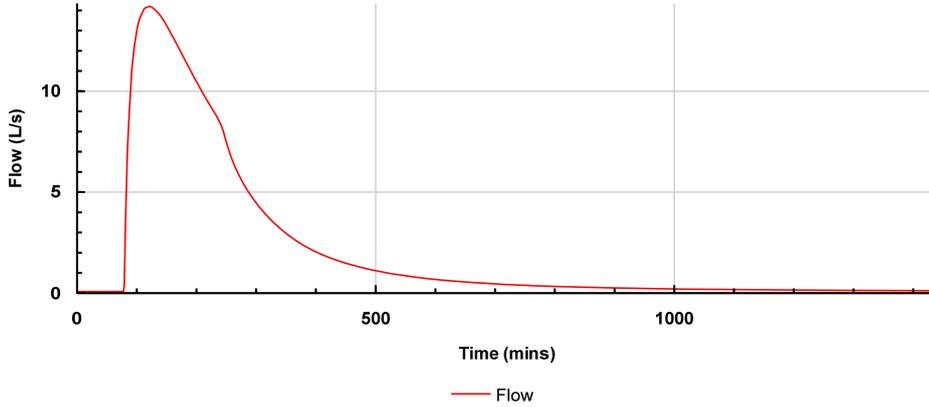


Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			

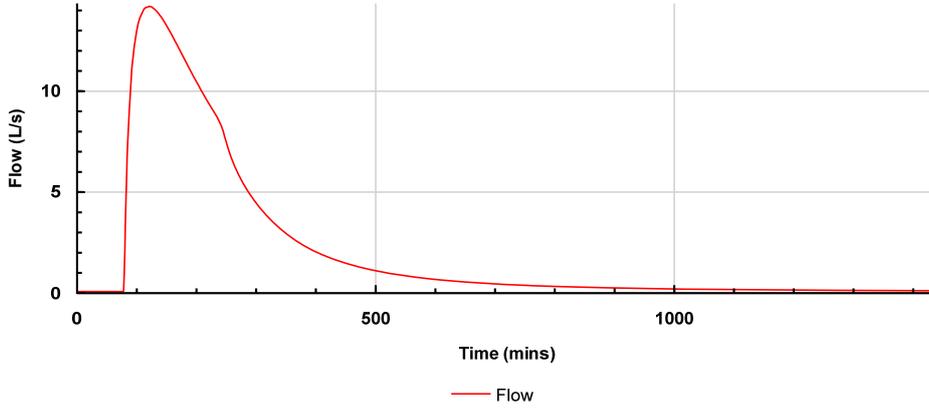


Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:			



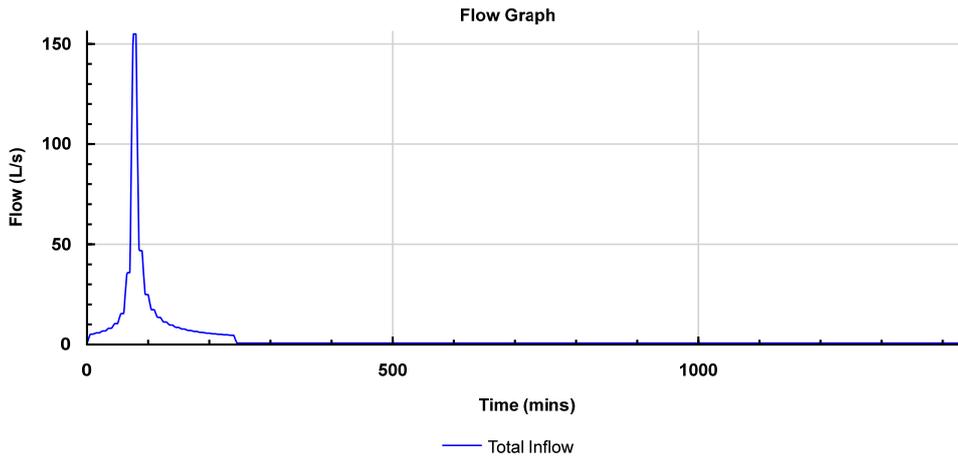
Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Catchment Area

Inflow

Max. Inflow (L/s)	155.0
Total Inflow Volume (m³)	246.058

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

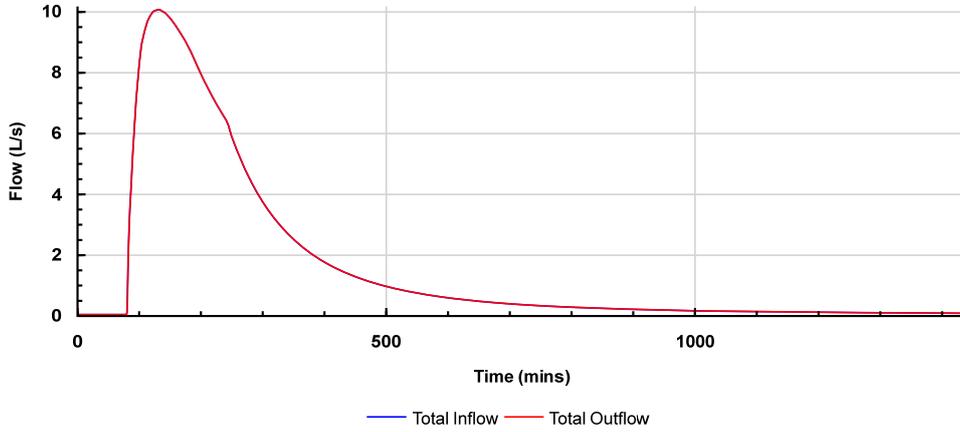


MH10
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

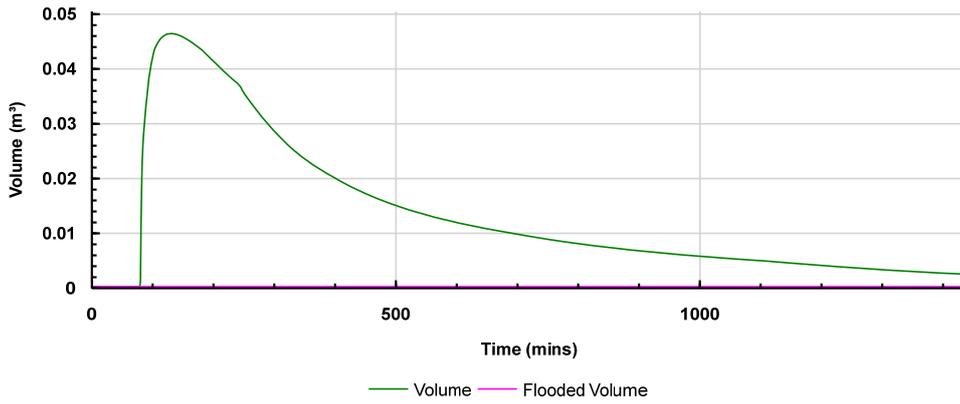
Type : Manhole

Graphs

Flow Graph

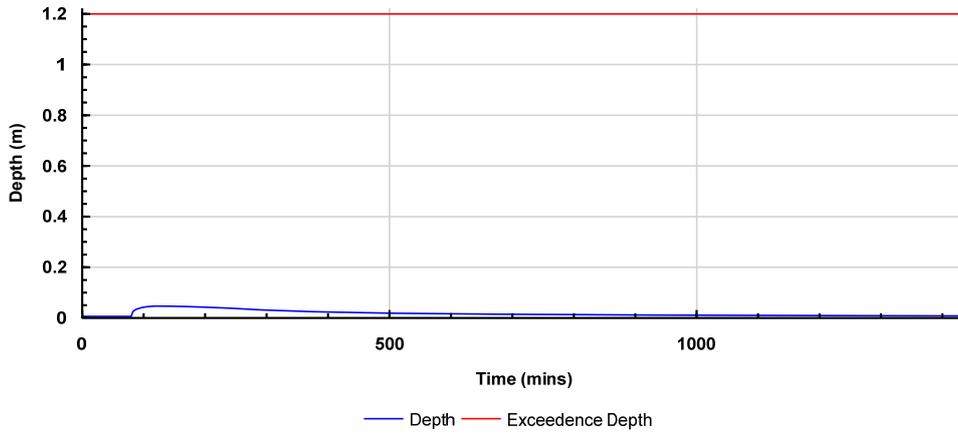


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



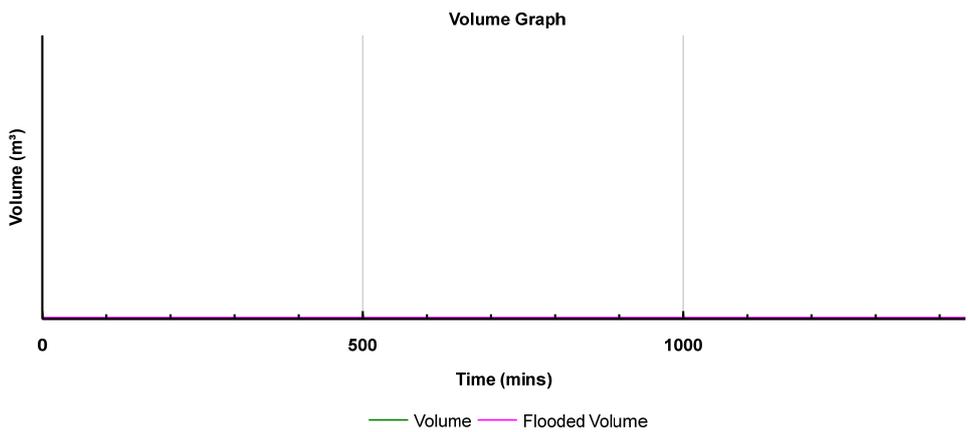
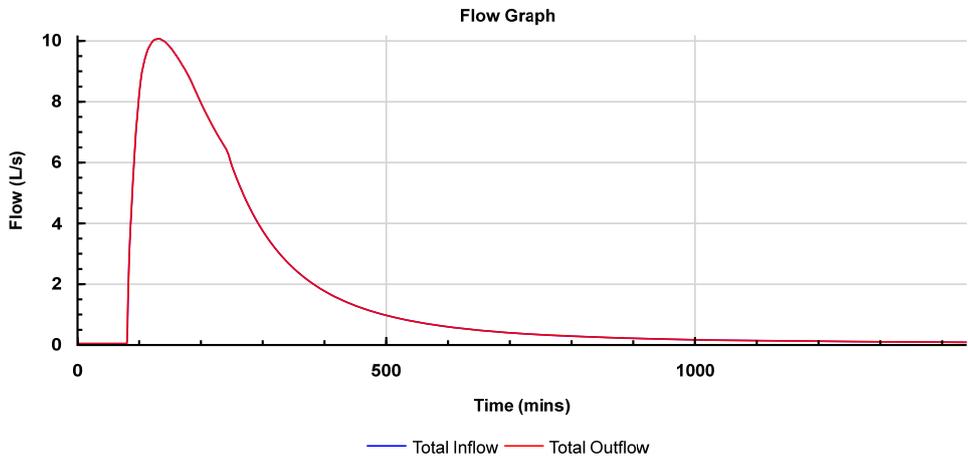
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			



MH11
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

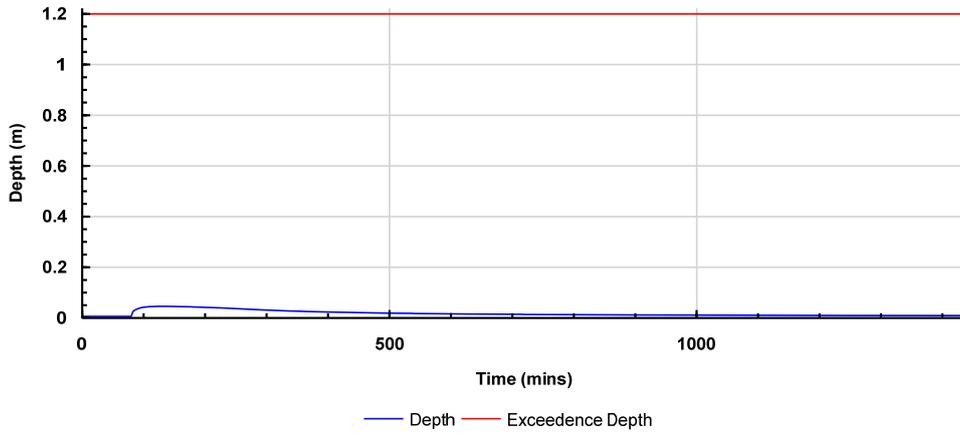
Type : Manhole

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

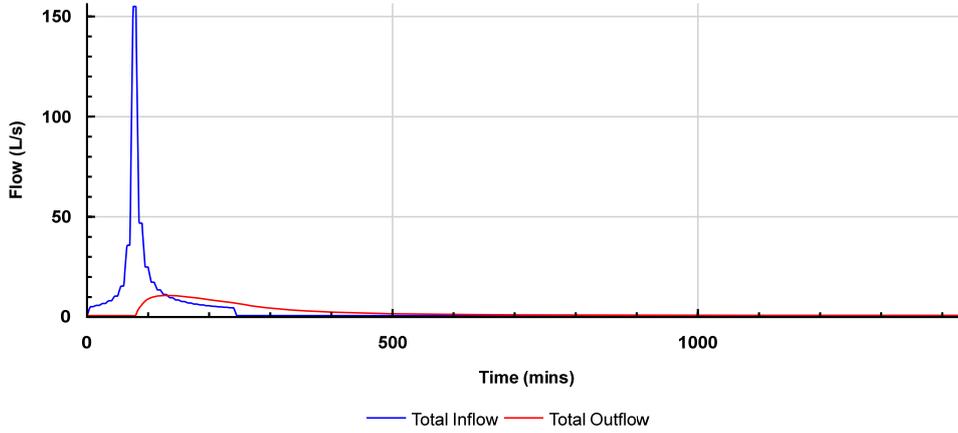


Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

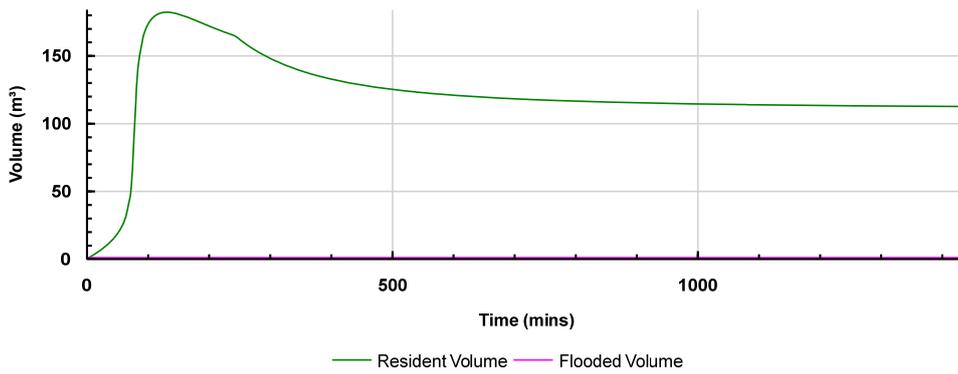
Type : Swale

Graphs

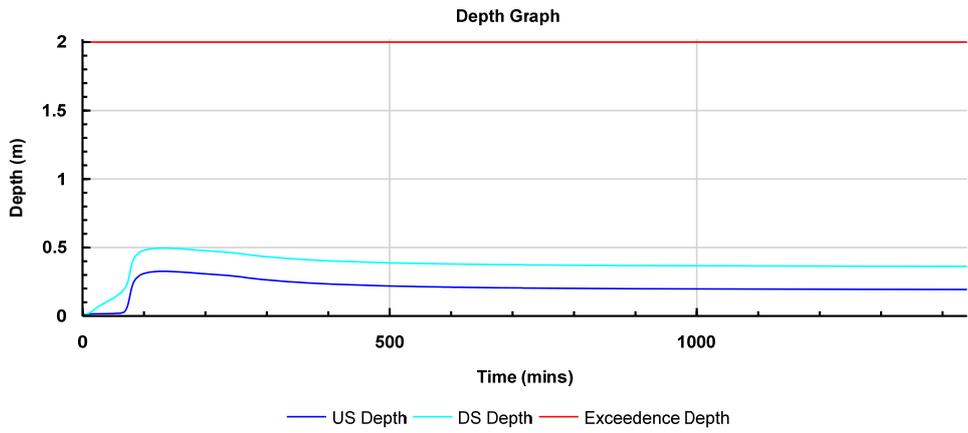
Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			



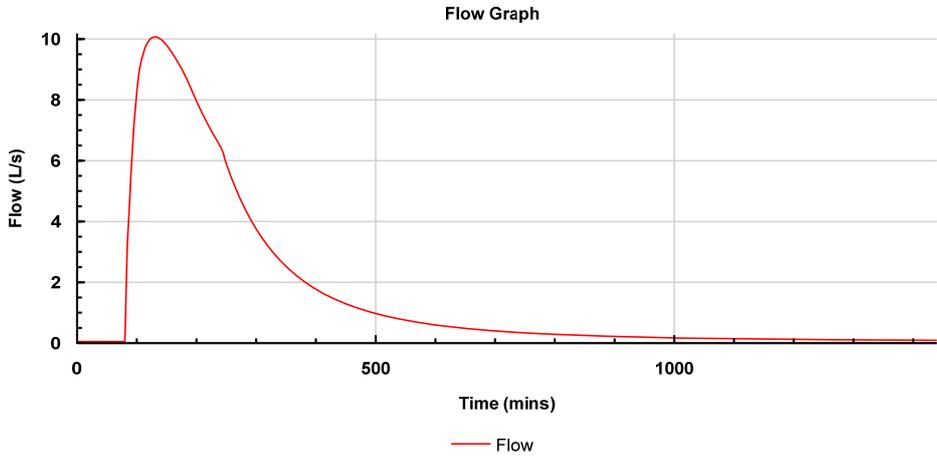
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs



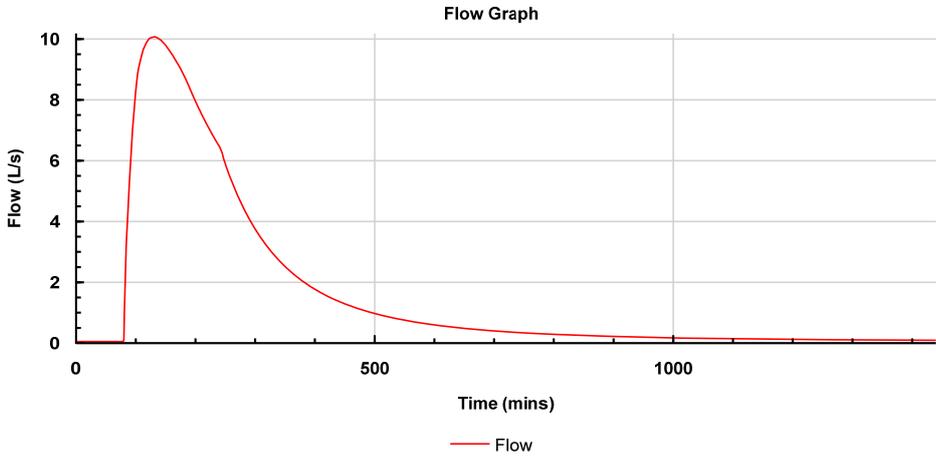
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:			



Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

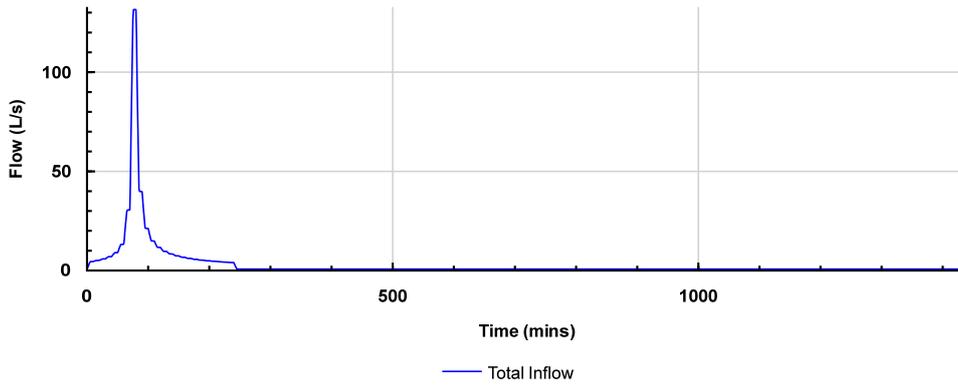
Type : Catchment Area

Inflow

Max. Inflow (L/s)	131.6
Total Inflow Volume (m³)	209.177

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

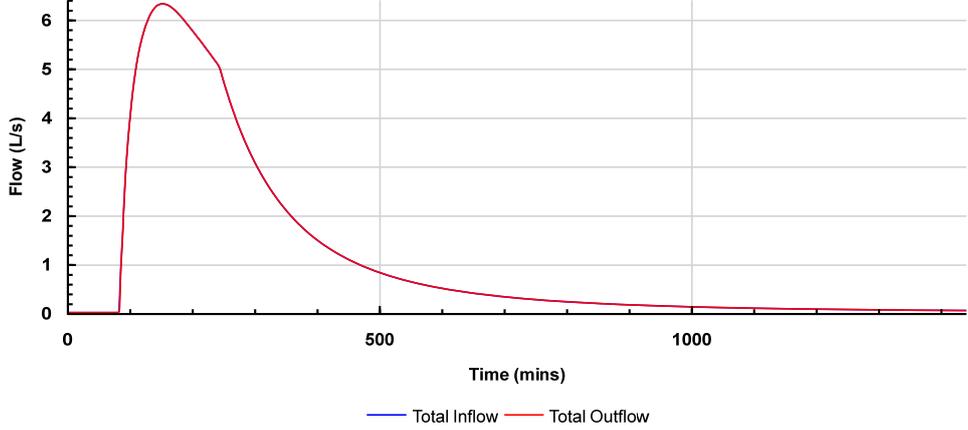


MH10
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

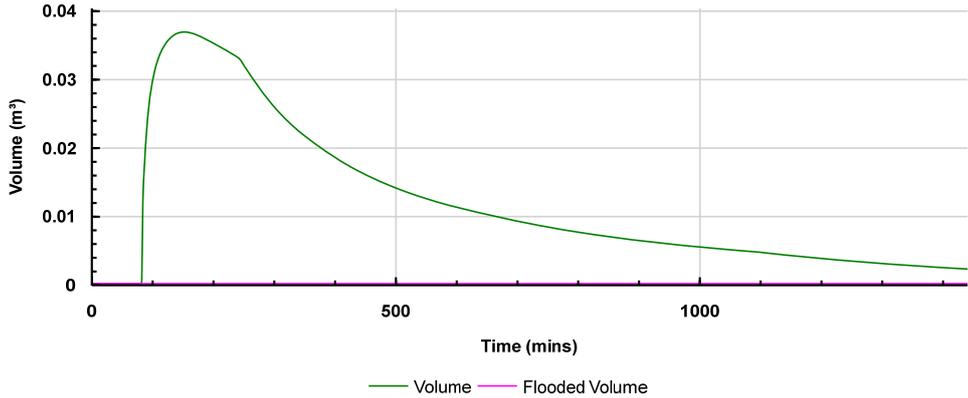
Type : Manhole

Graphs

Flow Graph

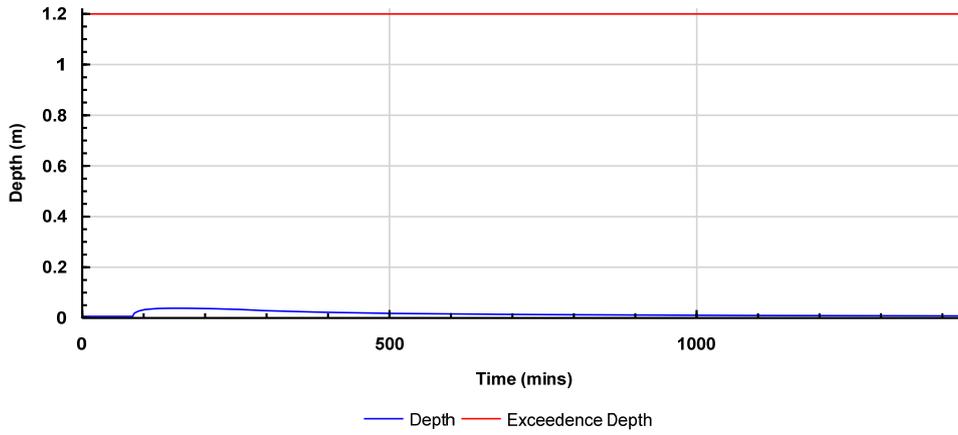


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



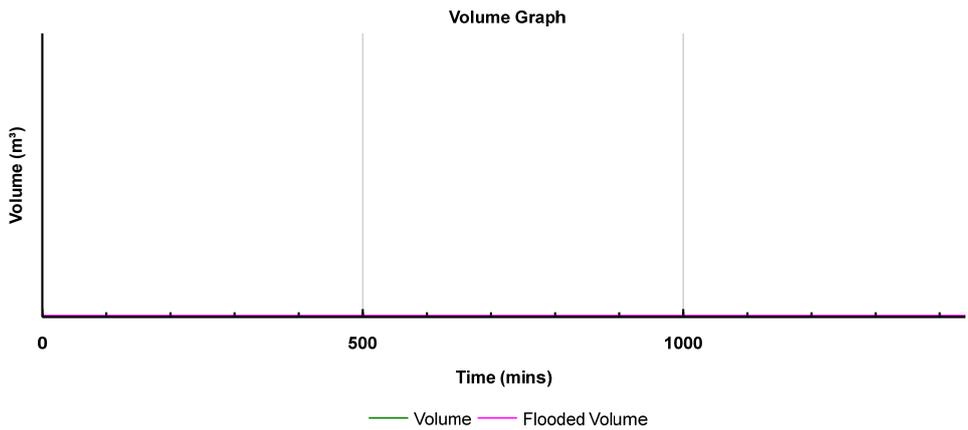
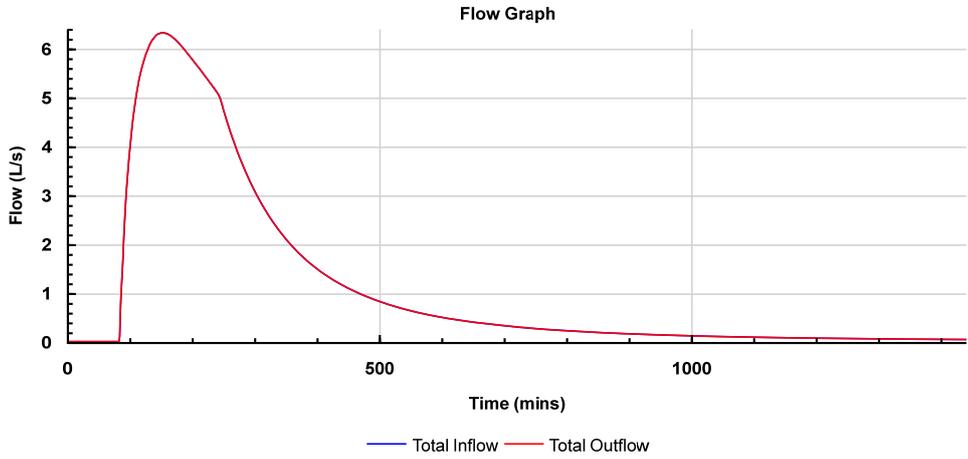
Wooden Sticks: Parking Lot	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



MH11
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

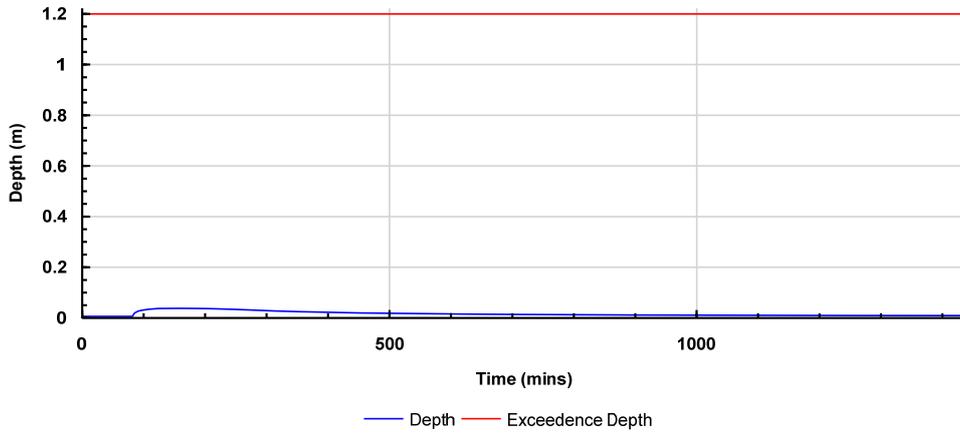
Type : Manhole

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

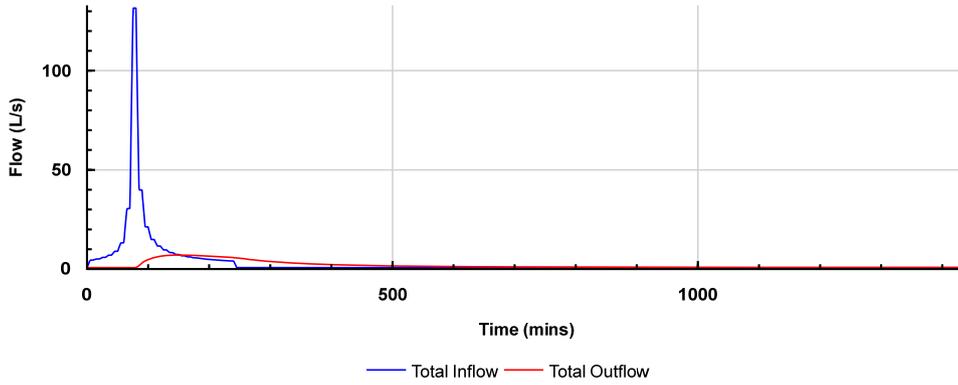


Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

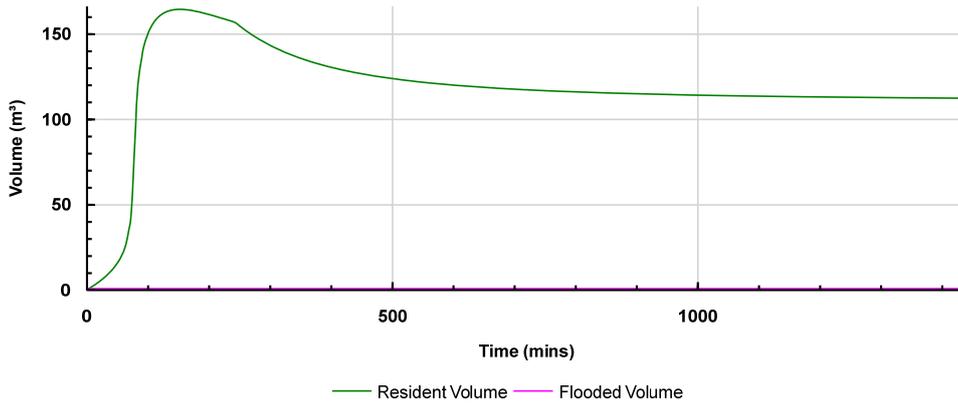
Type : Swale

Graphs

Flow Graph

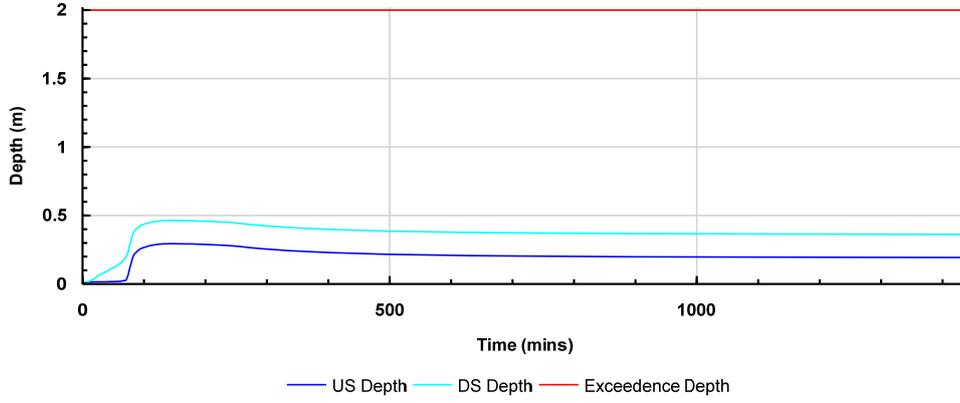


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

Depth Graph



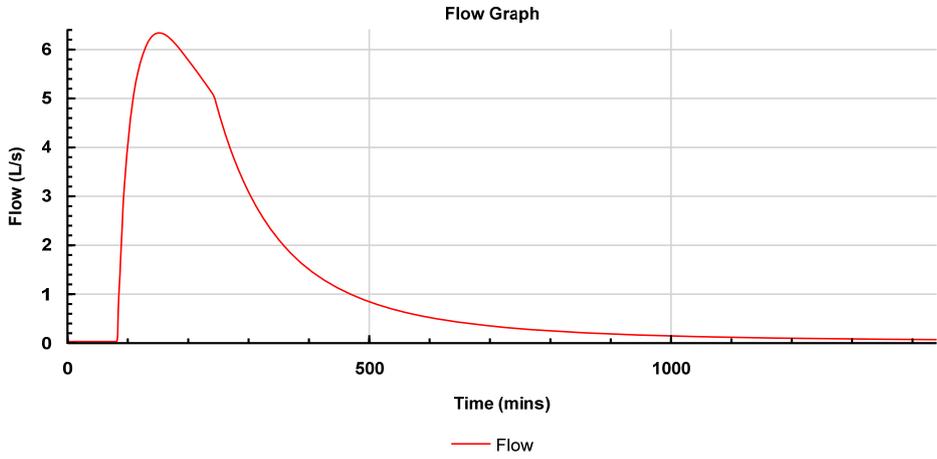
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs



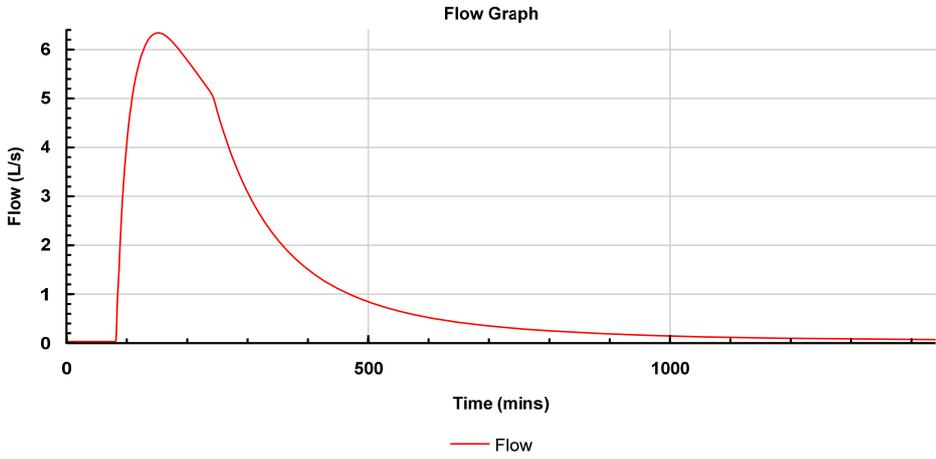
Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			



Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:			



Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

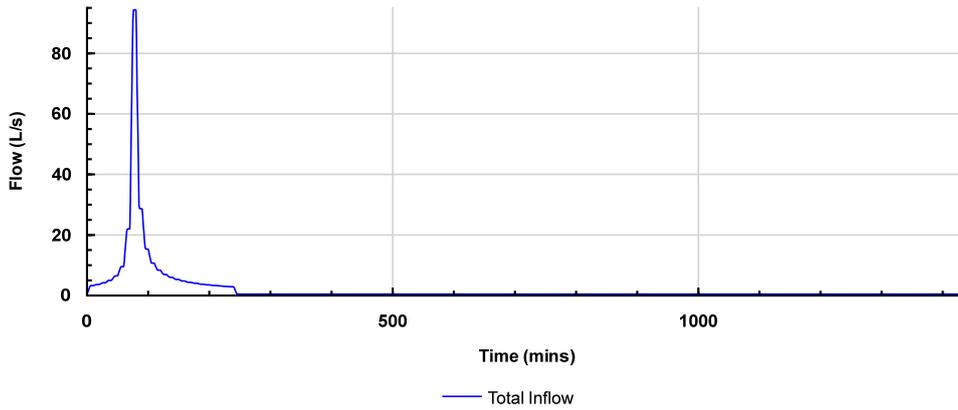
Type : Catchment Area

Inflow

Max. Inflow (L/s)	94.4
Total Inflow Volume (m³)	151.068

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

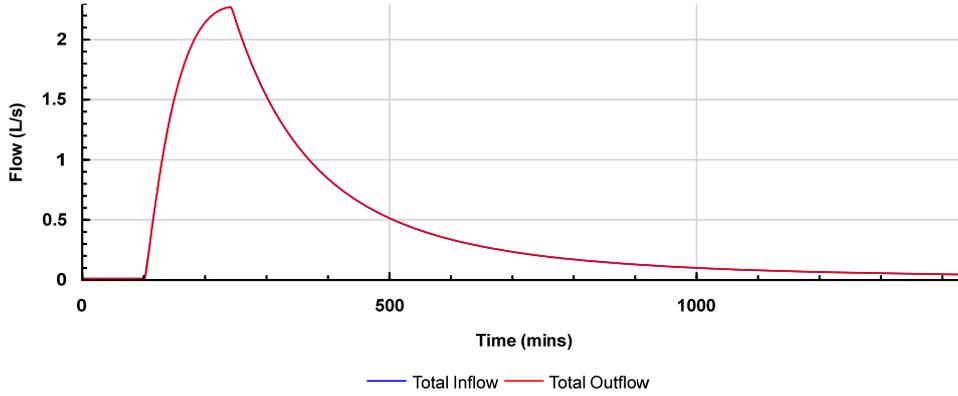


MH10
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

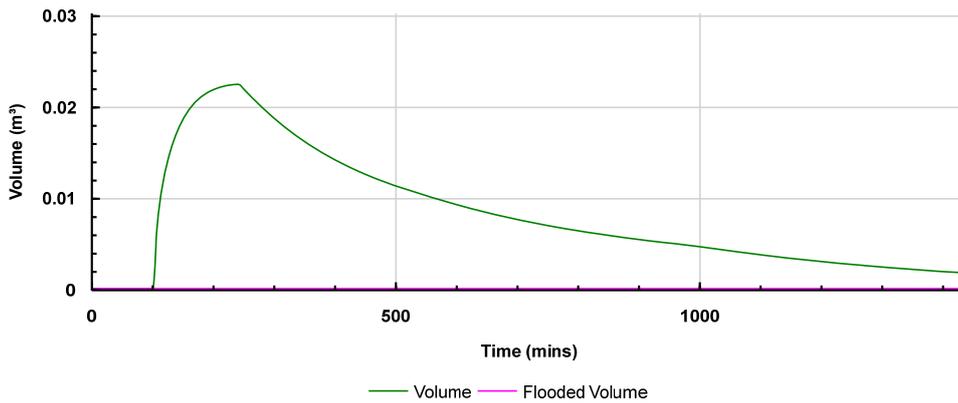
Type : Manhole

Graphs

Flow Graph

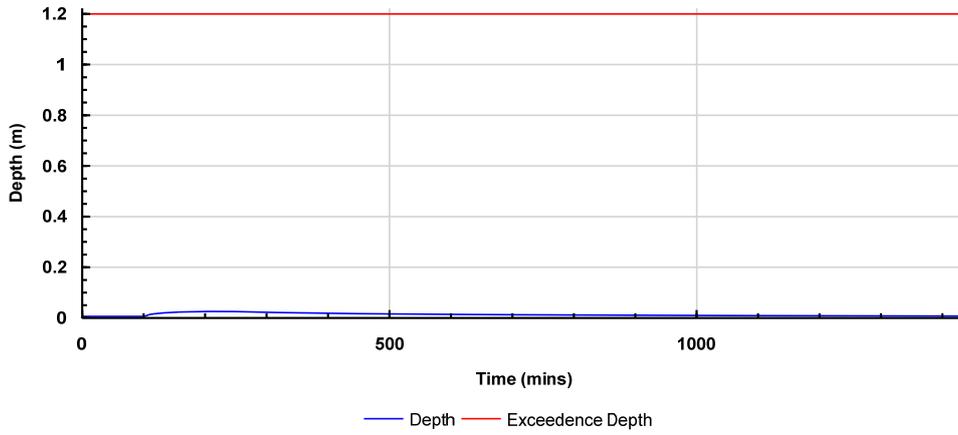


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

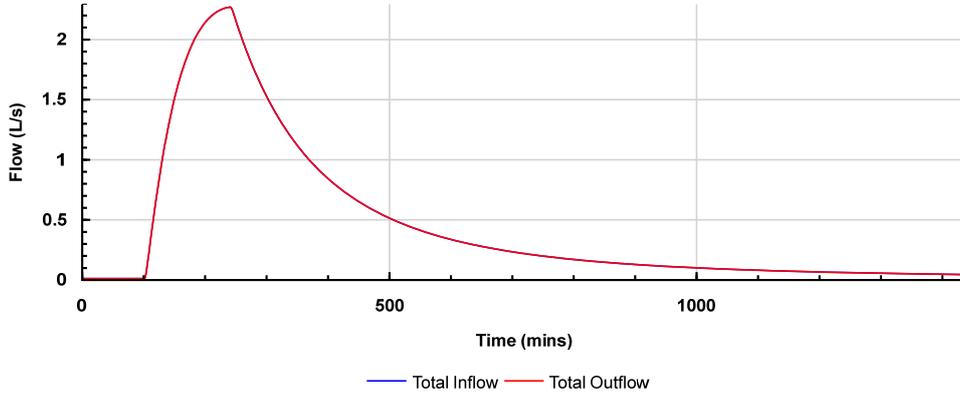


MH11
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

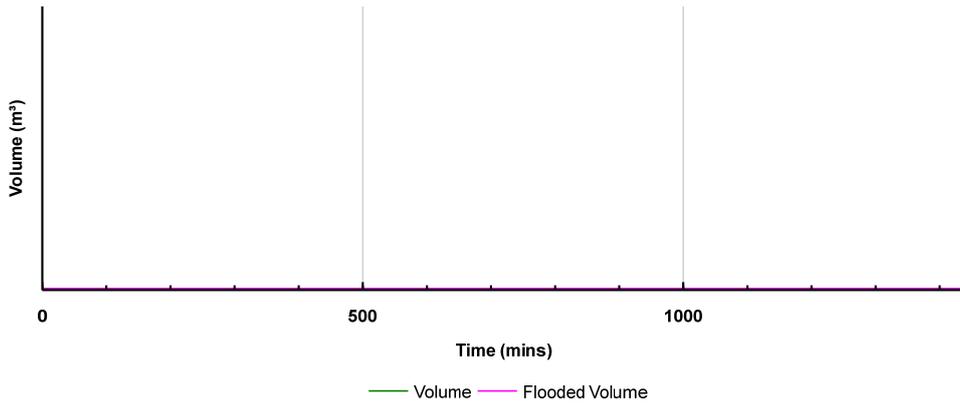
Type : Manhole

Graphs

Flow Graph

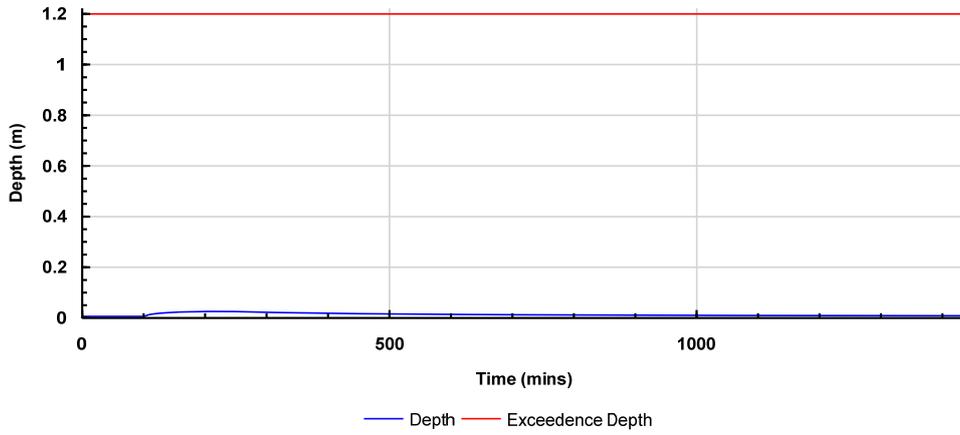


Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

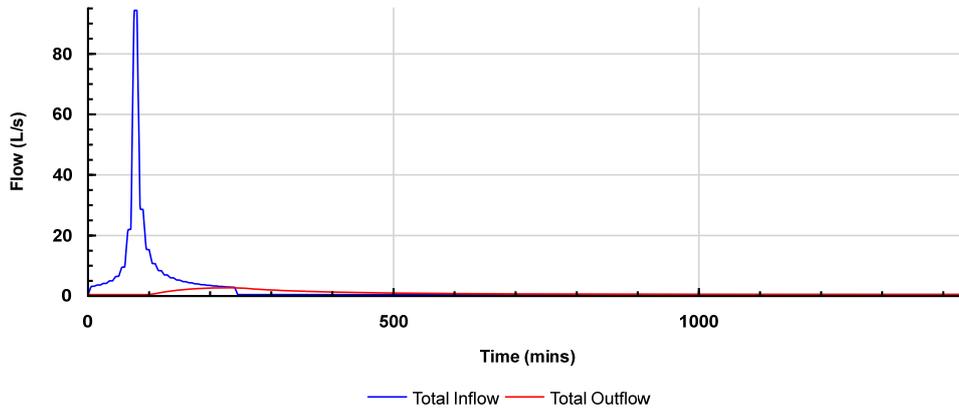


Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

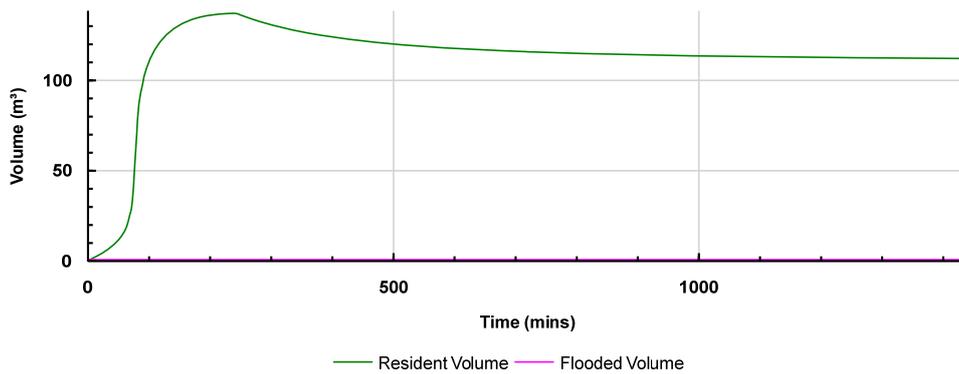
Type : Swale

Graphs

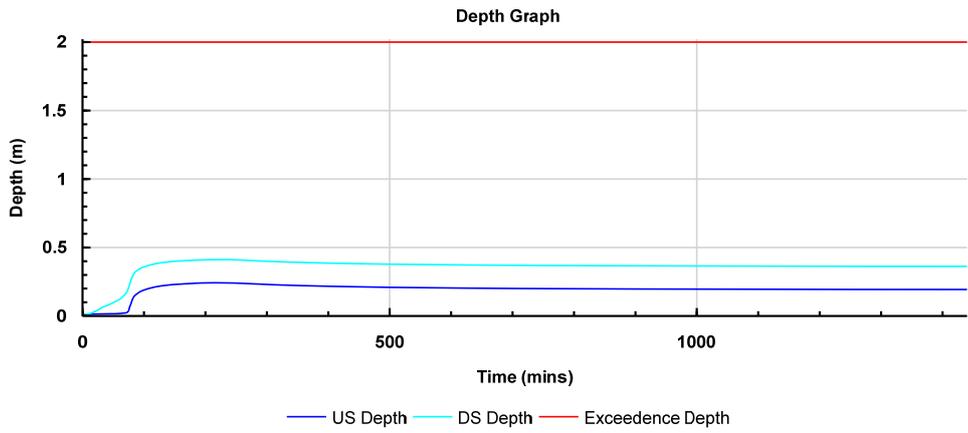
Flow Graph



Volume Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			

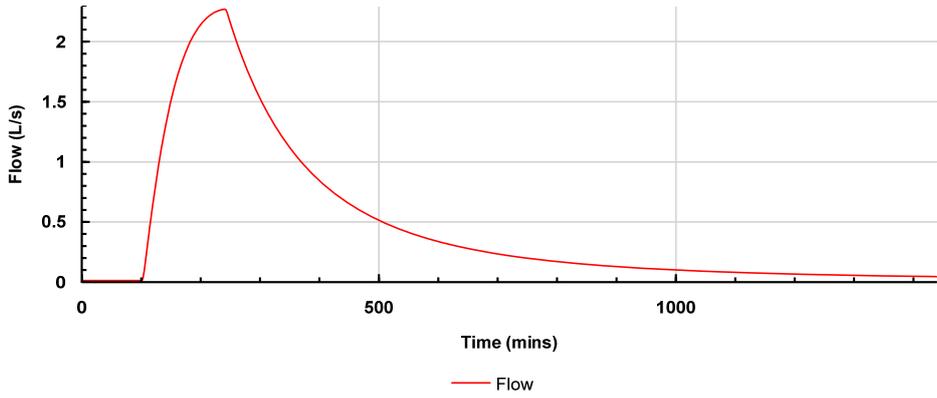


Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs

Flow Graph



Wooden Sticks: Parking Lot	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:			

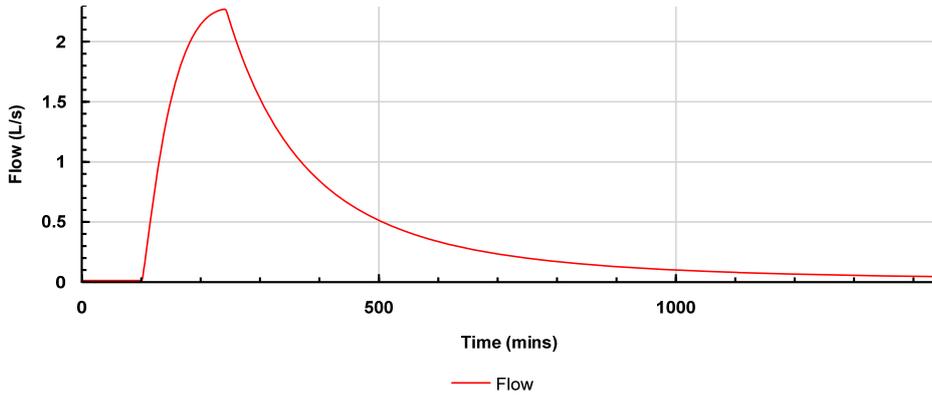


Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs

Flow Graph



F-3 Hotel Swale Sizing

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Inflows Storm Phase: Phase	Company Address:			



Catchment Area

Type : Catchment Area

Area (ha)	0.125
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Dynamic Sizing

Runoff Method	Time of Concentration
Volumetric Runoff Coefficient	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address:		



Dry Swale

Type : Swale

Swale

Exceedence Level (m)	287.500
Depth (m)	1.350
Base Level (m)	286.150
Top Width (m)	12.100
Side Slope (1:x)	3.00
Base Width (m)	4.000
Freeboard (mm)	0
Length (m)	44.000
Long. Slope (1:x)	500.00
Filtration Rate (m/hr)	0.0
Friction Scheme	Manning's n
n	0.025
Total Volume (m³)	478.170

Inlets

Inlet (1)

Inlet Type	Point Inflow
Incoming Item(s)	Pipe
Bypass Destination	(None)
Inlet Destination	Ponding Area
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Free Discharge

Advanced

Swale

Porosity (%)	100
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Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Storm Phase: Phase	Company Address:		



Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Colebrook-White Roughness (mm)	Diameter / Base Width (mm)	Upstream Cover Level (m)	Upstream Invert Level (m)
1.000	24.562	Pipe	16.375		0.6	375	290.000	288.800
1.001	5.855	Pipe	6.505		0.6	375	288.500	287.300
1.004	6.035	Pipe	1.901		0.6	375	287.500	286.100
Pipe	4.848	Pipe	32.322		0.6	375	287.500	286.400
Pipe (1)	4.212	Pipe	84.239		0.6	375	287.588	286.150

Name	Downstream Cover Level (m)	Downstream Invert Level (m)	Flow Restriction (L/s)
1.000	288.500	287.300	
1.001	287.500	286.400	
1.004	284.500	282.925	13.7
Pipe	287.588	286.250	
Pipe (1)	287.500	286.100	

Project: Wooden Sticks Hotel Drainage		Date: 15/09/2022			
Report Details: Type: Inflow Summary Storm Phase: Phase		Designed by: DR	Checked by: DN	Approved By:	
Company Address:					

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	1		Time of Concentration	0.125	100	0	100	0.125
TOTAL		0.0		0.125				0.125

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address:		



Runoff Type	Dynamic
Output Interval (mins)	1
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	<input checked="" type="checkbox"/>
Rainfall Depth (mm)	1.0
Run Time (mins)	1440

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.12	417.4	625.424

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.12	50.8	81.130

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.12	43.7	69.636

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.12	37.1	59.109

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Inflow	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow (m³)
Catchment Area	0.12	26.6	42.643

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	290.000	288.800	289.492	0.692	417.4	0.990	0.000	417.4	625.254	Surcharged
2	288.500	287.300	288.100	0.800	417.4	1.145	0.000	417.3	625.299	Surcharged
3	287.500	286.400	287.509	1.109	417.3	10.964	9.390	409.6	604.942	Flood
4	287.500	286.100	287.499	1.399	13.7	2.002	0.000	13.7	605.017	Flood Risk
5	284.500	282.925	282.950	0.025	13.7	0.000	0.000	13.7	605.008	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	290.000	288.800	288.886	0.086	50.8	0.123	0.000	50.8	81.132	OK
2	288.500	287.300	287.367	0.067	50.8	0.096	0.000	50.8	81.130	OK
3	287.500	286.400	286.514	0.114	50.8	0.163	0.000	50.8	81.069	OK
4	287.500	286.100	286.403	0.303	6.1	0.434	0.000	6.1	81.071	OK
5	284.500	282.925	282.942	0.017	6.1	0.000	0.000	6.1	81.046	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	290.000	288.800	288.880	0.080	43.7	0.114	0.000	43.7	69.638	OK
2	288.500	287.300	287.361	0.061	43.7	0.088	0.000	43.7	69.636	OK
3	287.500	286.400	286.504	0.104	43.7	0.149	0.000	43.7	69.589	OK
4	287.500	286.100	286.372	0.272	5.7	0.389	0.000	5.7	69.591	OK
5	284.500	282.925	282.941	0.016	5.7	0.000	0.000	5.7	69.564	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	290.000	288.800	288.873	0.073	37.1	0.105	0.000	37.1	59.111	OK
2	288.500	287.300	287.356	0.056	37.1	0.080	0.000	37.1	59.109	OK
3	287.500	286.400	286.495	0.095	37.1	0.136	0.000	37.1	59.074	OK
4	287.500	286.100	286.343	0.243	5.3	0.347	0.000	5.3	59.076	OK
5	284.500	282.925	282.941	0.016	5.3	0.000	0.000	5.3	59.048	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Junction	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
1	290.000	288.800	288.862	0.062	26.6	0.089	0.000	26.6	42.645	OK
2	288.500	287.300	287.347	0.047	26.6	0.067	0.000	26.6	42.643	OK
3	287.500	286.400	286.479	0.079	26.6	0.113	0.000	26.6	42.630	OK
4	287.500	286.100	286.297	0.197	4.7	0.282	0.000	4.7	42.630	OK
5	284.500	282.925	282.940	0.015	4.7	0.000	0.000	4.7	42.602	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Dry Swale	287.500	287.500	1.262	1.350	409.6	454.961	0.000	0.000	13.7	605.022	5	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Dry Swale	286.404	286.404	0.166	0.254	50.8	42.806	0.000	0.000	6.1	81.068	91	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Dry Swale	286.372	286.372	0.134	0.222	43.7	35.690	0.000	0.000	5.7	69.586	93	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Dry Swale	286.343	286.343	0.105	0.193	37.1	29.278	0.000	0.000	5.3	59.070	94	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Stormwater Control	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Dry Swale	286.297	286.297	0.059	0.147	26.6	19.716	0.000	0.000	4.7	42.623	96	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	Pipe	1	2	290.0	289.492	0.375	625.254	5.0	0.84	417.4	Surcharged
1.001	Pipe	2	3	288.5	288.100	0.375	625.299	3.8	0.53	417.3	Surcharged
1.004	Pipe	4	5	287.5	287.499	0.026	605.008	4.2	0.01	13.7	Flood Risk
Pipe	Pipe	3	Dry Swale	287.5	287.509	0.375	604.942	3.7	1.16	409.6	Flood
Pipe (1)	Pipe	Dry Swale	4	287.6	287.456	0.375	605.022	0.6	0.06	13.7	Surcharged

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	Pipe	1	2	290.0	288.886	0.077	81.132	3.1	0.1	50.8	OK
1.001	Pipe	2	3	288.5	287.367	0.090	81.130	2.5	0.06	50.8	OK
1.004	Pipe	4	5	287.5	286.403	0.017	81.046	3.3	0	6.1	OK
Pipe	Pipe	3	Dry Swale	287.5	286.514	0.105	81.069	2.0	0.14	50.8	OK
Pipe (1)	Pipe	Dry Swale	4	287.6	286.360	0.278	81.068	0.4	0.03	6.1	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	Pipe	1	2	290.0	288.880	0.071	69.638	3.0	0.09	43.7	OK
1.001	Pipe	2	3	288.5	287.361	0.083	69.636	2.4	0.06	43.7	OK
1.004	Pipe	4	5	287.5	286.372	0.017	69.564	3.2	0	5.7	OK
Pipe	Pipe	3	Dry Swale	287.5	286.504	0.097	69.589	1.9	0.12	43.7	OK
Pipe (1)	Pipe	Dry Swale	4	287.6	286.328	0.247	69.586	0.3	0.03	5.7	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	Pipe	1	2	290.0	288.873	0.065	59.111	2.9	0.07	37.1	OK
1.001	Pipe	2	3	288.5	287.356	0.075	59.109	2.3	0.05	37.1	OK
1.004	Pipe	4	5	287.5	286.343	0.016	59.048	3.2	0	5.3	OK
Pipe	Pipe	3	Dry Swale	287.5	286.495	0.088	59.074	1.9	0.11	37.1	OK
Pipe (1)	Pipe	Dry Swale	4	287.6	286.299	0.218	59.070	0.3	0.02	5.3	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	Company Address:		



Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Connection	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	Pipe	1	2	290.0	288.862	0.054	42.645	2.7	0.05	26.6	OK
1.001	Pipe	2	3	288.5	287.347	0.063	42.643	2.2	0.03	26.6	OK
1.004	Pipe	4	5	287.5	286.297	0.015	42.602	3.1	0	4.7	OK
Pipe	Pipe	3	Dry Swale	287.5	286.479	0.074	42.630	1.7	0.08	26.6	OK
Pipe (1)	Pipe	Dry Swale	4	287.6	286.253	0.172	42.623	0.3	0.02	4.7	OK

Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



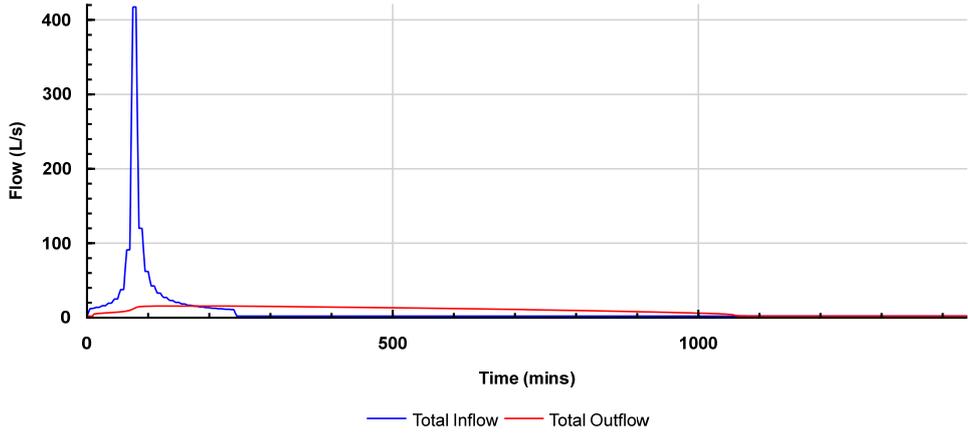
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Tables

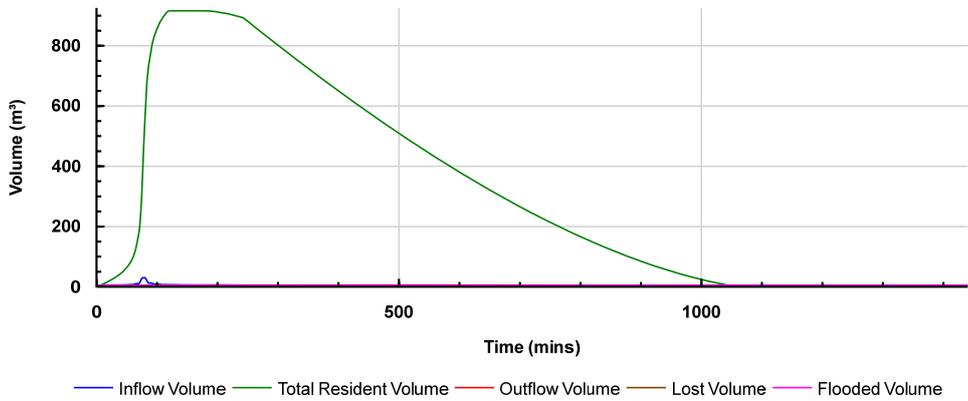
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5			13.7	605.008
TOTAL	417.4	625.424	13.7	605.008

Graphs

Flow Graph



Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



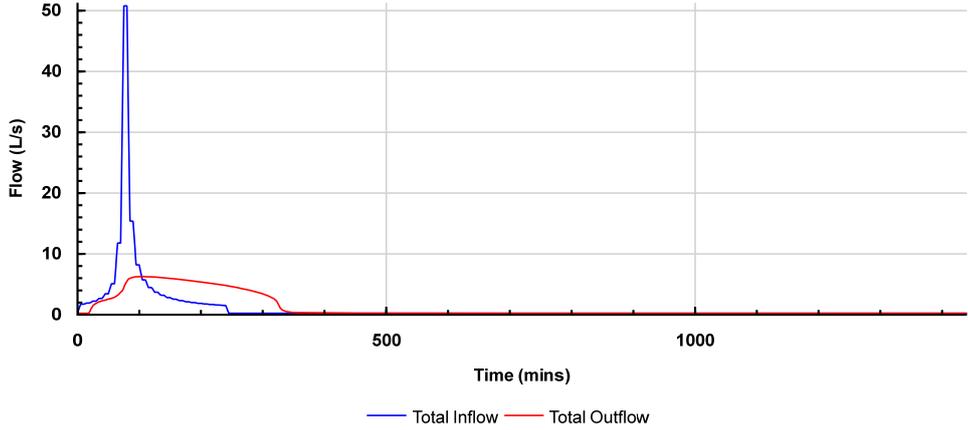
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Tables

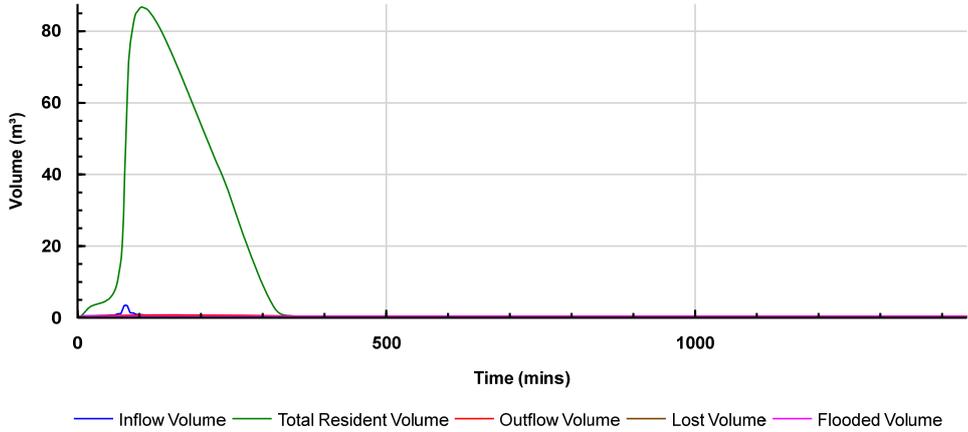
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5			6.1	81.046
TOTAL	50.8	81.130	6.1	81.046

Graphs

Flow Graph



Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



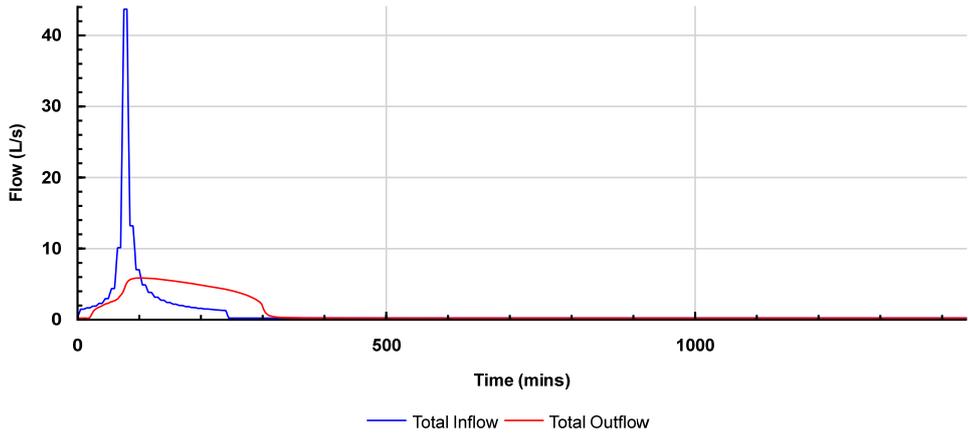
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Tables

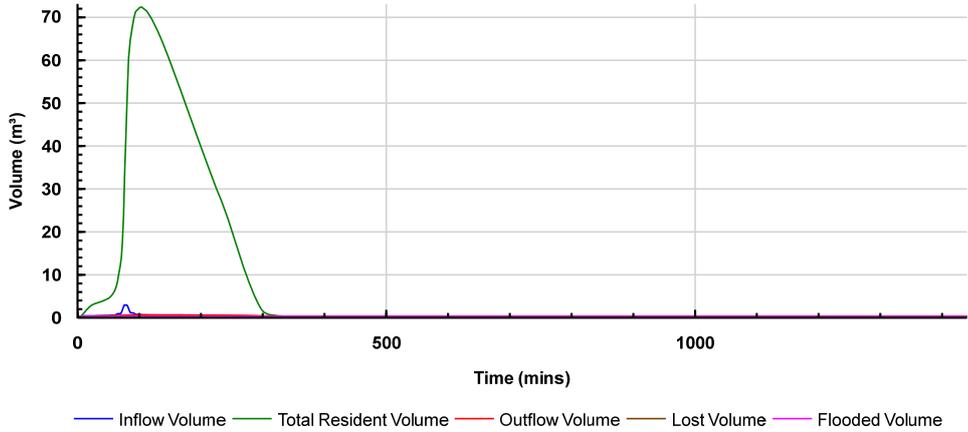
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5			5.7	69.564
TOTAL	43.7	69.636	5.7	69.564

Graphs

Flow Graph



Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



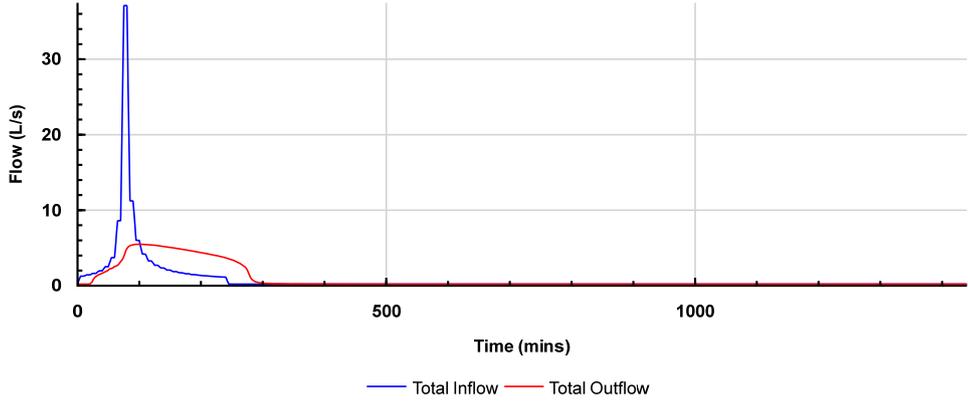
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Tables

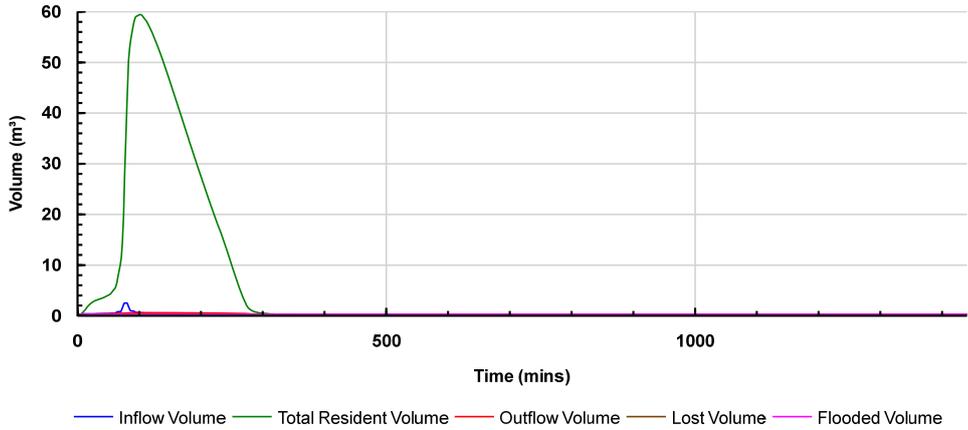
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5			5.3	59.048
TOTAL	37.1	59.109	5.3	59.048

Graphs

Flow Graph



Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Phase Management Storm Phase: Phase	Company Address:		



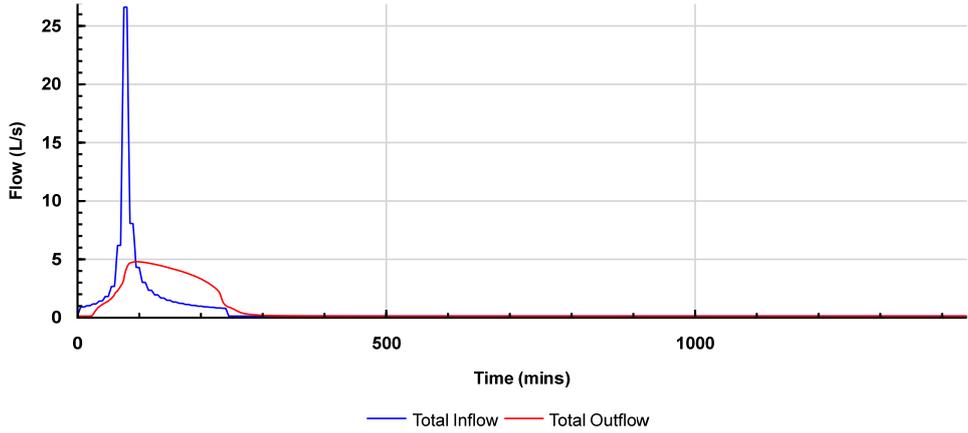
Phase
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Tables

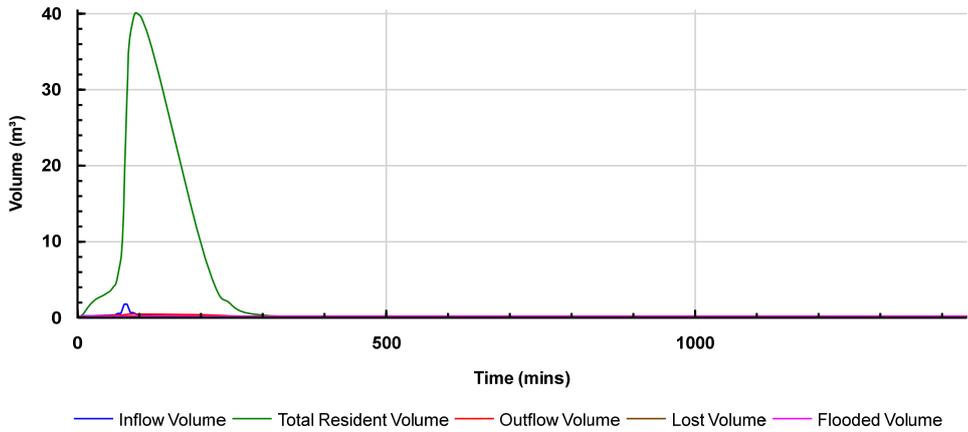
Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5			4.7	42.602
TOTAL	26.6	42.643	4.7	42.602

Graphs

Flow Graph



Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		



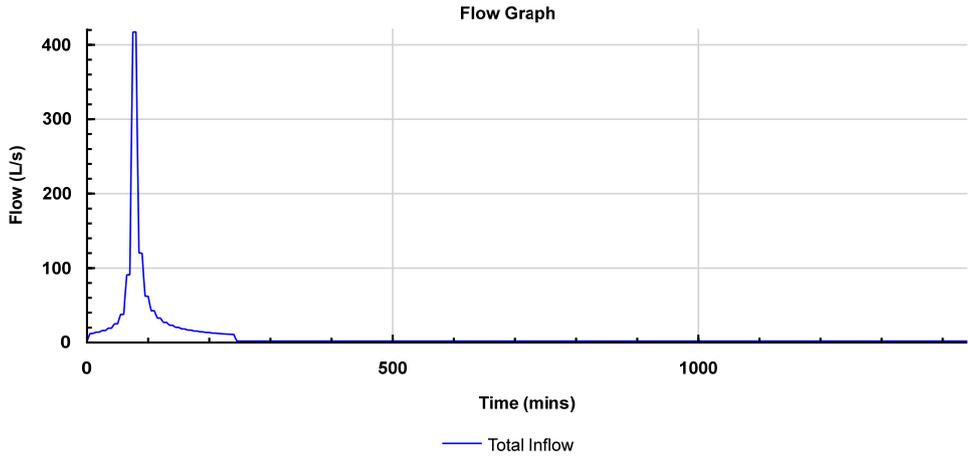
Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Catchment Area

Inflow

Max. Inflow (L/s)	417.4
Total Inflow Volume (m³)	625.424

Graphs



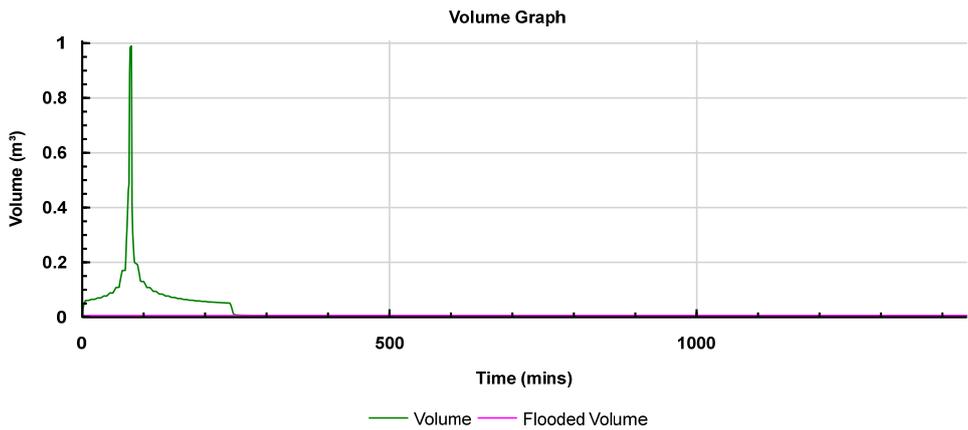
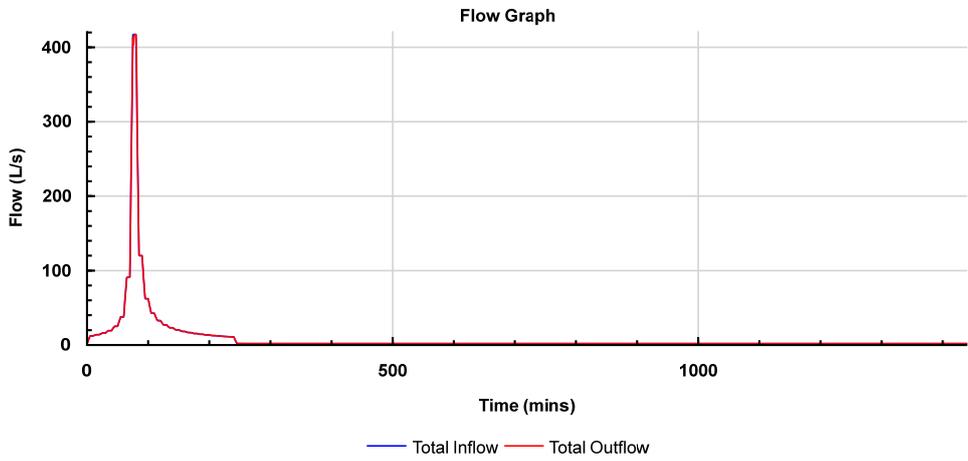
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



1 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Manhole

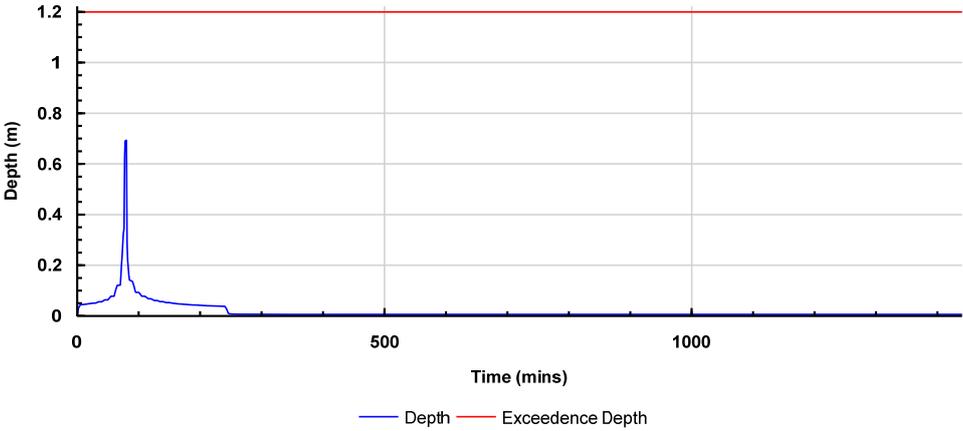
Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

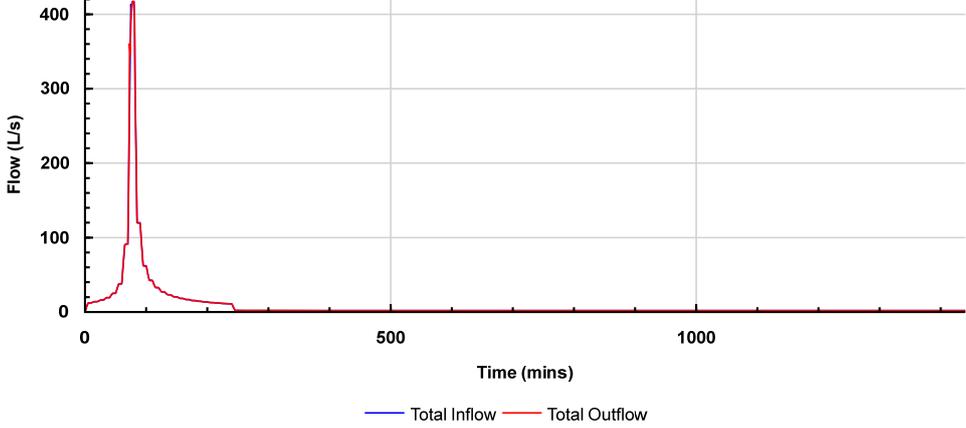


2
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

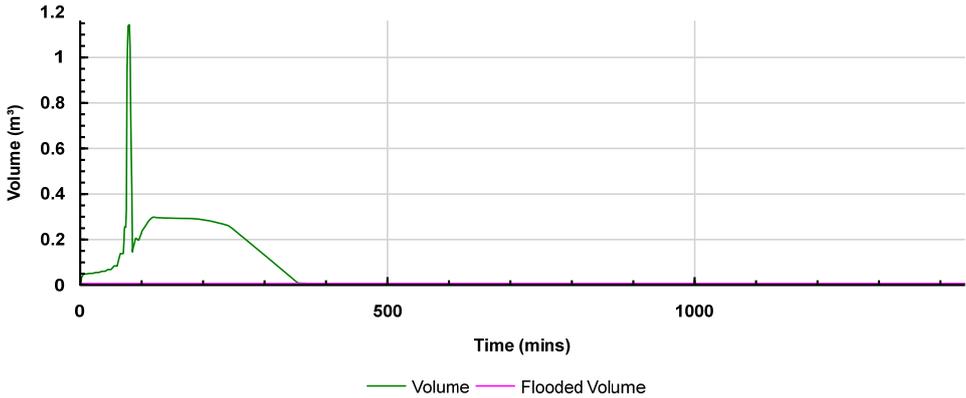
Type : Manhole

Graphs

Flow Graph



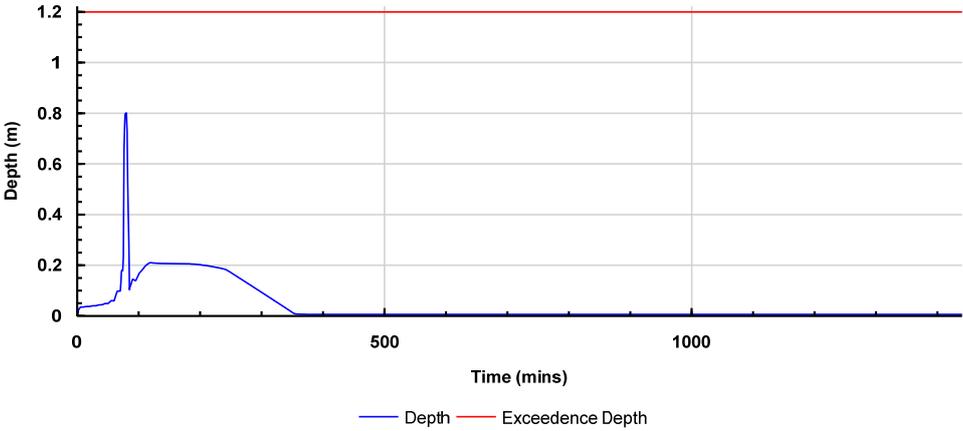
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

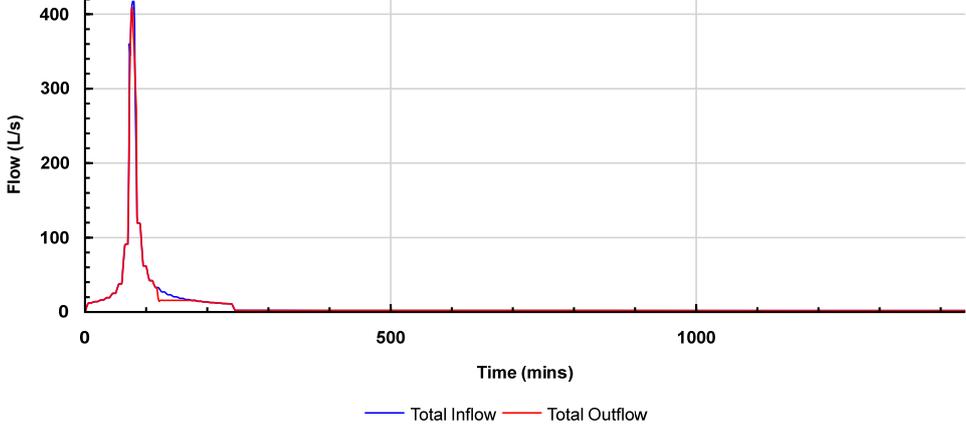


3
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

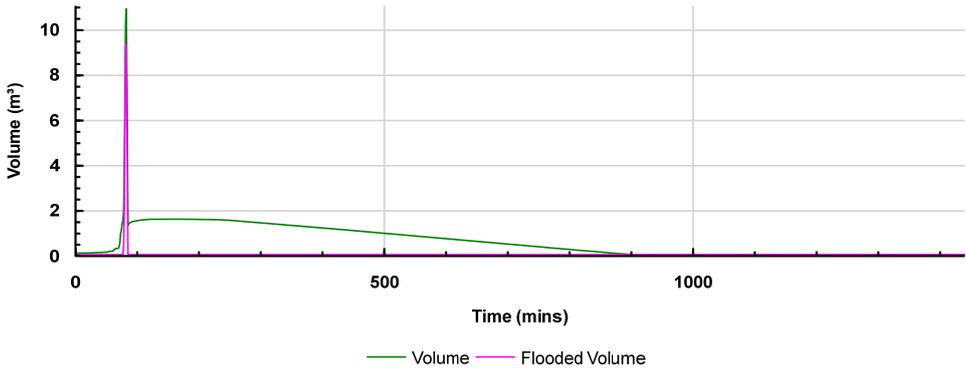
Type : Manhole

Graphs

Flow Graph



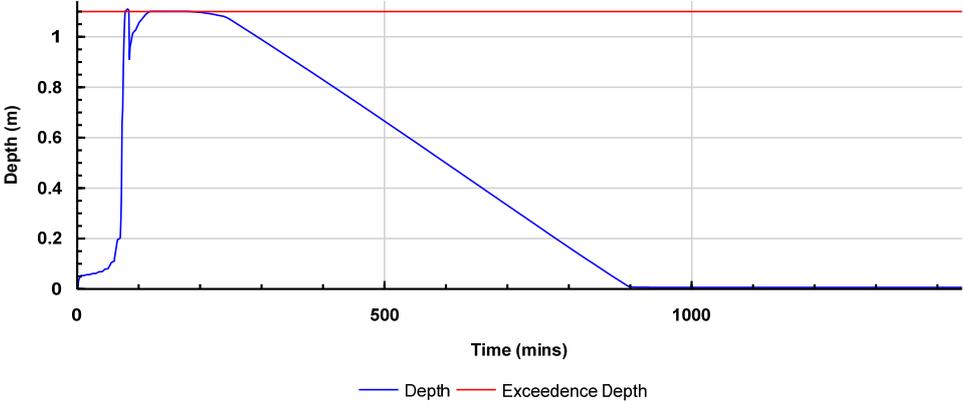
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

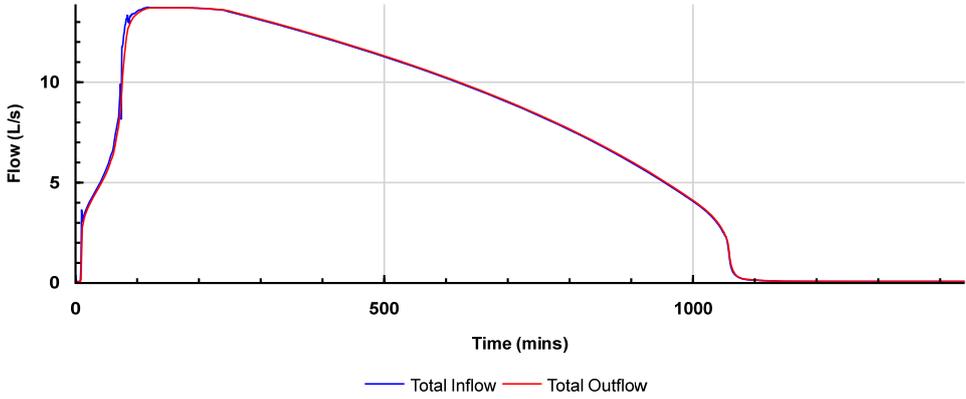


4 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

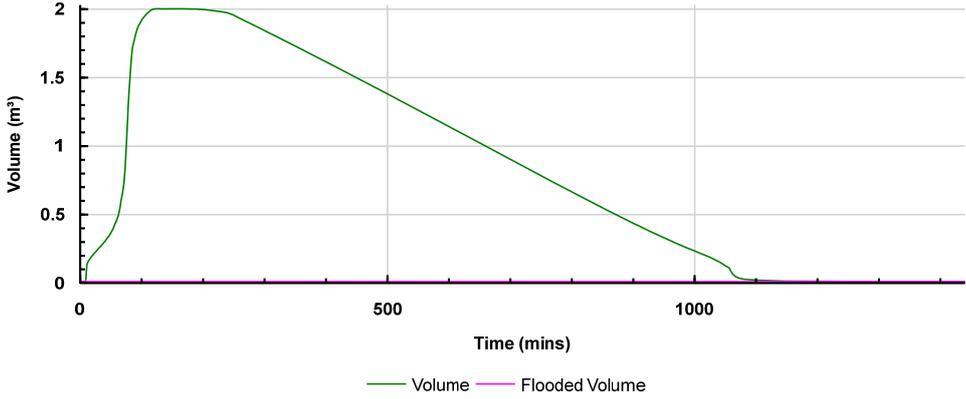
Type : Manhole

Graphs

Flow Graph

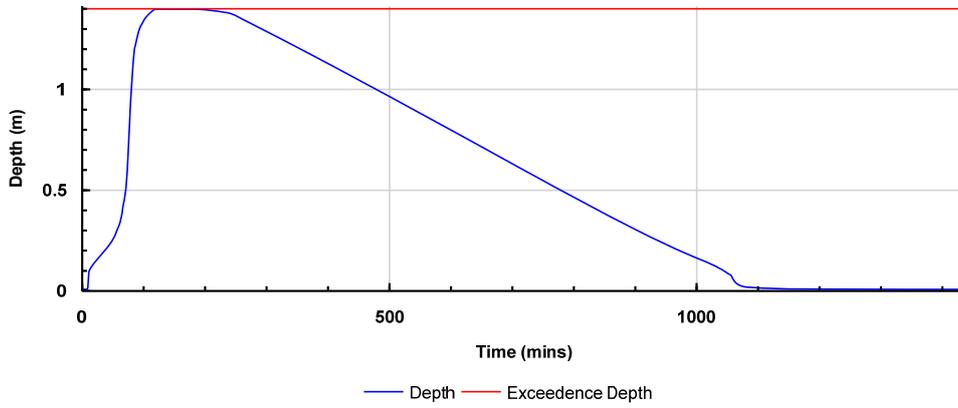


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

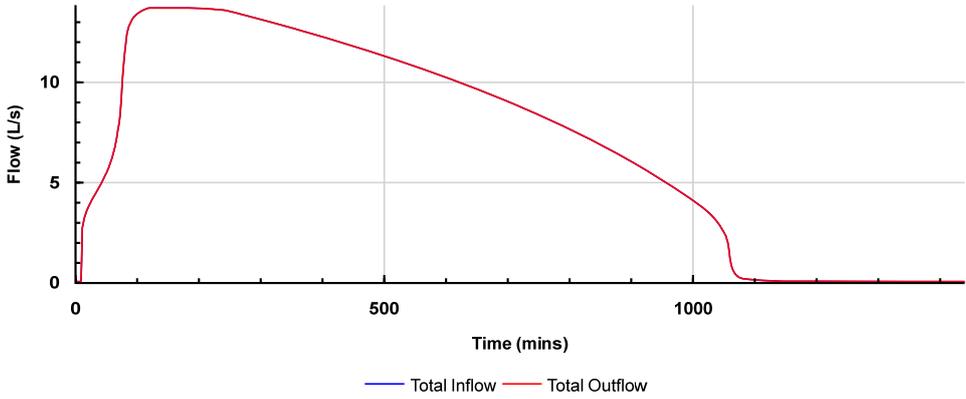


5
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

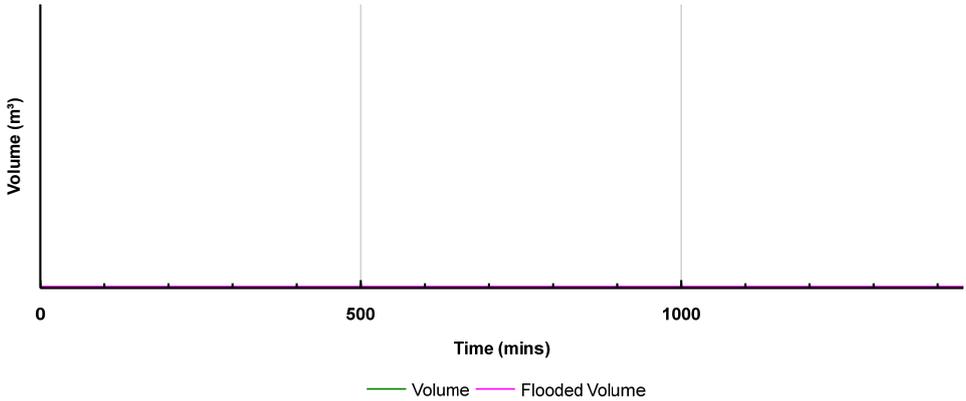
Type : Manhole

Graphs

Flow Graph



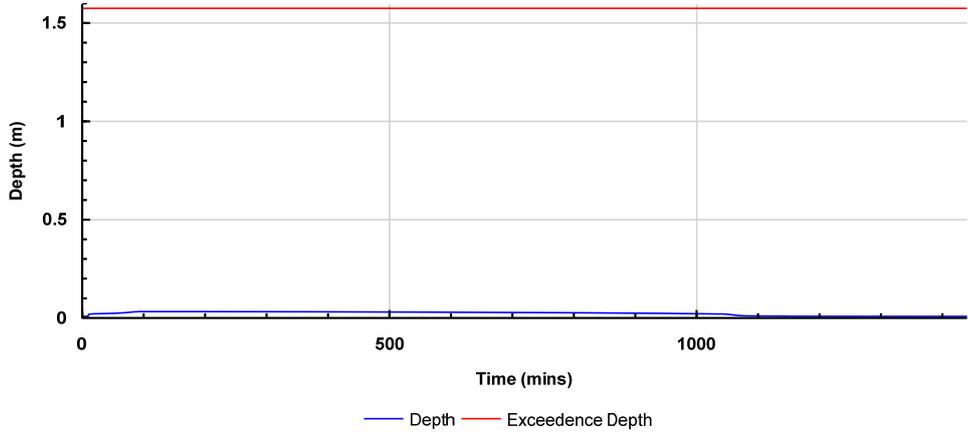
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

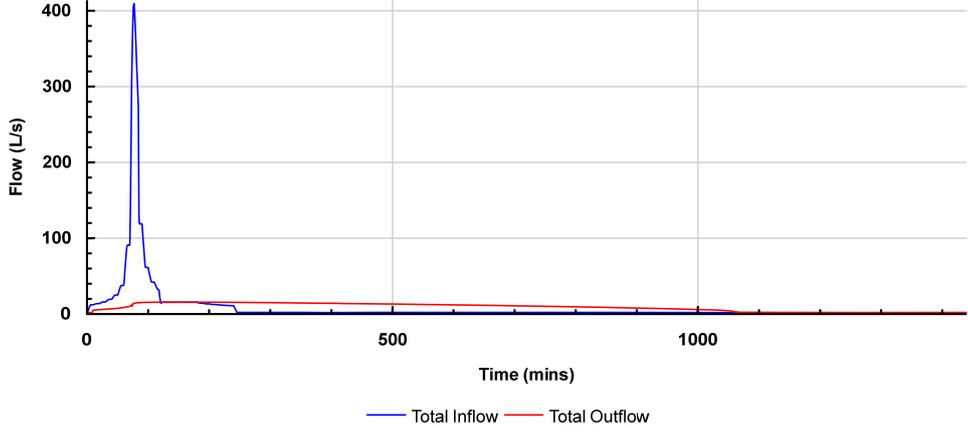


Dry Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

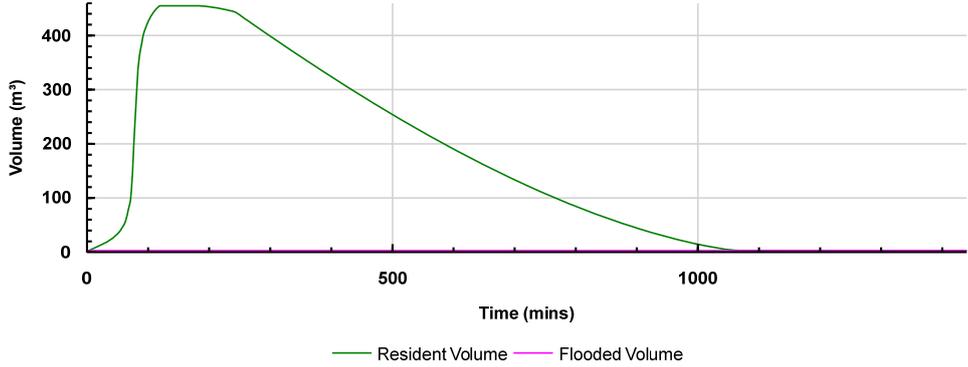
Type : Swale

Graphs

Flow Graph

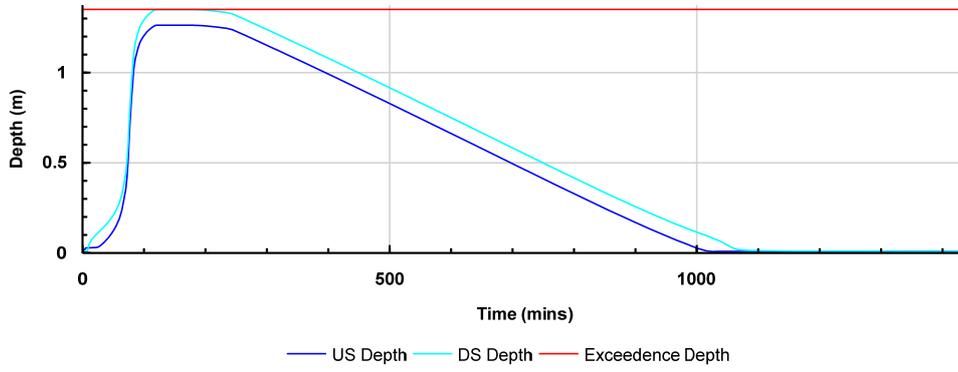


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

Depth Graph



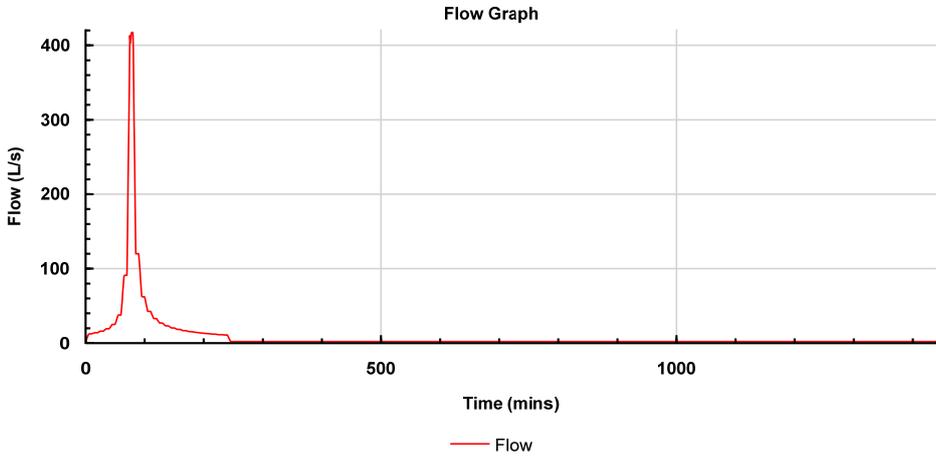
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.000
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs



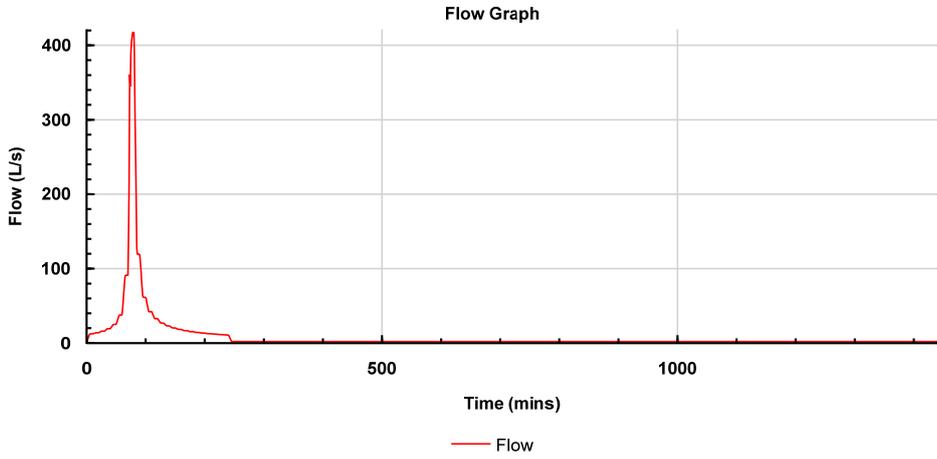
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.001
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

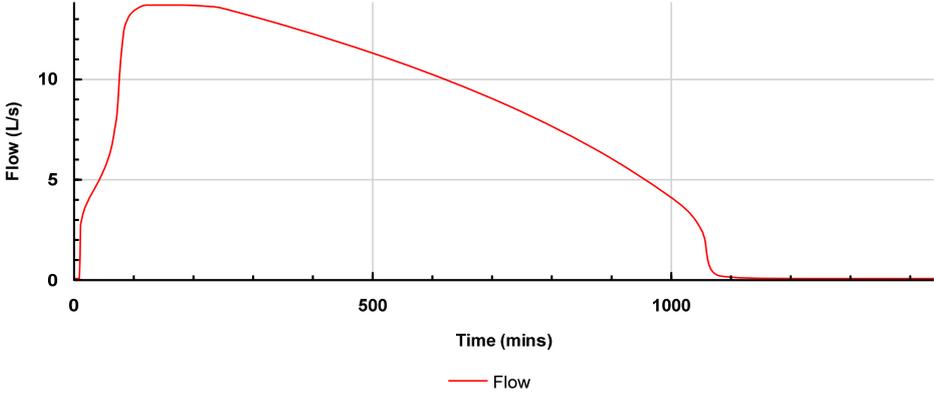


1.004
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs

Flow Graph



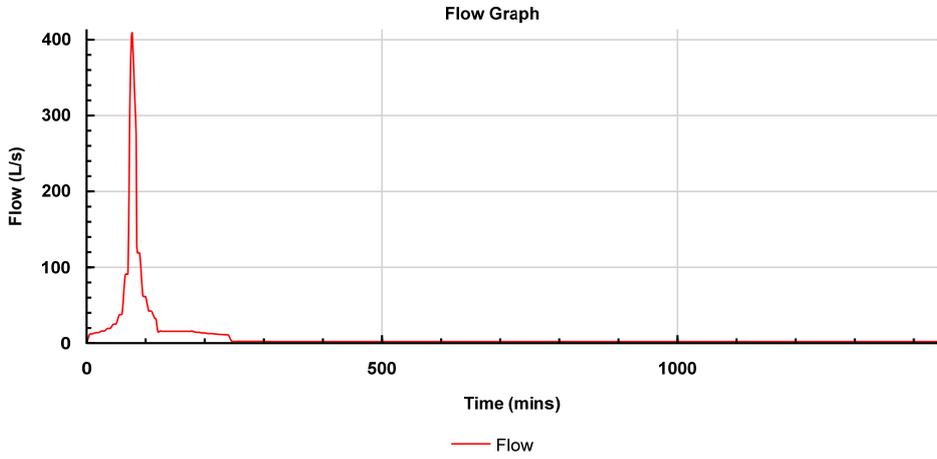
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

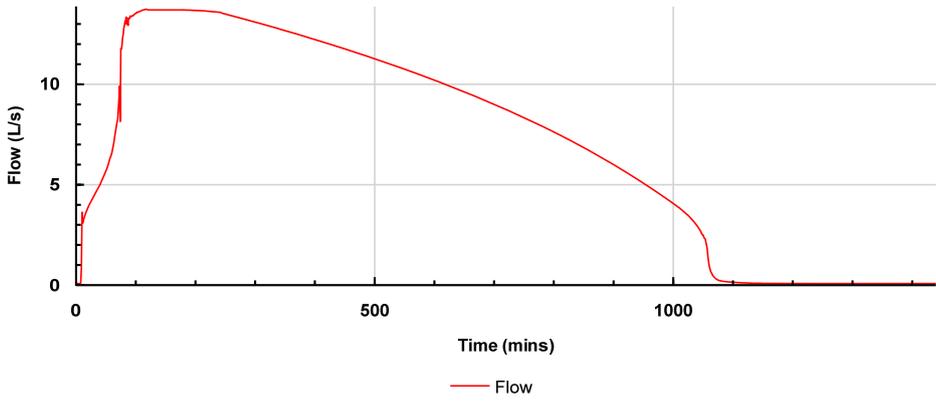


Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 100yr

Type : Pipe

Graphs

Flow Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		



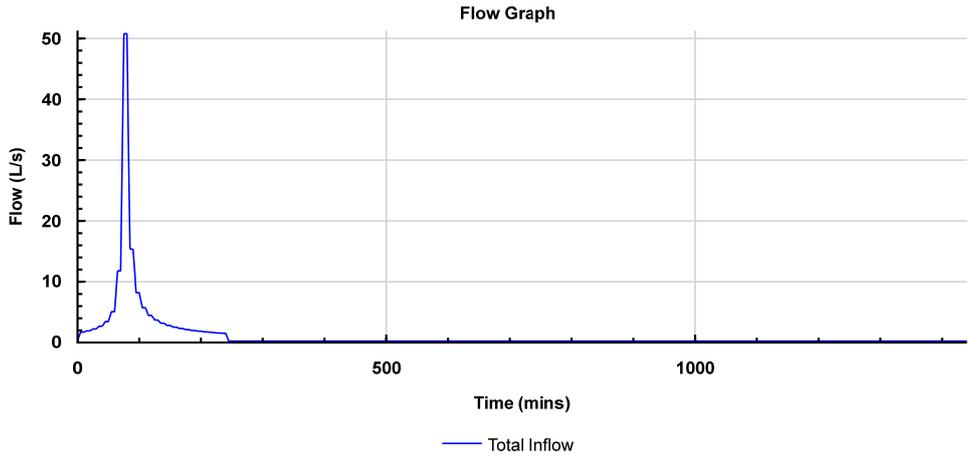
Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Catchment Area

Inflow

Max. Inflow (L/s)	50.8
Total Inflow Volume (m³)	81.130

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

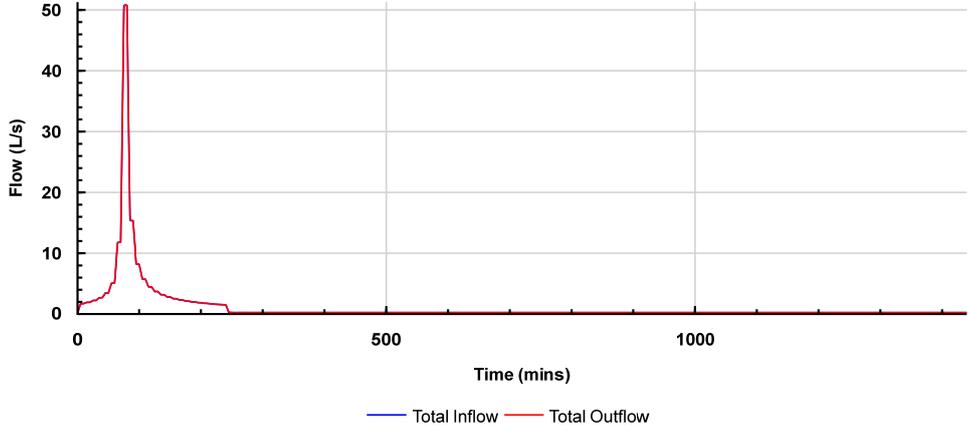


1
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

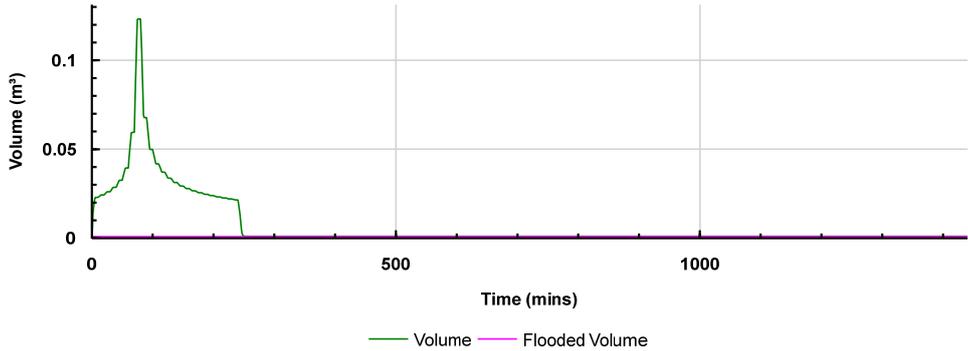
Type : Manhole

Graphs

Flow Graph



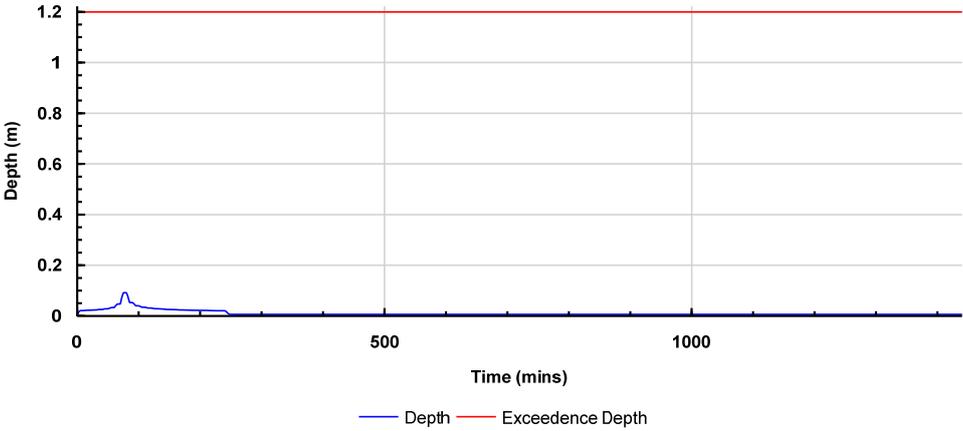
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

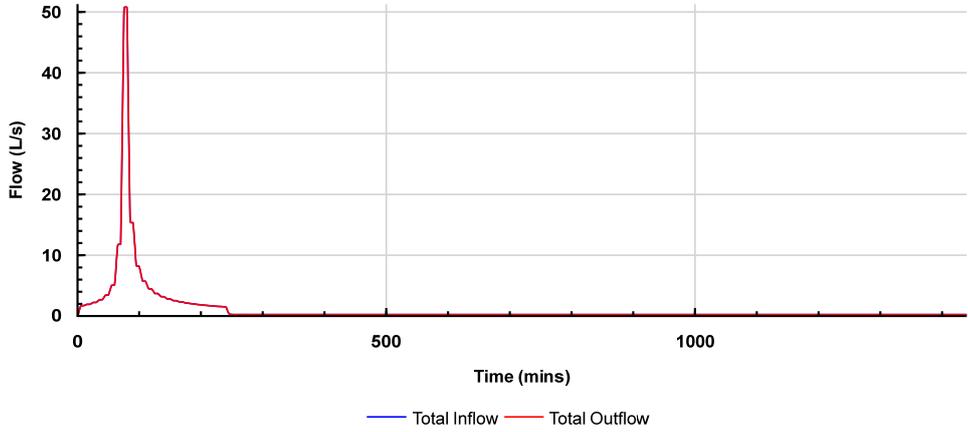


2
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

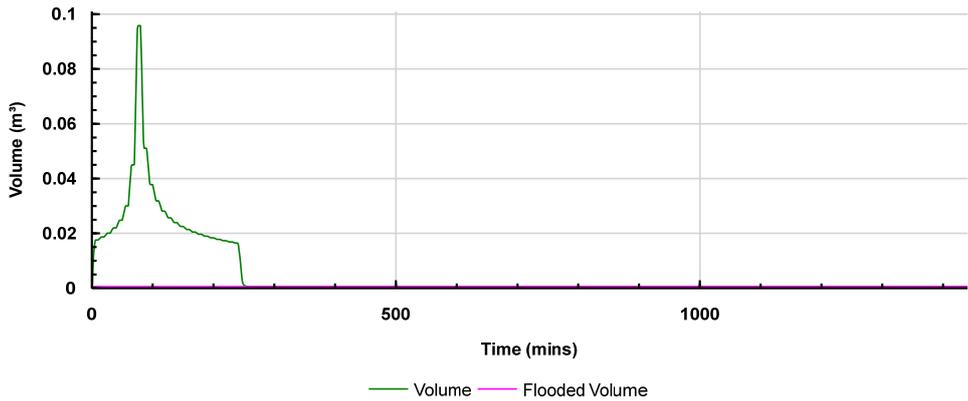
Type : Manhole

Graphs

Flow Graph



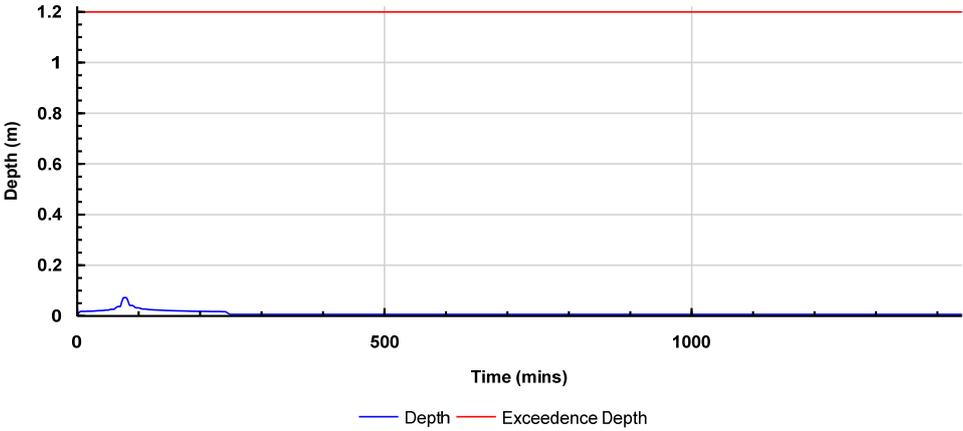
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

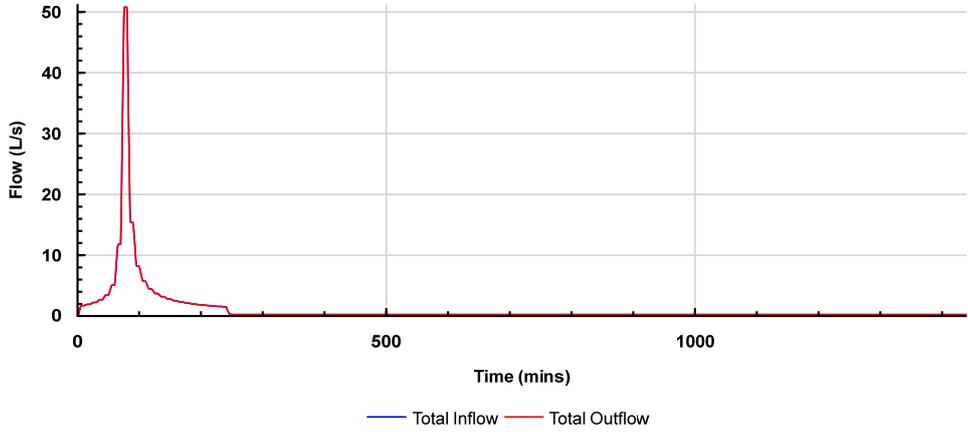


3
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

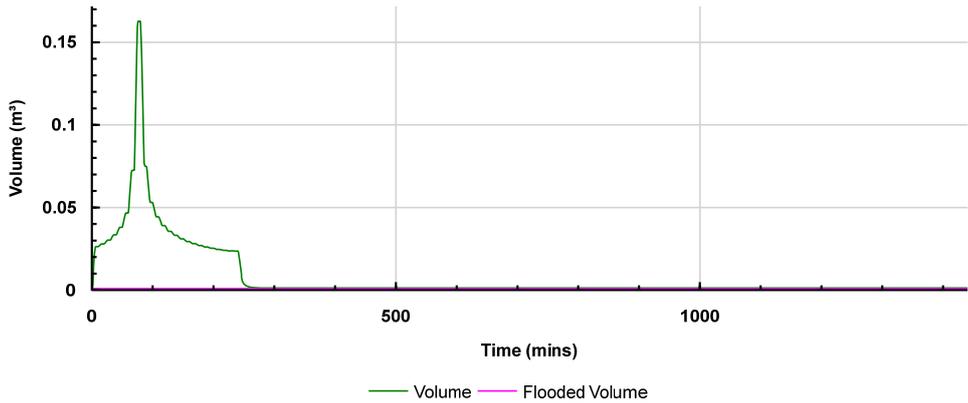
Type : Manhole

Graphs

Flow Graph



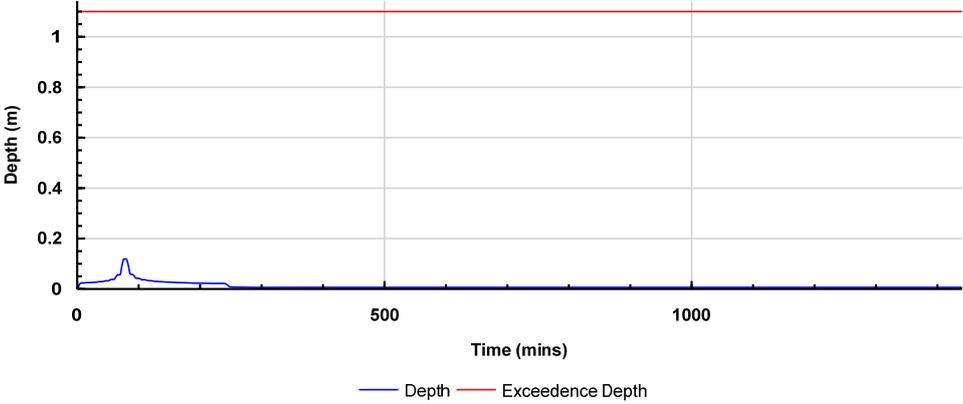
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

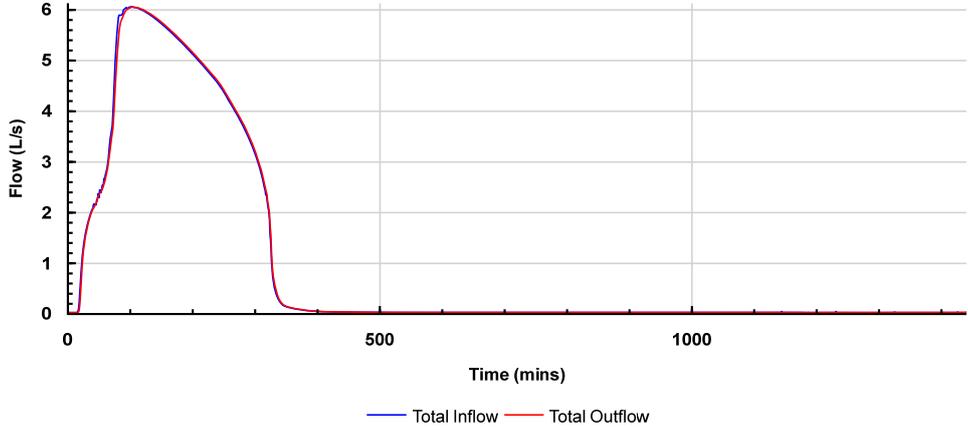


4 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

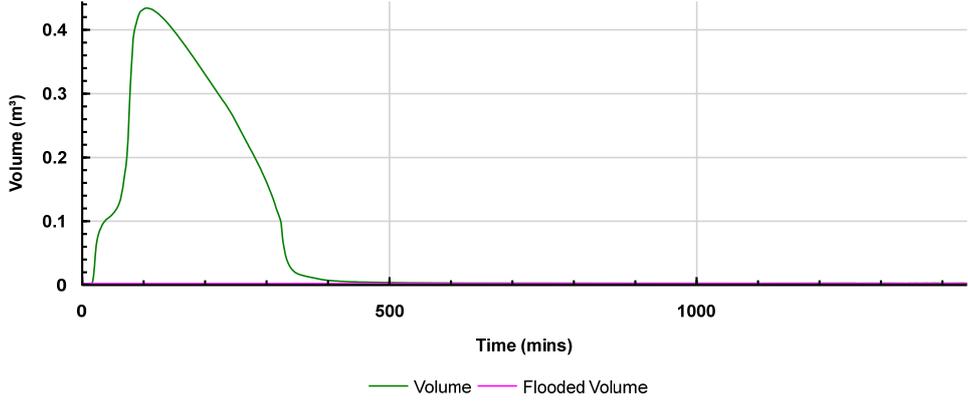
Type : Manhole

Graphs

Flow Graph

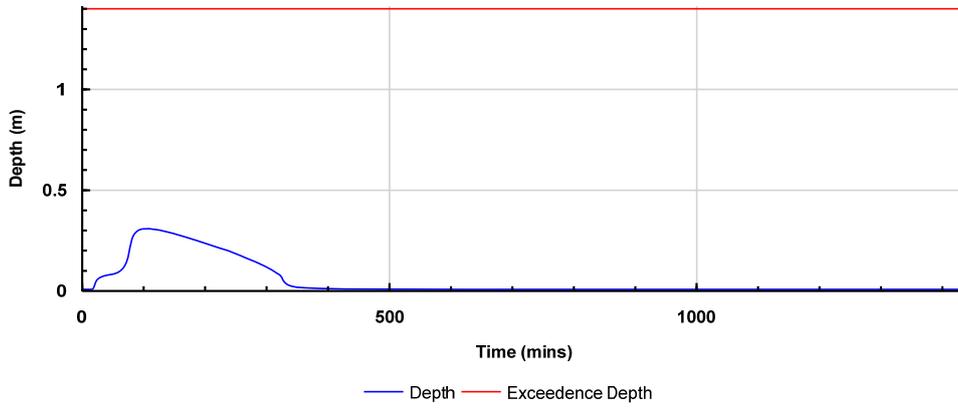


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



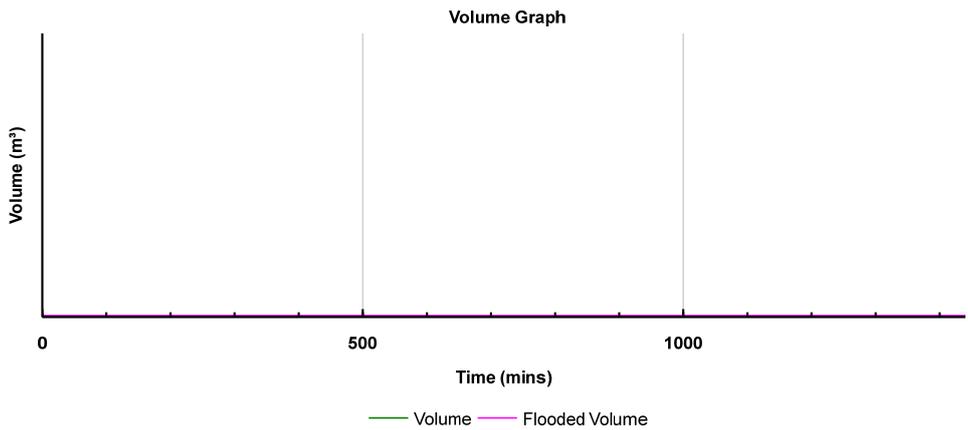
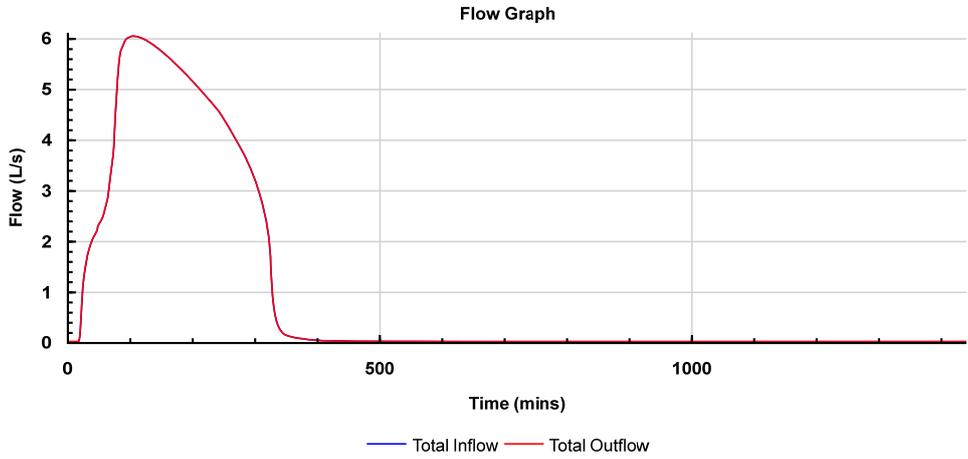
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



5 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Manhole

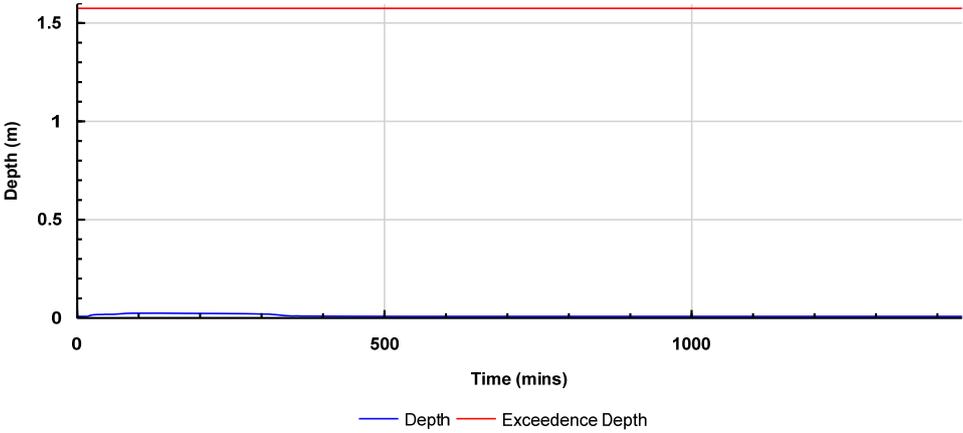
Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

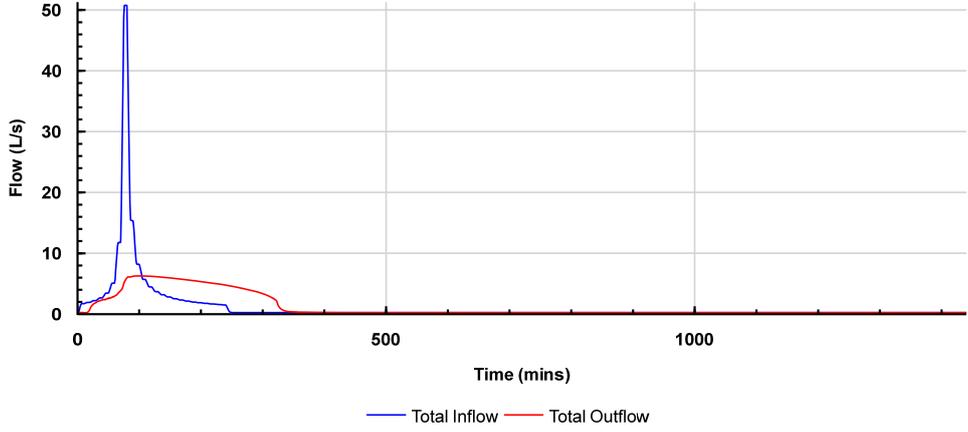


Dry Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

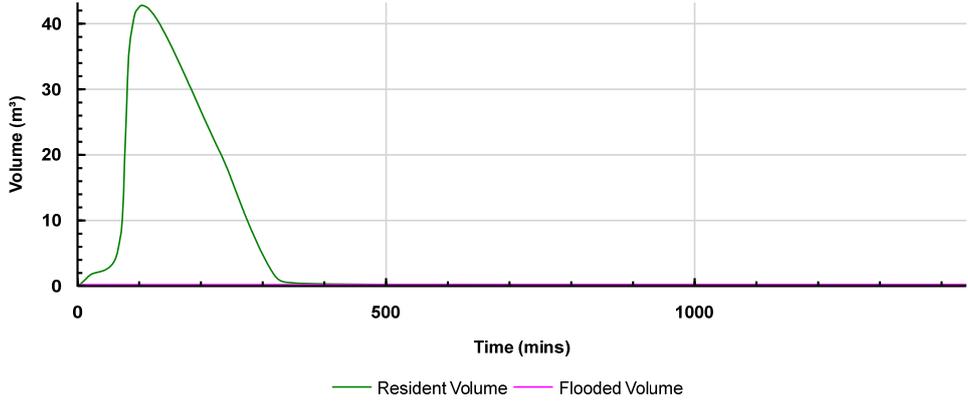
Type : Swale

Graphs

Flow Graph



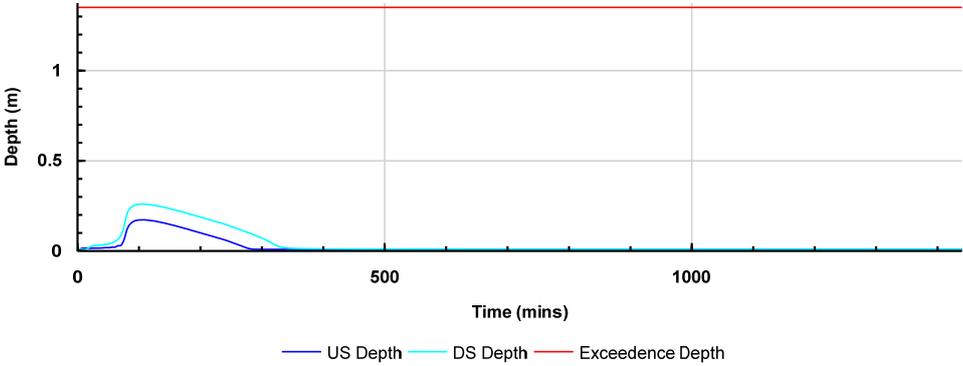
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Depth Graph



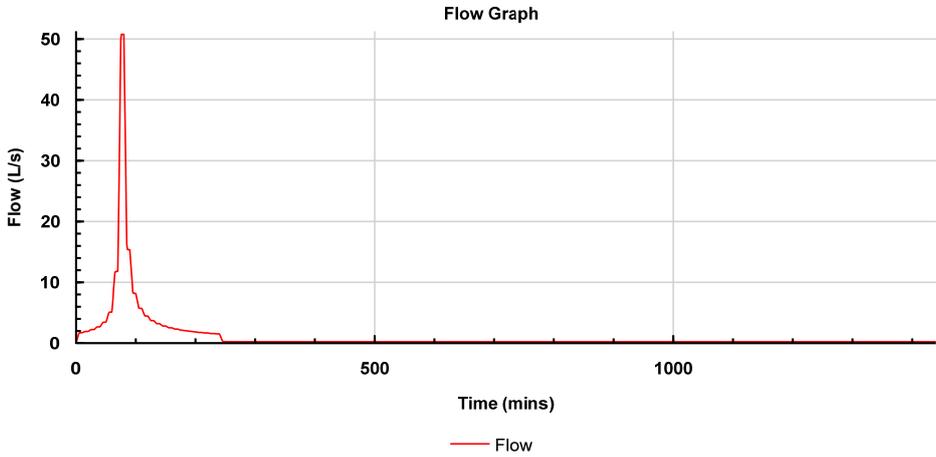
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.000
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs



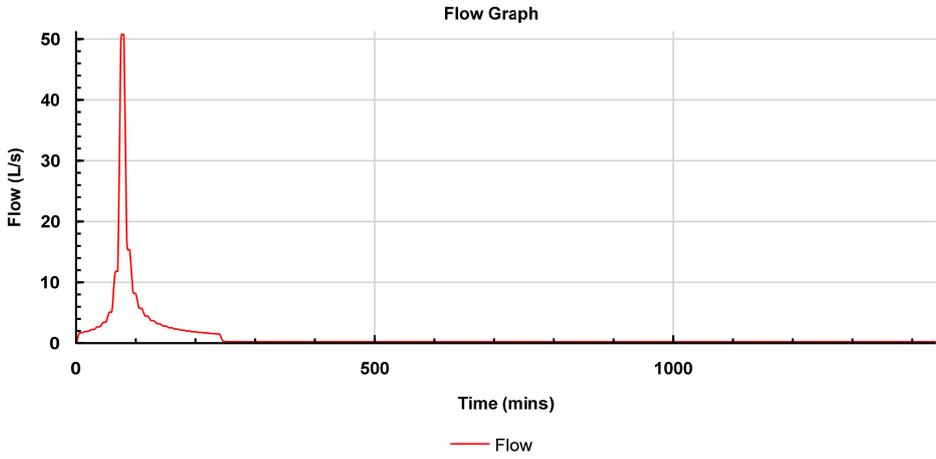
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.001
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs



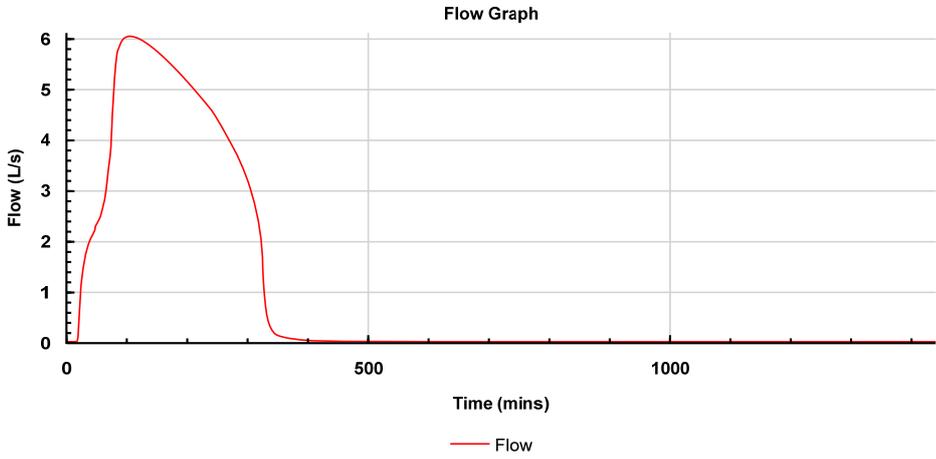
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.004
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs



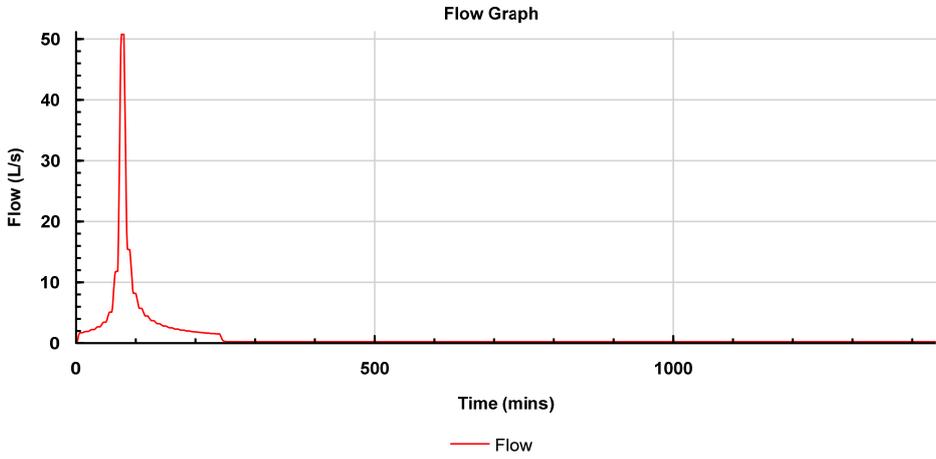
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs



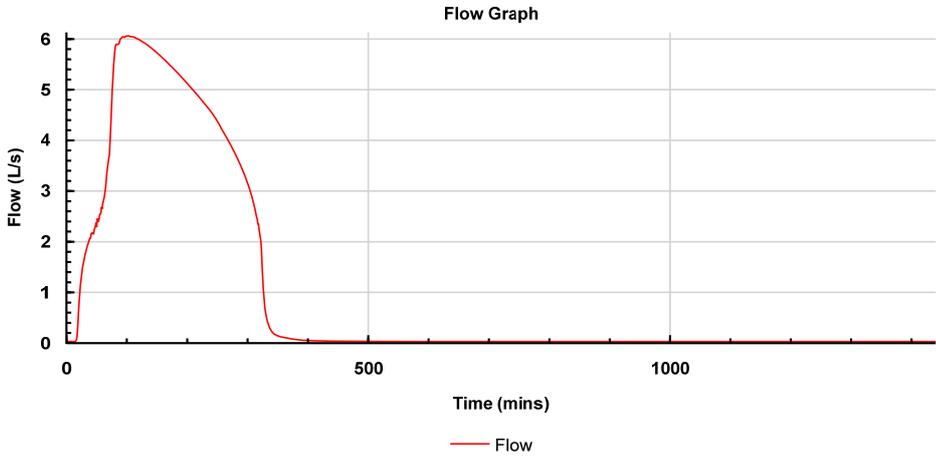
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 25yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		



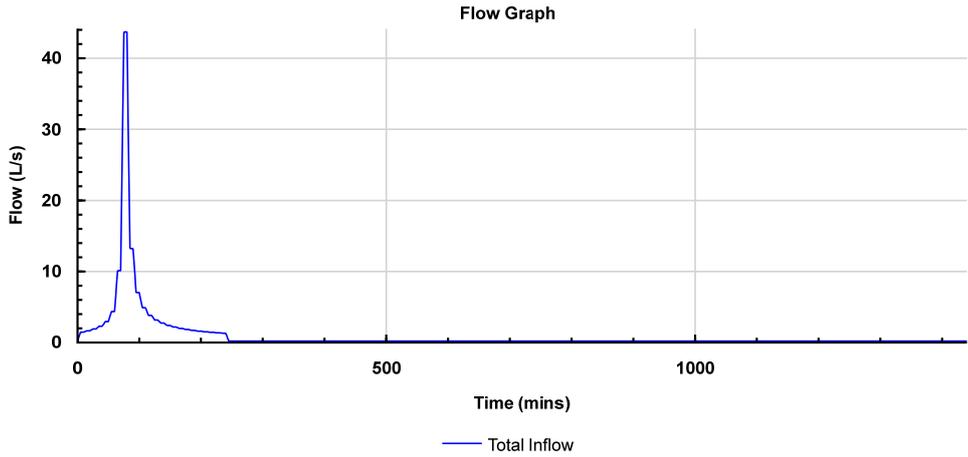
Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Catchment Area

Inflow

Max. Inflow (L/s)	43.7
Total Inflow Volume (m³)	69.636

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

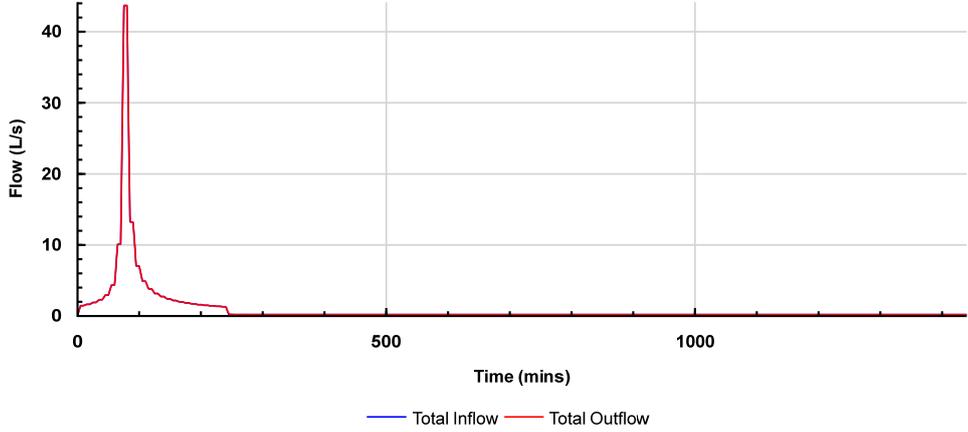


1
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

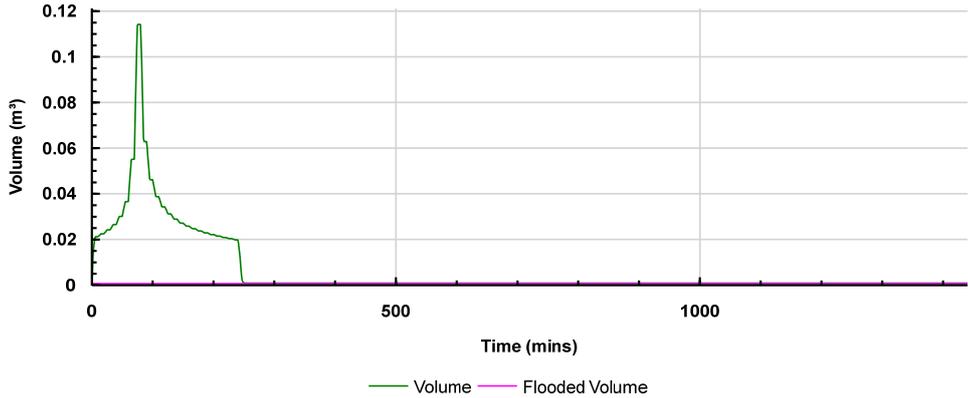
Type : Manhole

Graphs

Flow Graph



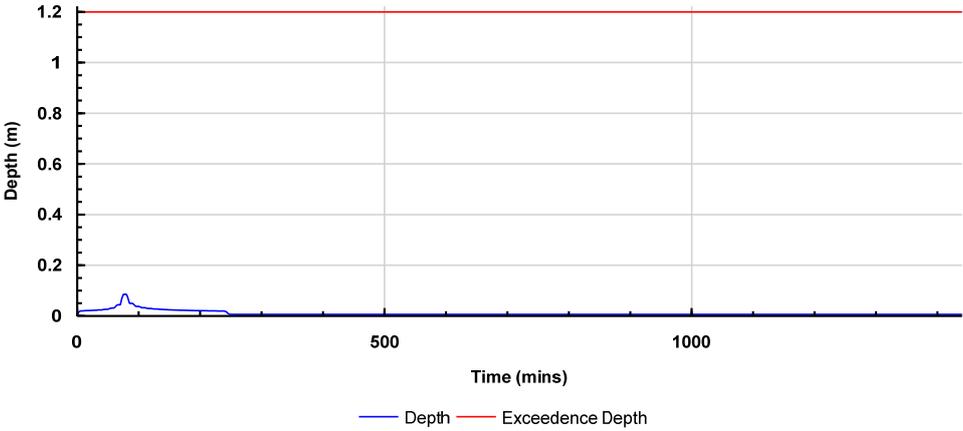
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

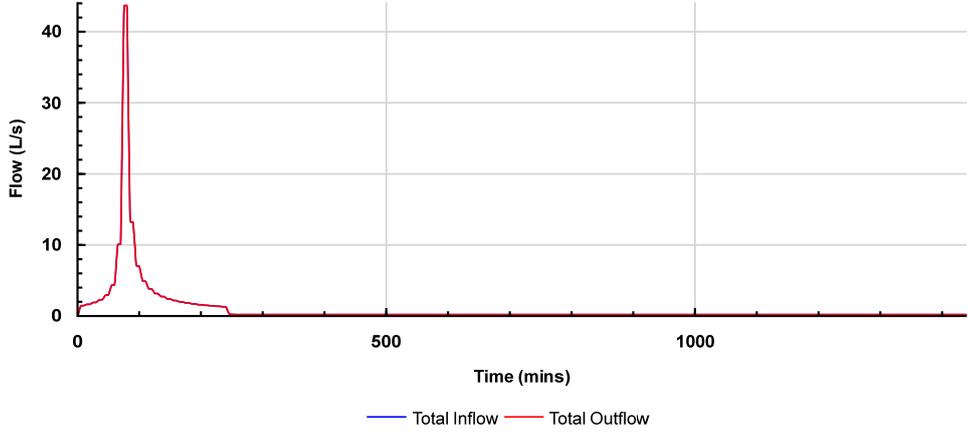


2
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

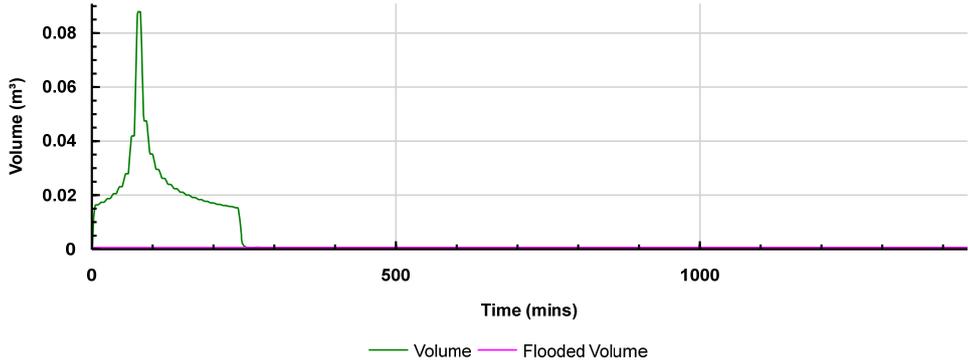
Type : Manhole

Graphs

Flow Graph



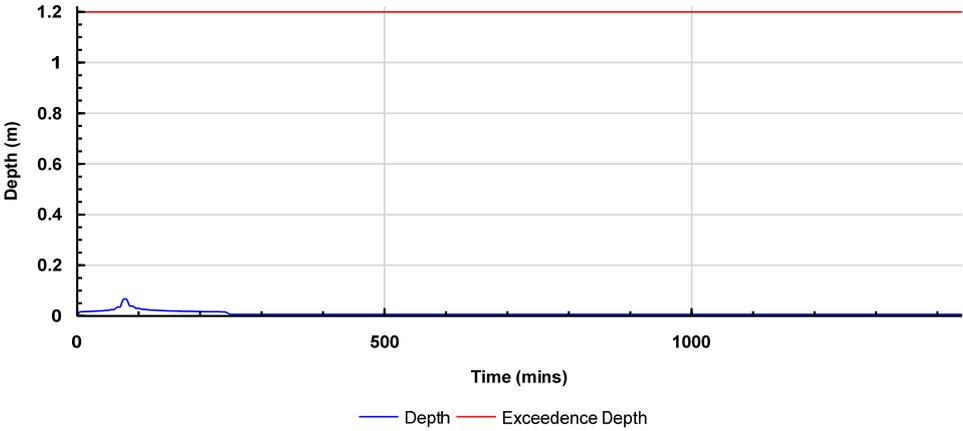
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

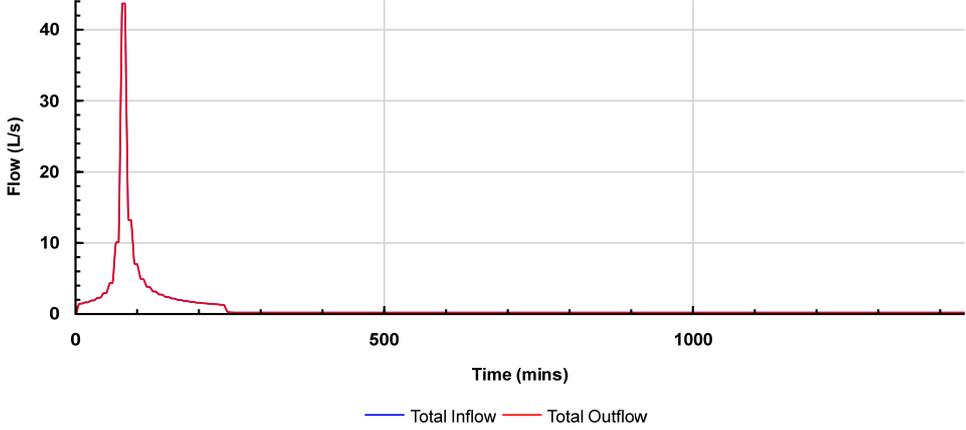


3
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

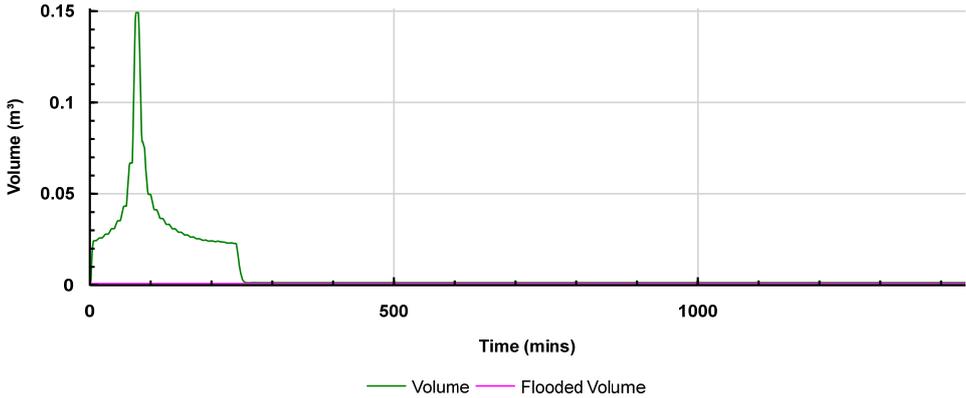
Type : Manhole

Graphs

Flow Graph



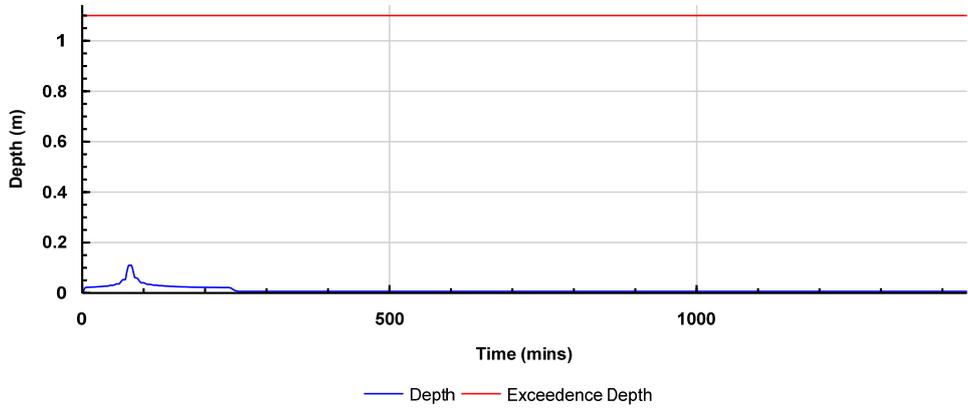
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

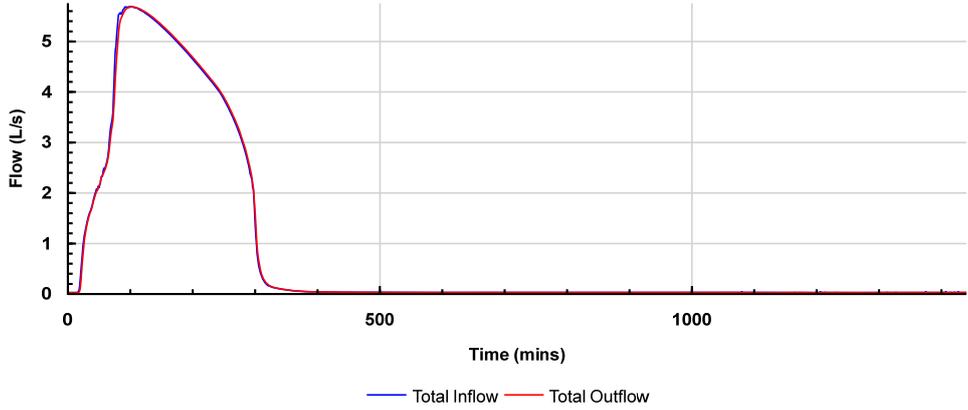


4 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

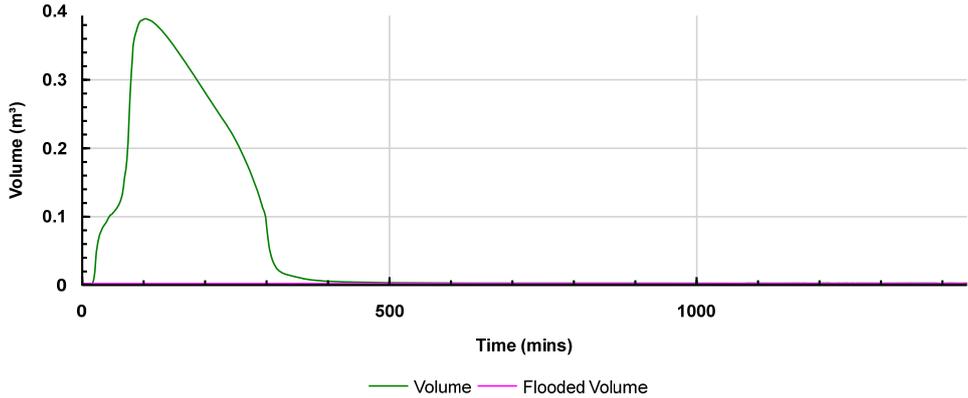
Type : Manhole

Graphs

Flow Graph



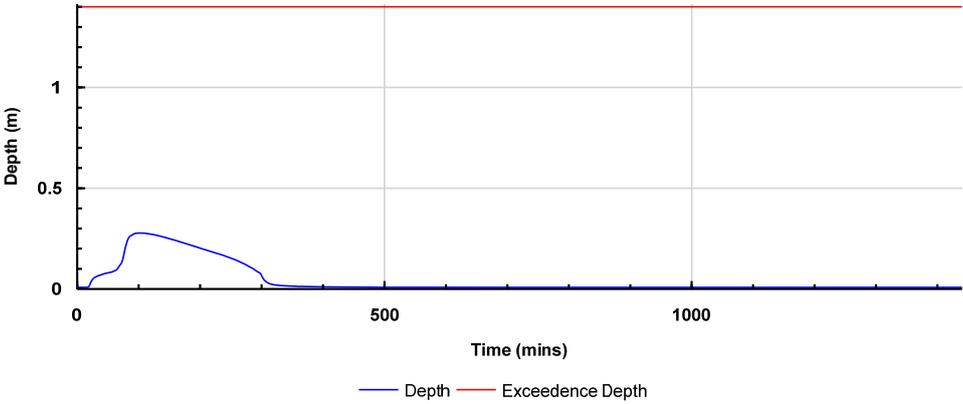
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

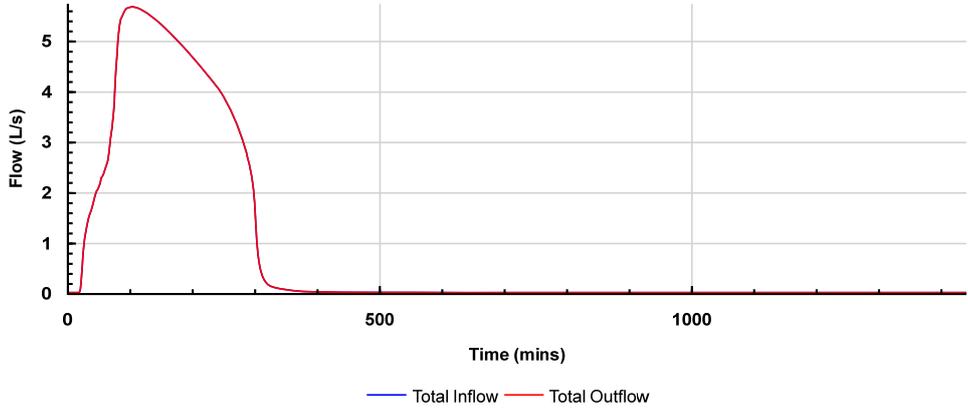


5 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

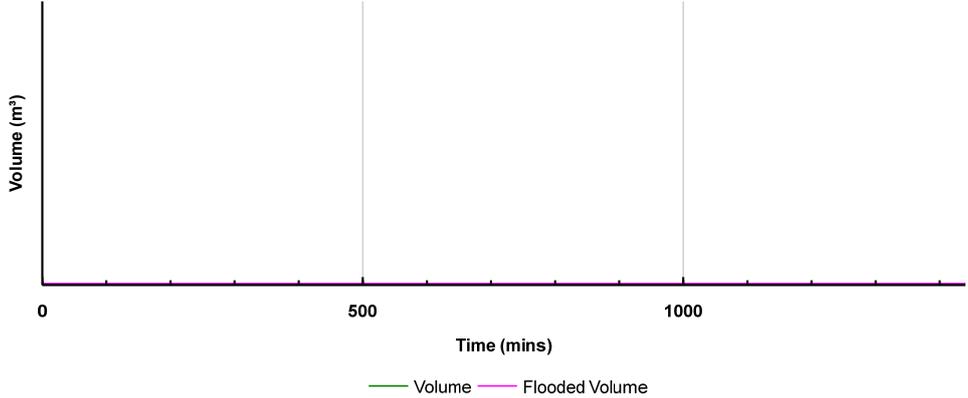
Type : Manhole

Graphs

Flow Graph

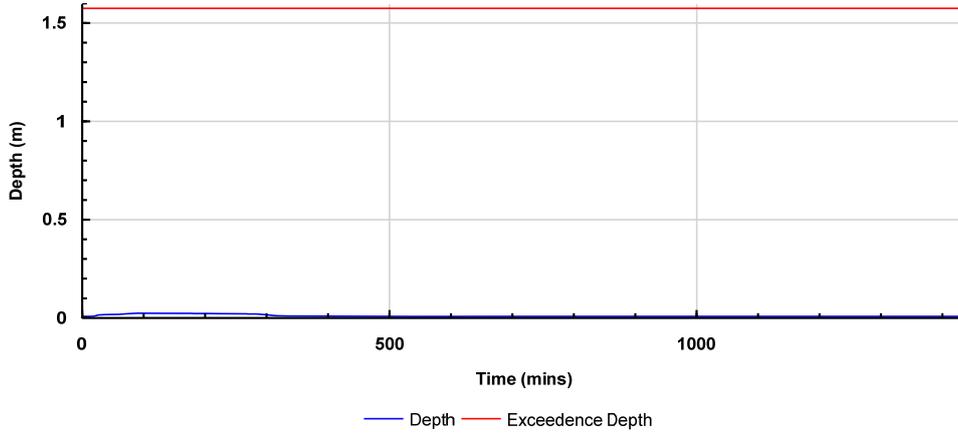


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

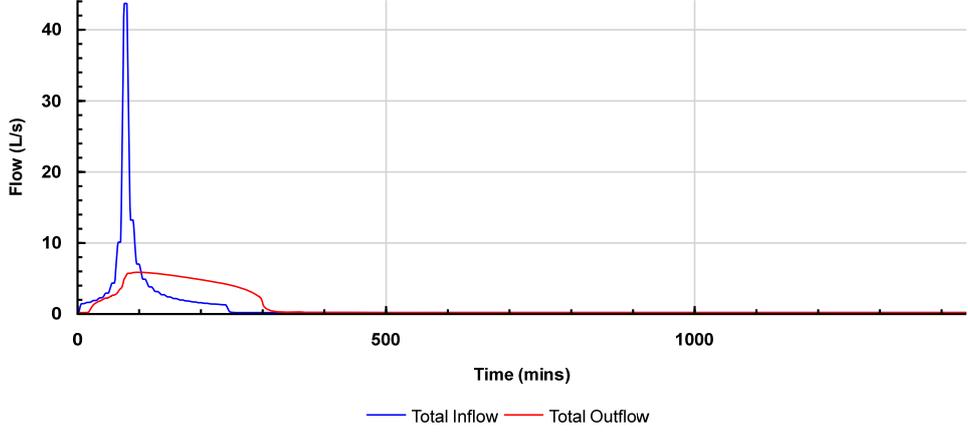


Dry Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

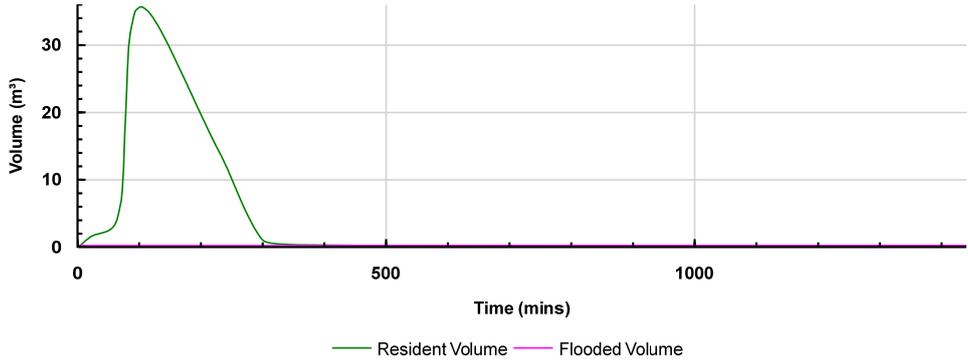
Type : Swale

Graphs

Flow Graph



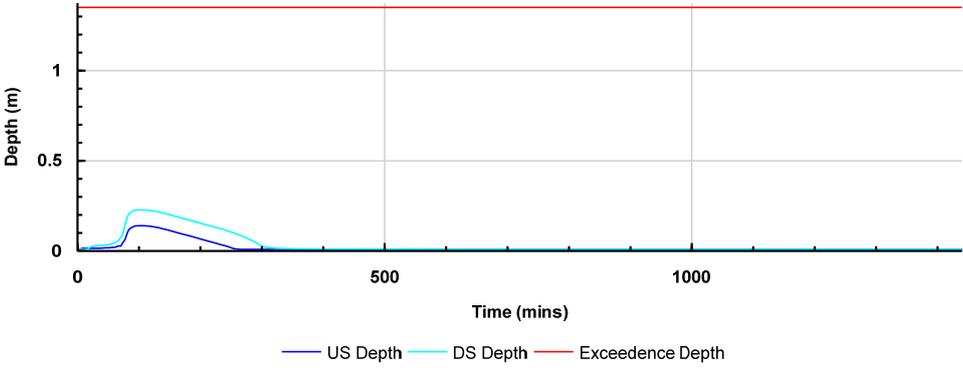
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Depth Graph



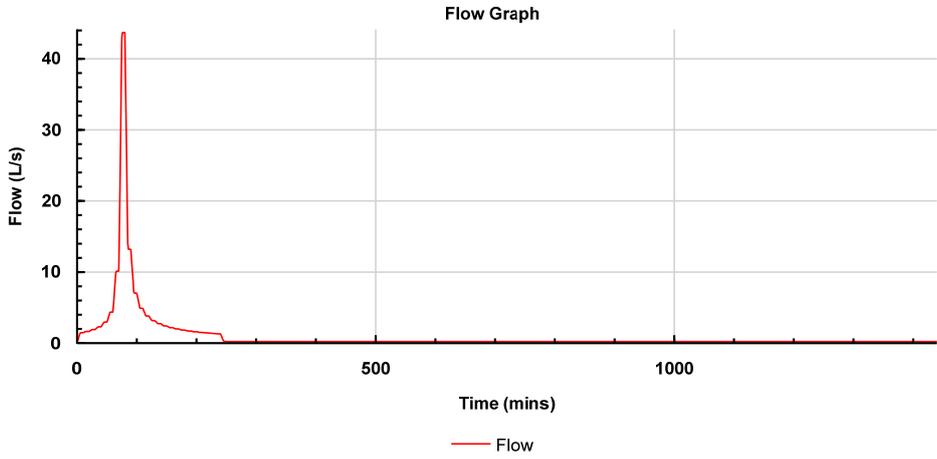
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.000
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs



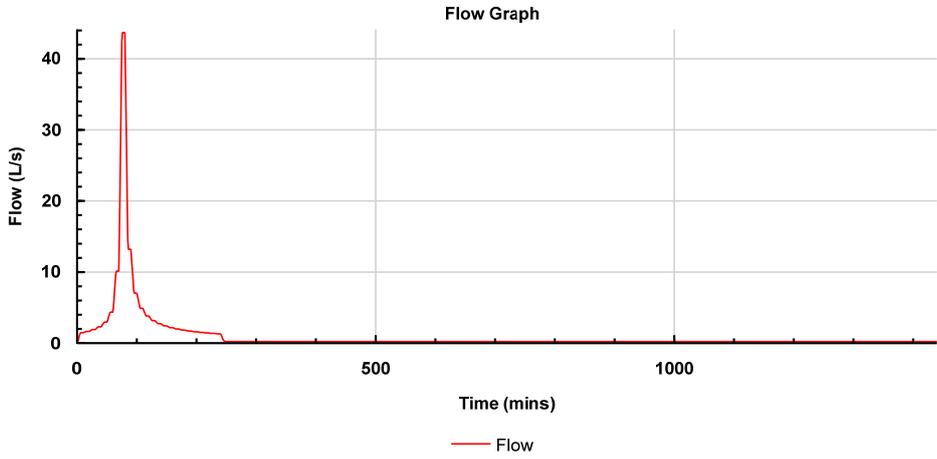
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.001
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

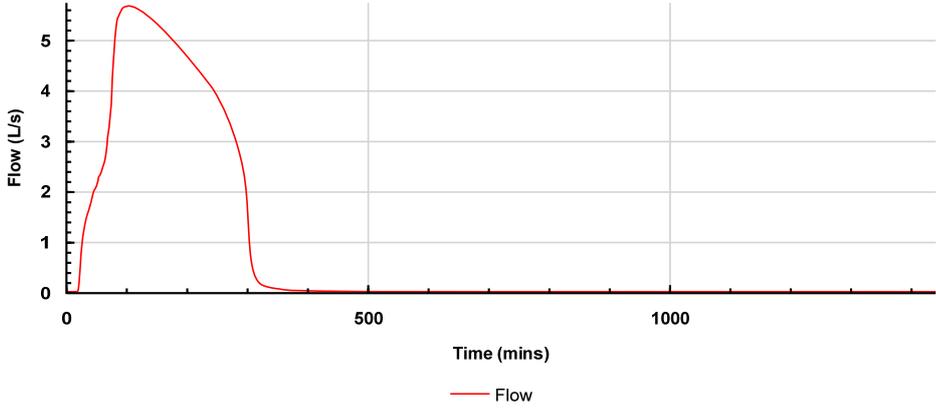


1.004
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs

Flow Graph



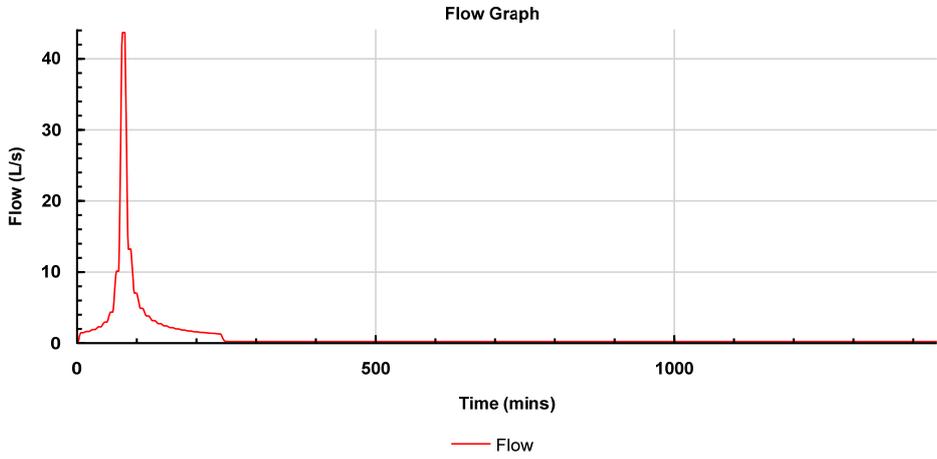
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

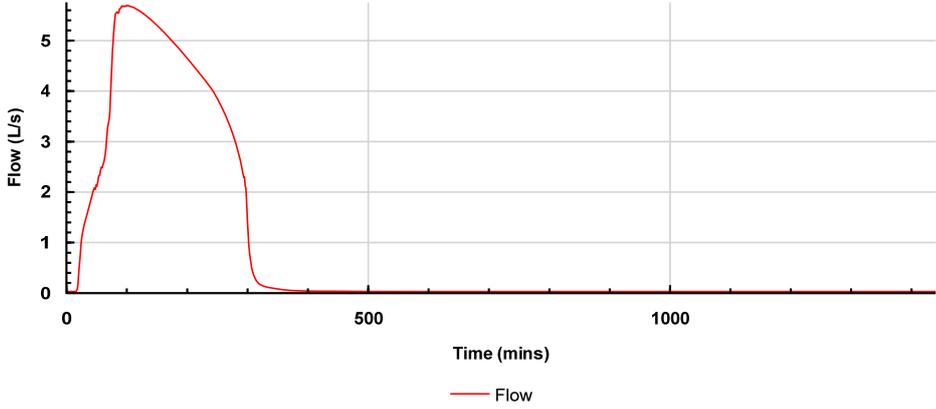


Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 10yr

Type : Pipe

Graphs

Flow Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		



Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

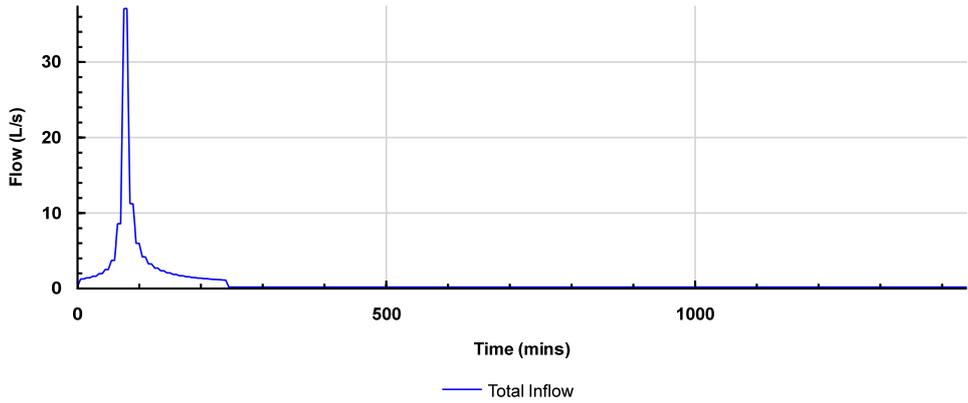
Type : Catchment Area

Inflow

Max. Inflow (L/s)	37.1
Total Inflow Volume (m³)	59.109

Graphs

Flow Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

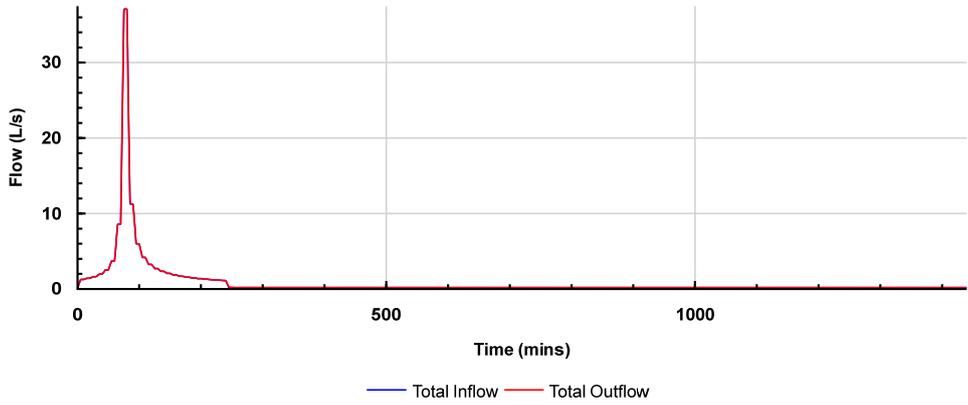


1
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

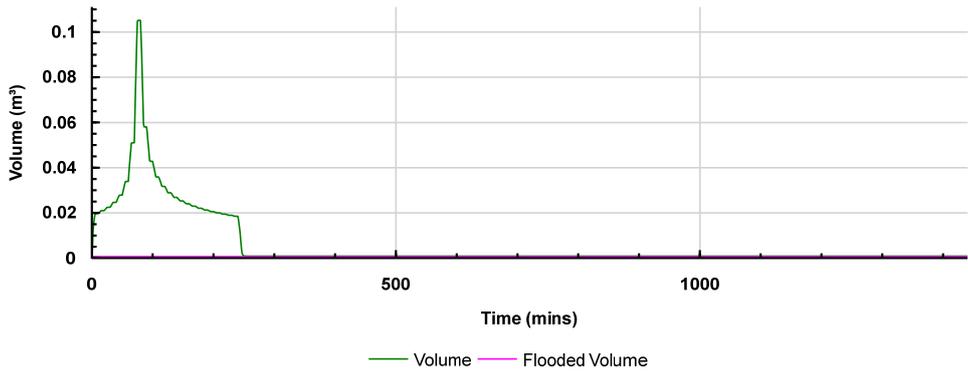
Type : Manhole

Graphs

Flow Graph



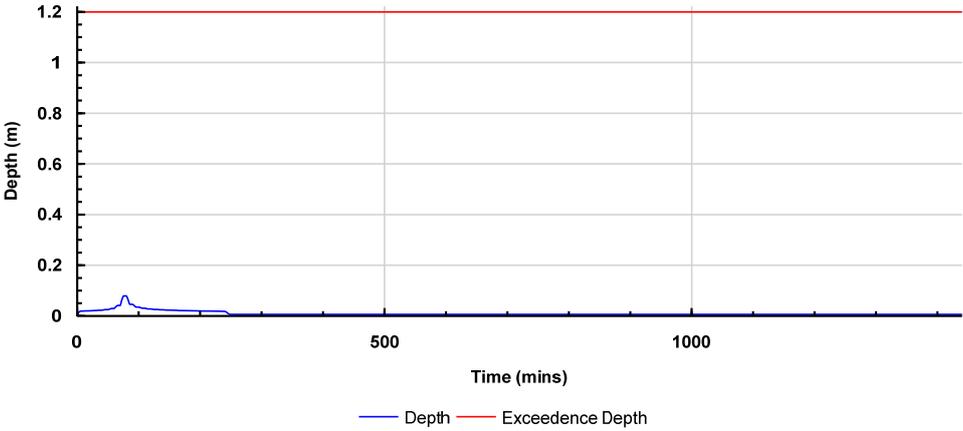
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

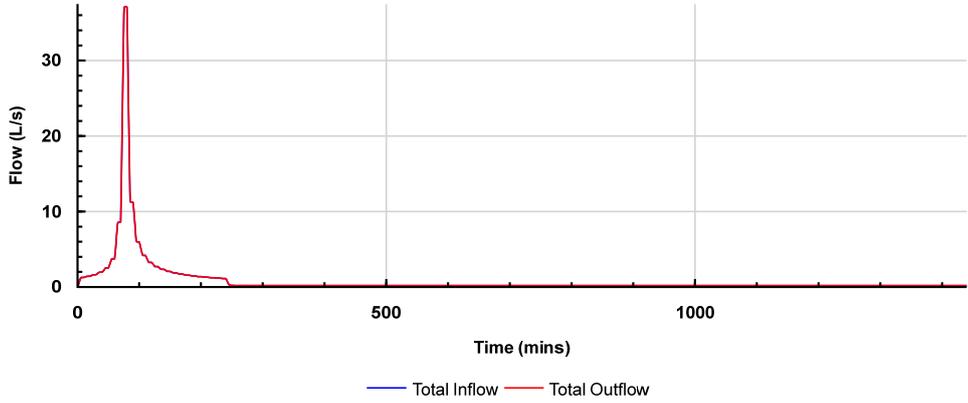


2
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

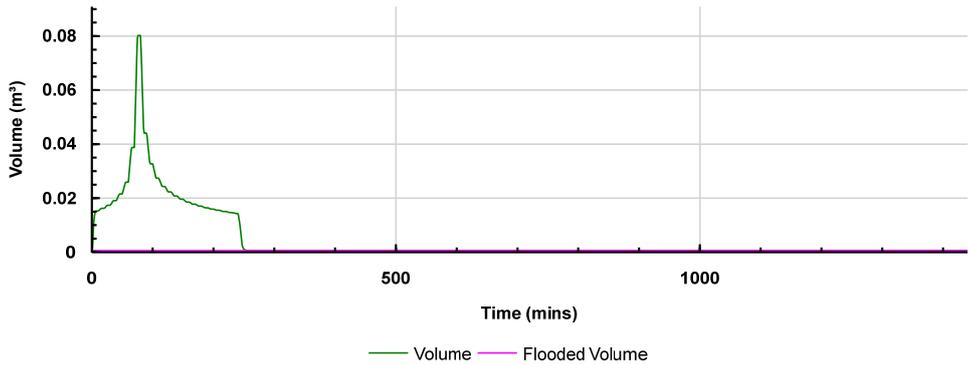
Type : Manhole

Graphs

Flow Graph



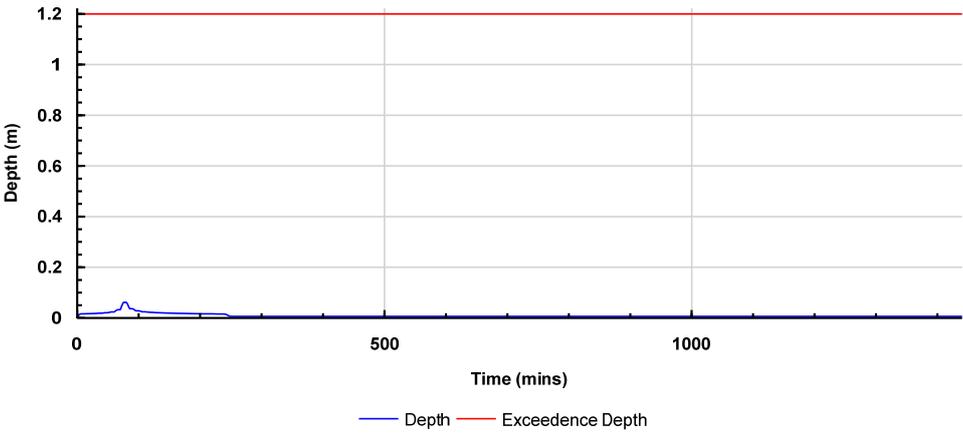
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

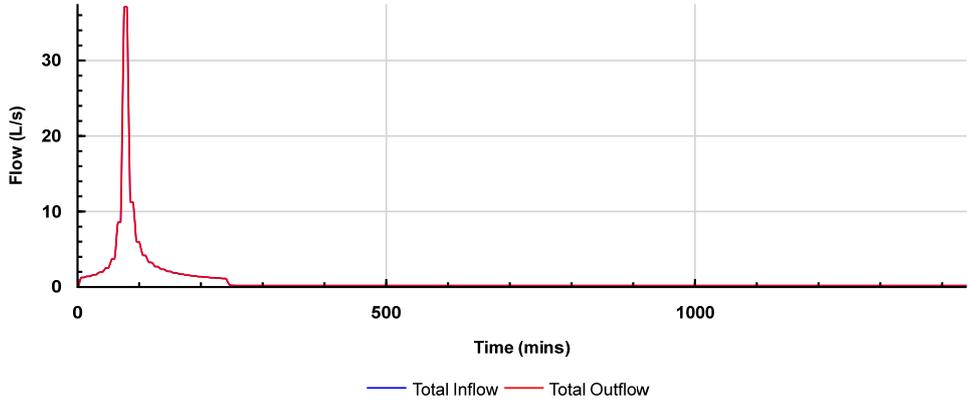


3
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

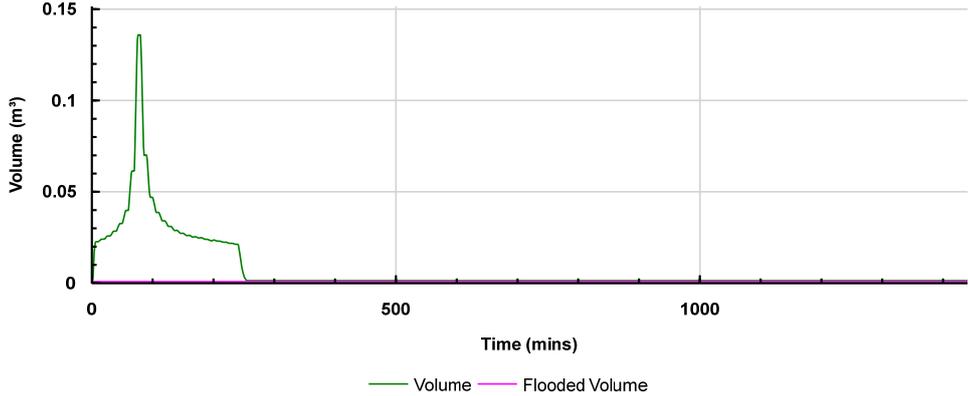
Type : Manhole

Graphs

Flow Graph



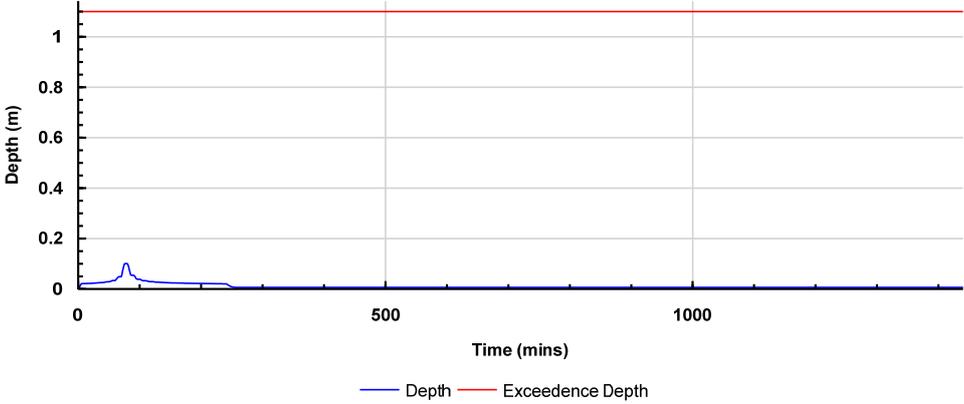
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

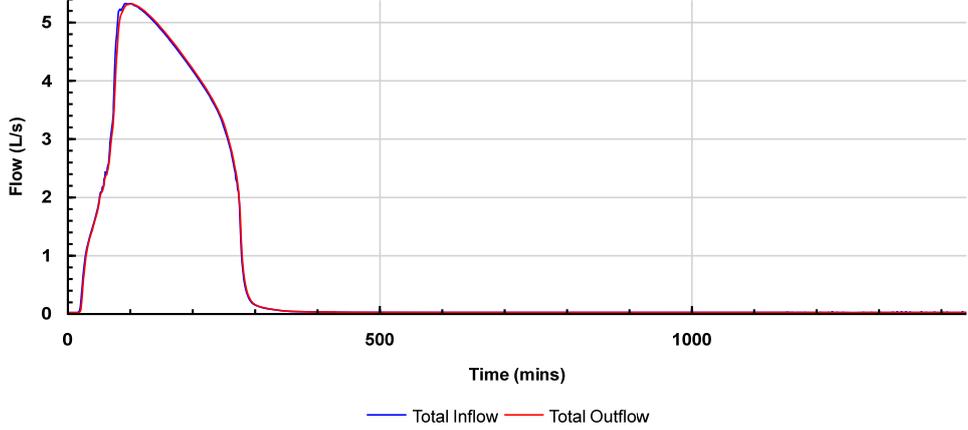


4 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

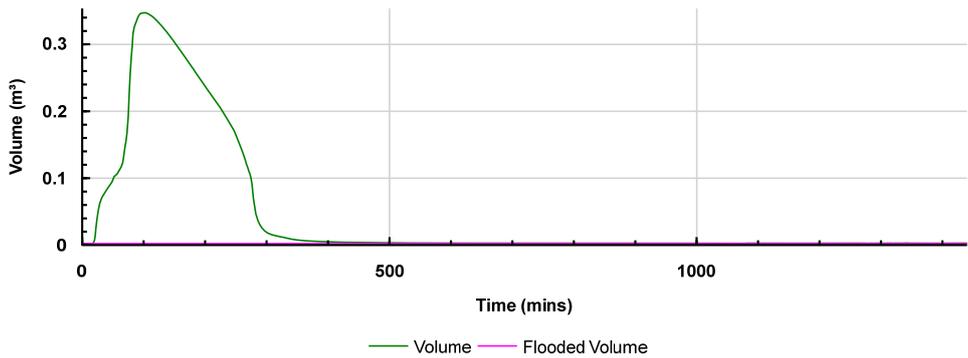
Type : Manhole

Graphs

Flow Graph

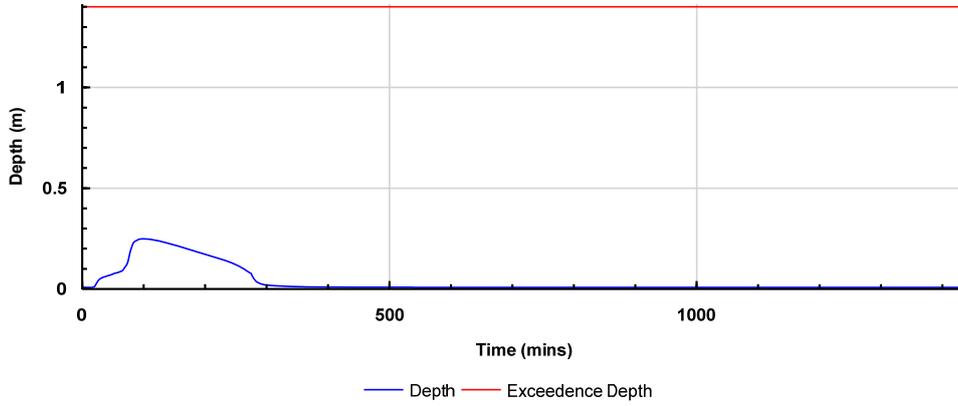


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



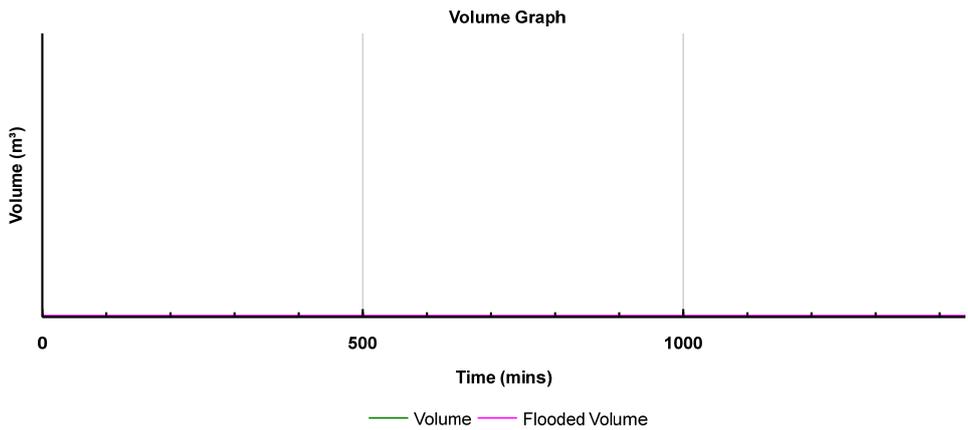
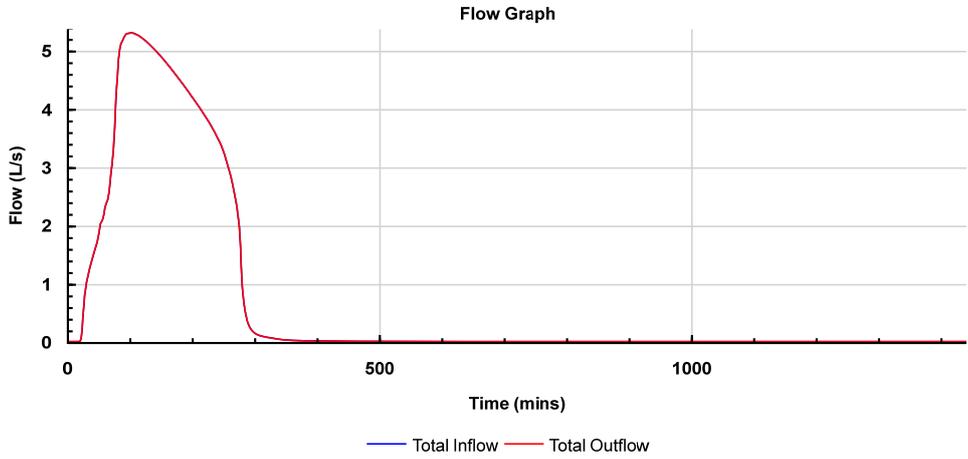
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



5
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Manhole

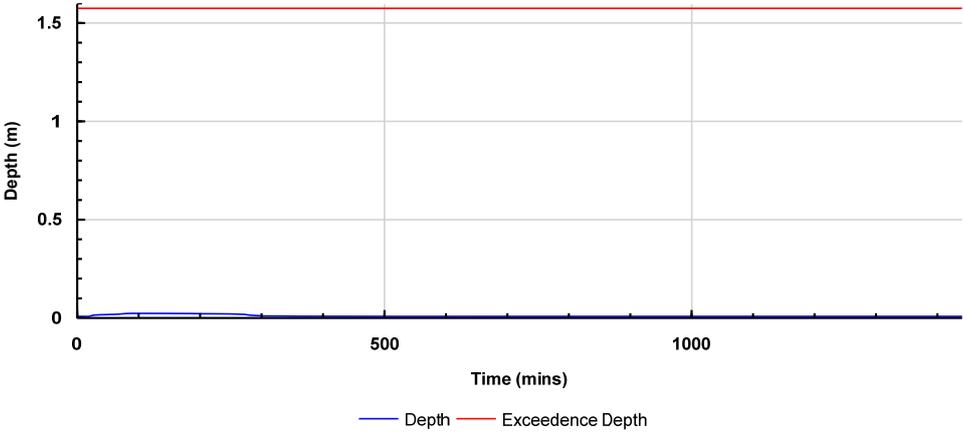
Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

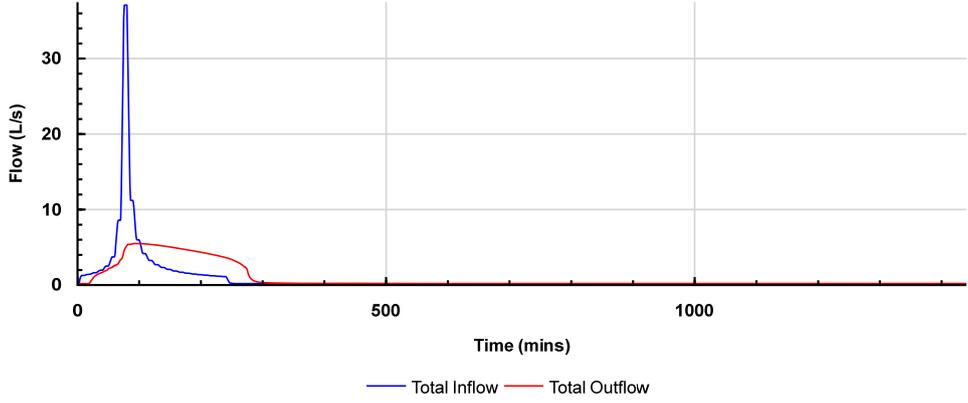


Dry Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

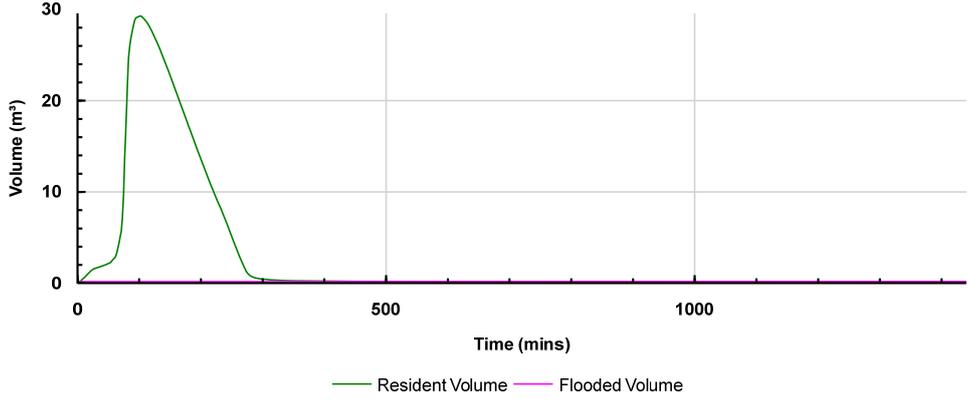
Type : Swale

Graphs

Flow Graph

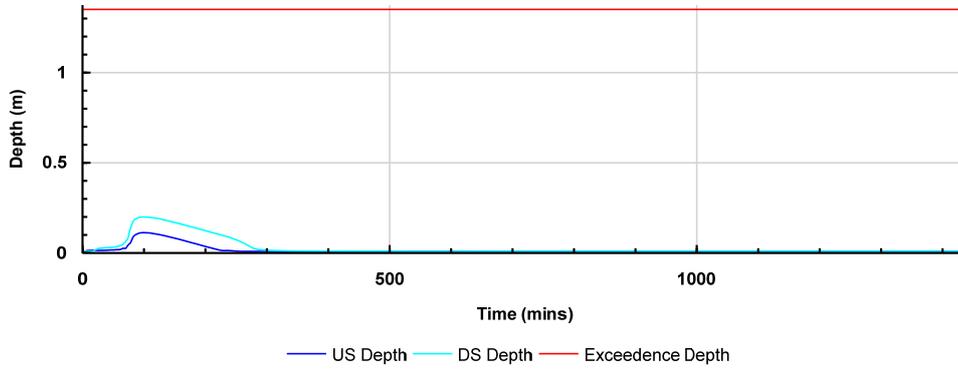


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:			

Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

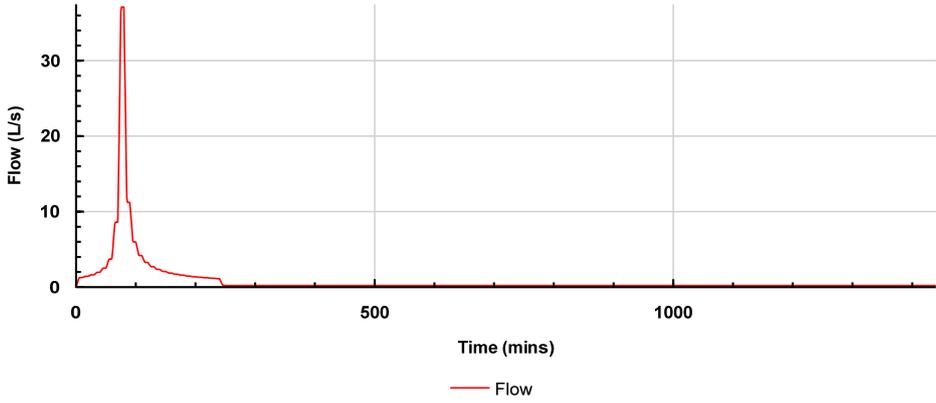


1.000
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs

Flow Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

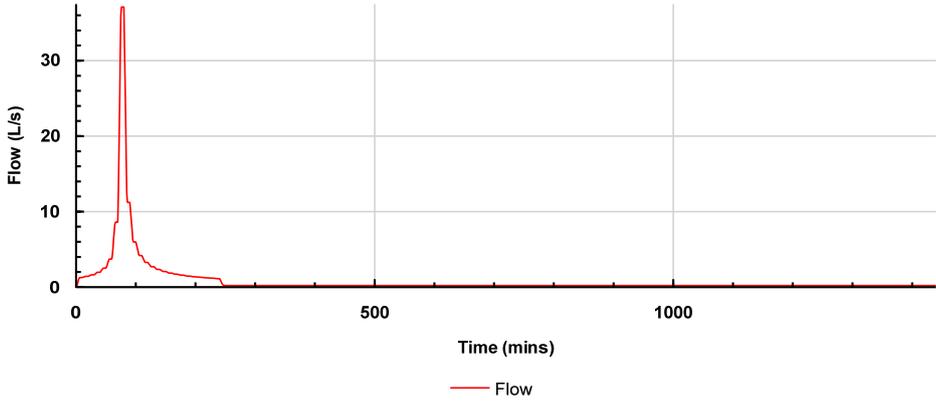


1.001
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs

Flow Graph



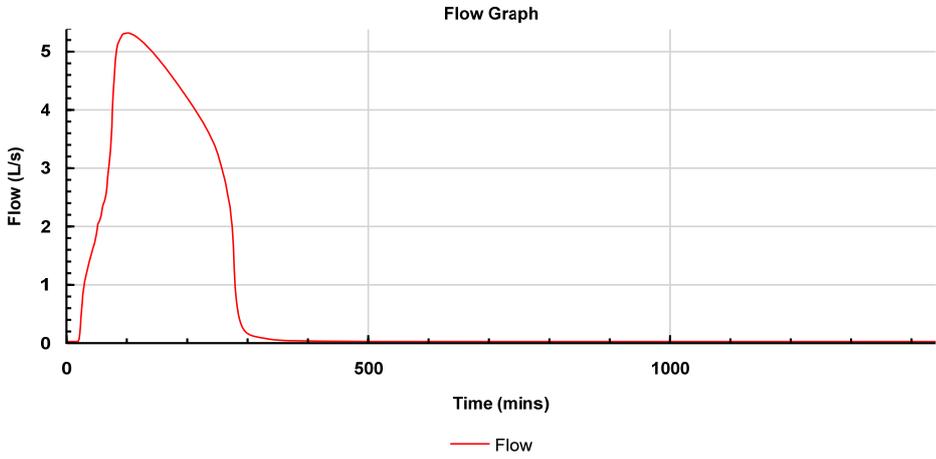
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.004
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

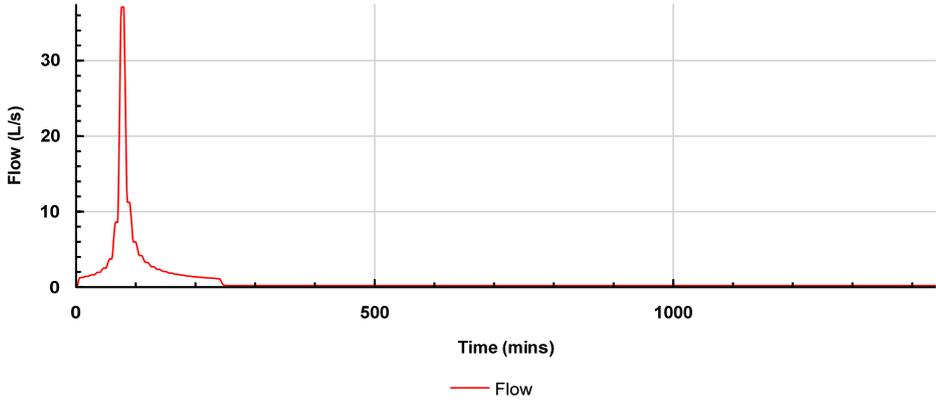


Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs

Flow Graph



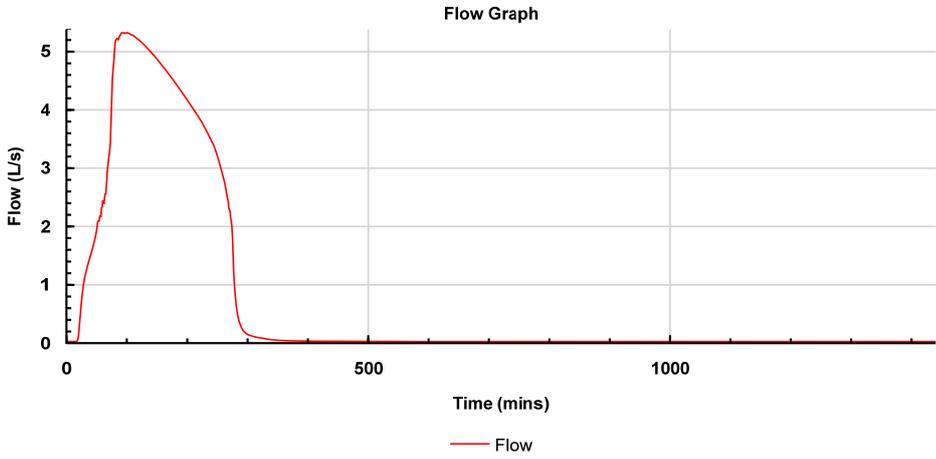
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 5yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Inflow Results Storm Phase: Phase	Company Address:		



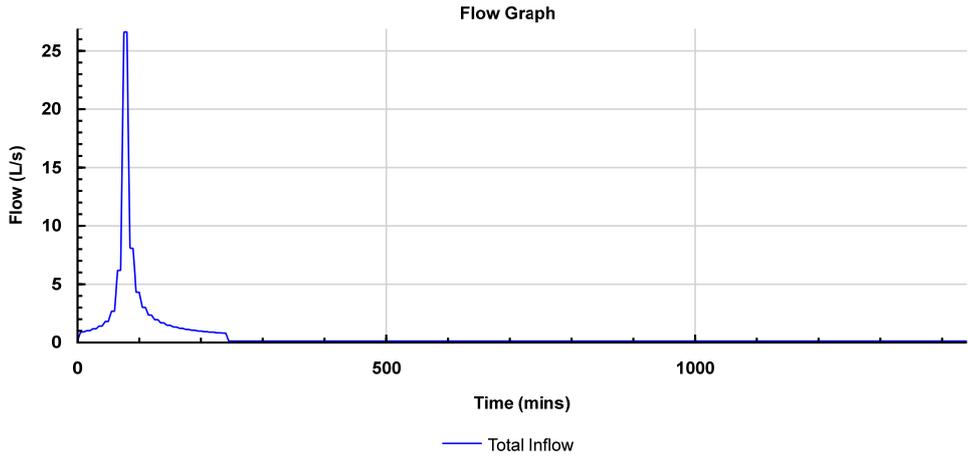
Catchment Area
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Catchment Area

Inflow

Max. Inflow (L/s)	26.6
Total Inflow Volume (m³)	42.643

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

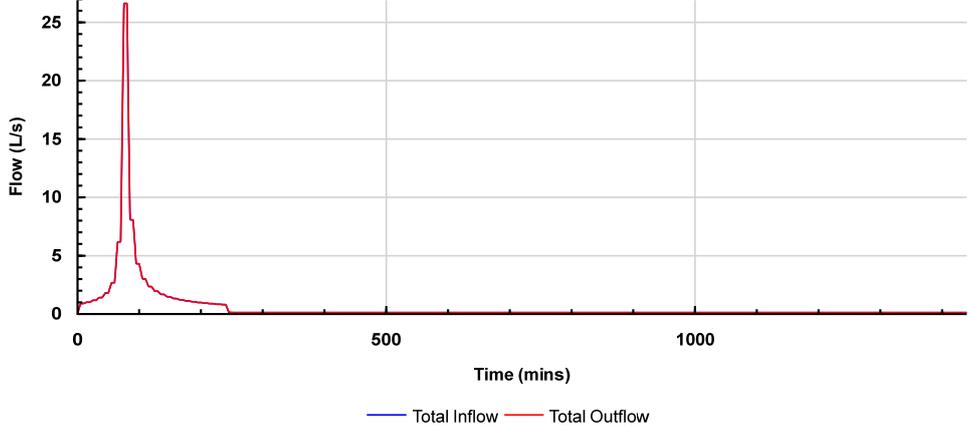


1
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

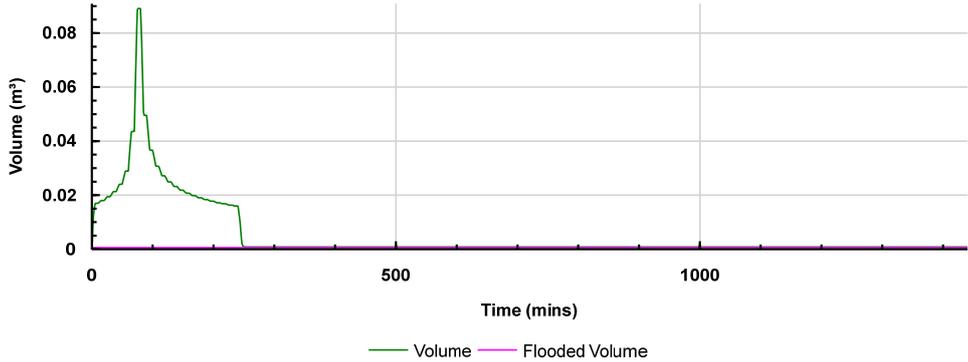
Type : Manhole

Graphs

Flow Graph



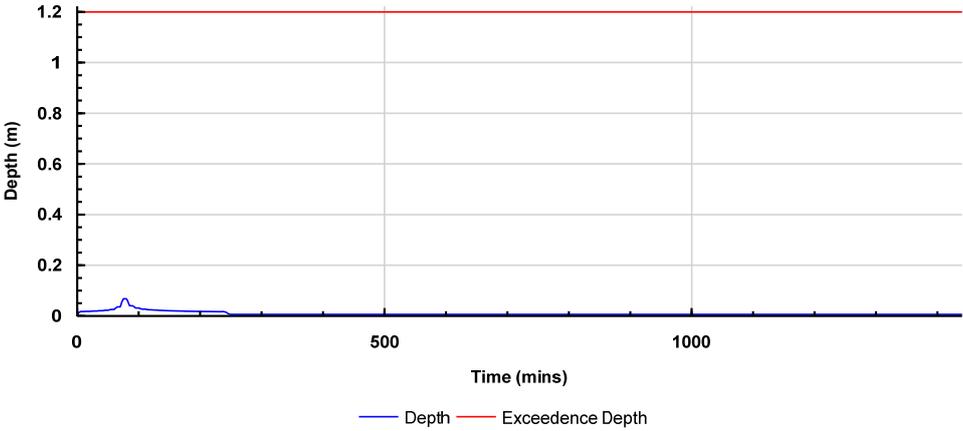
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

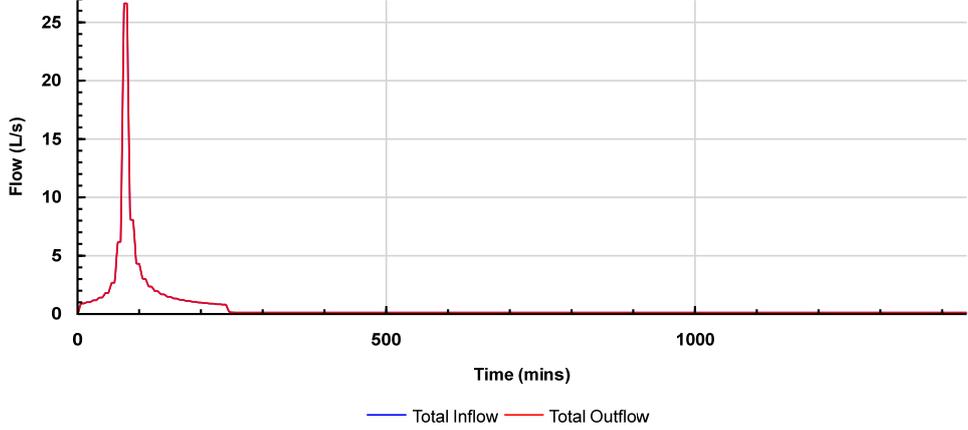


2
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

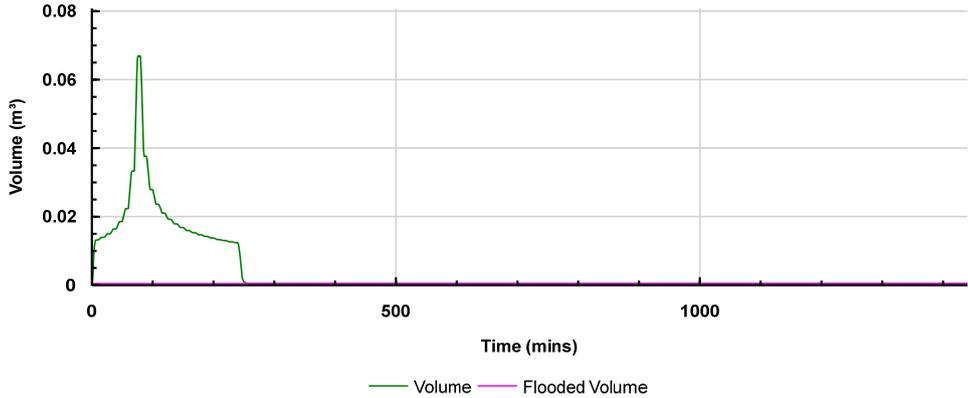
Type : Manhole

Graphs

Flow Graph



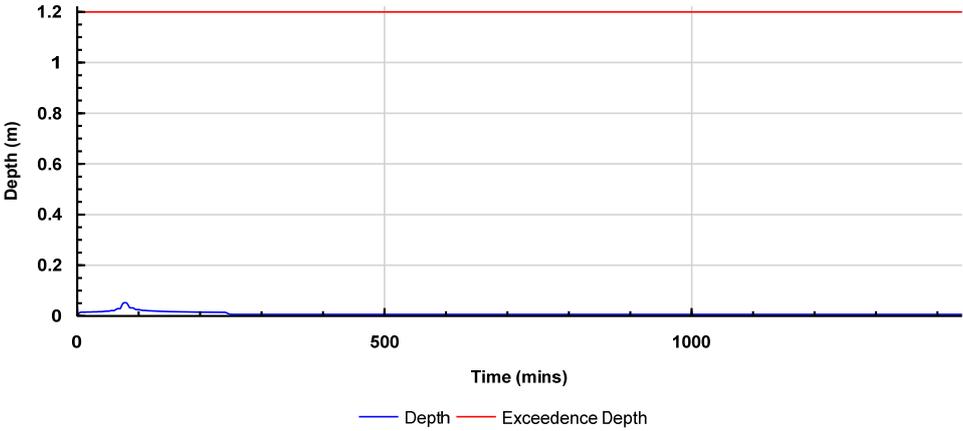
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

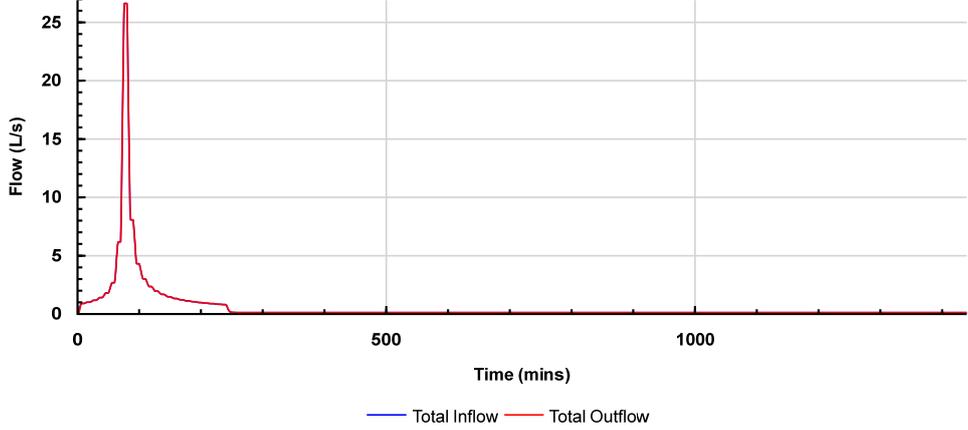


3
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

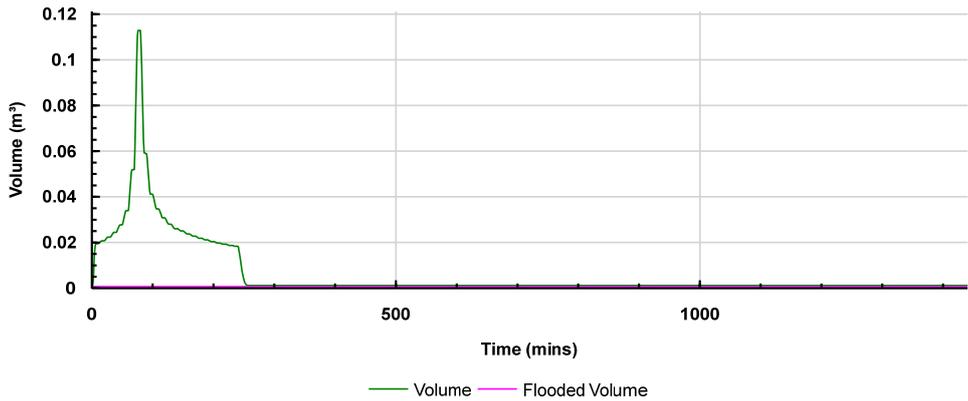
Type : Manhole

Graphs

Flow Graph



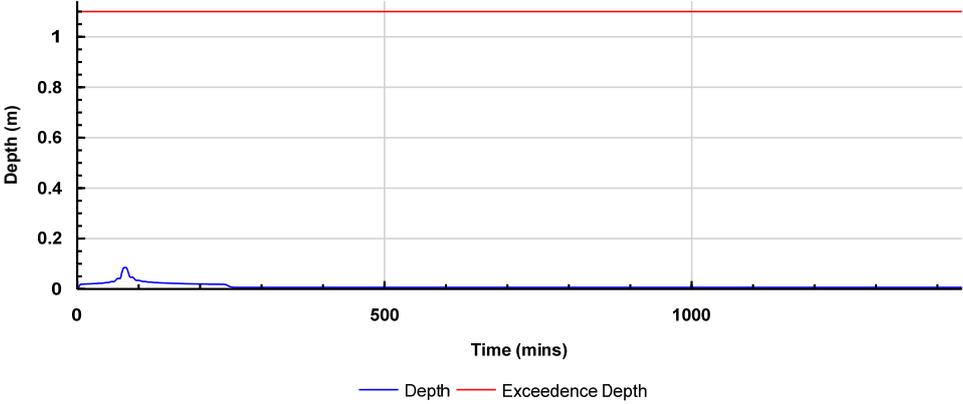
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

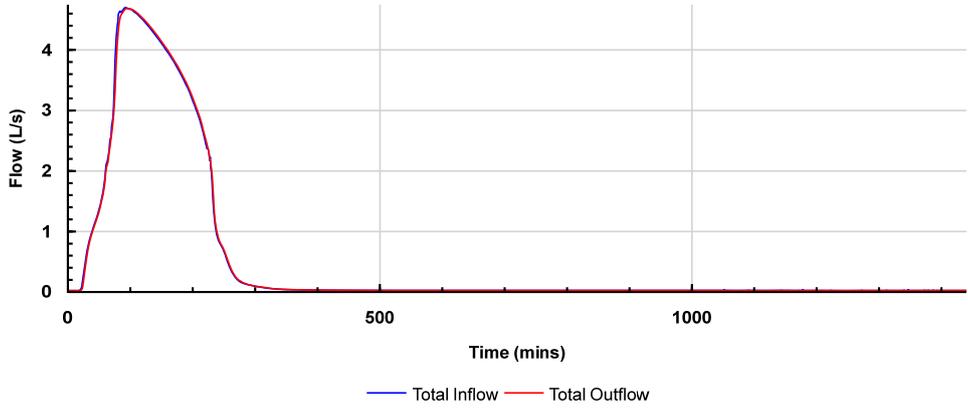


4 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

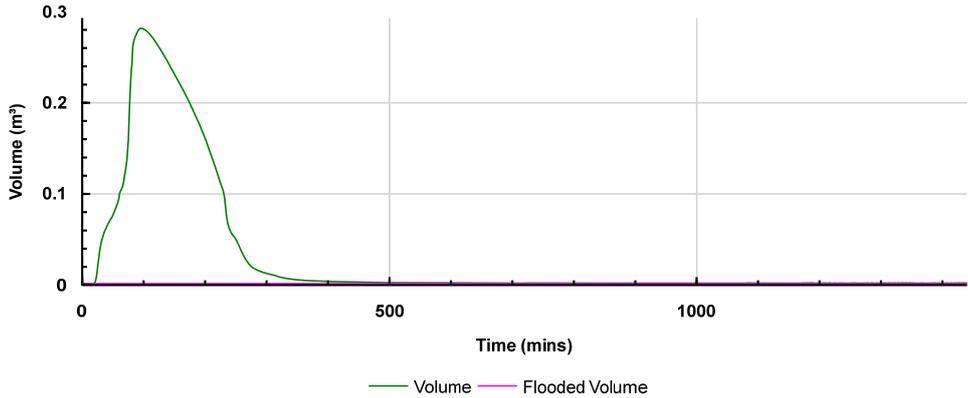
Type : Manhole

Graphs

Flow Graph



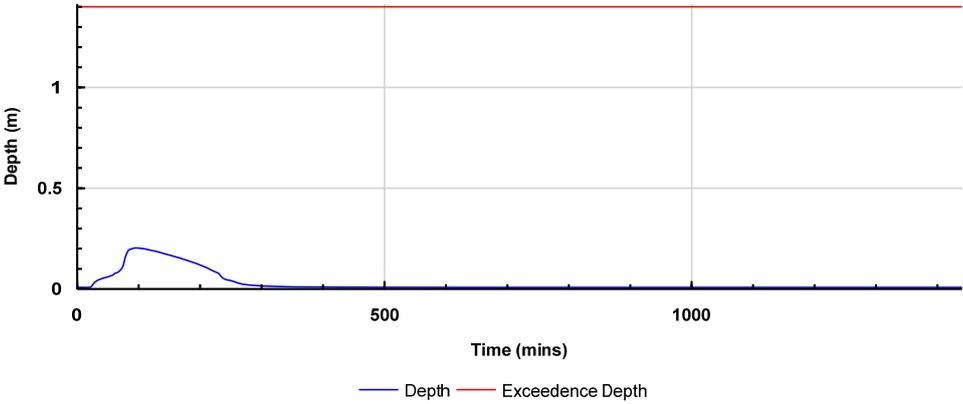
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		



Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:		

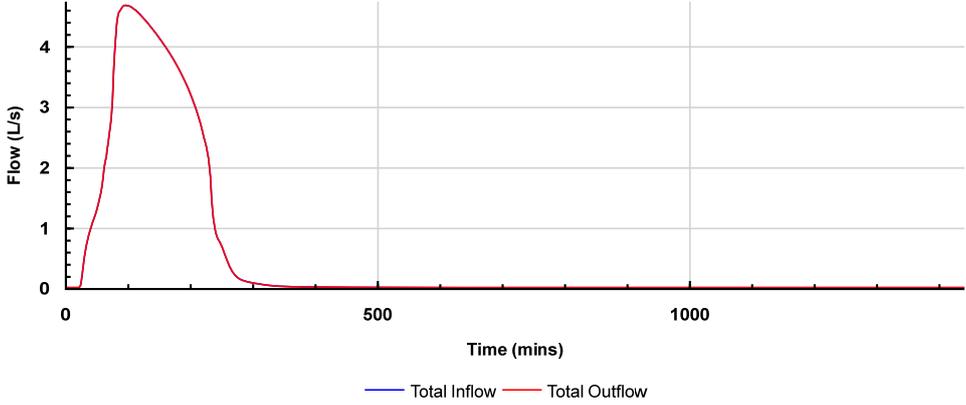


5 Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

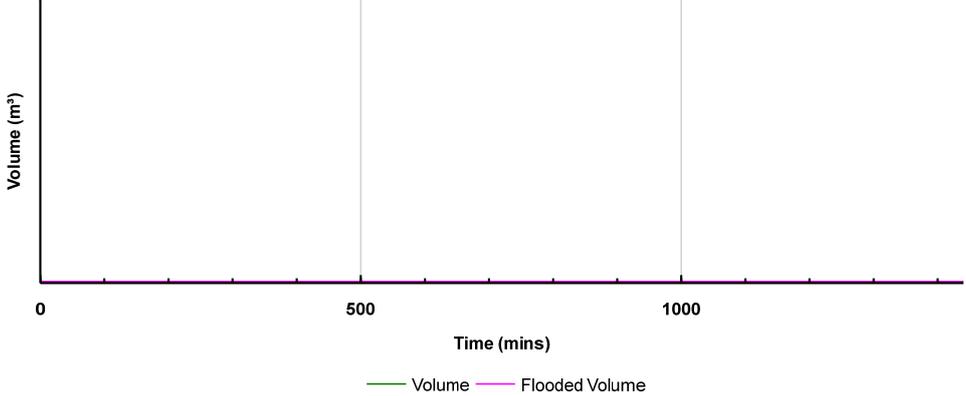
Type : Manhole

Graphs

Flow Graph

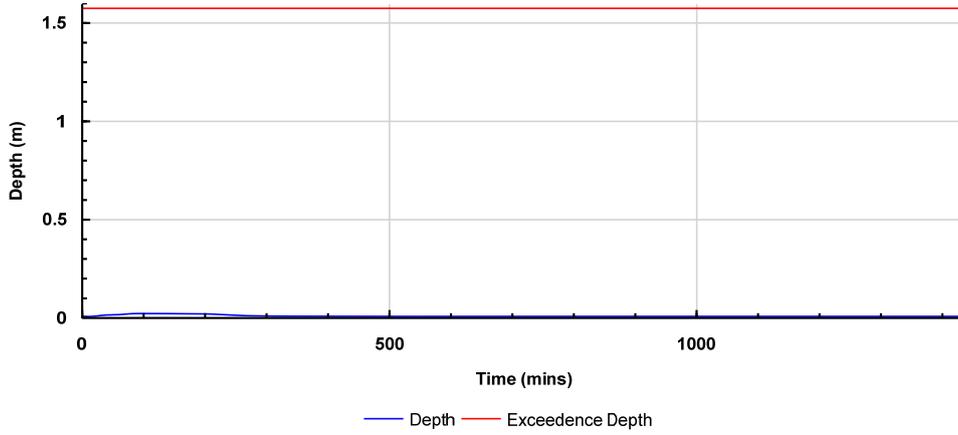


Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022			
	Designed by: DR	Checked by: DN	Approved By:	
Report Details: Type: Junction Results Storm Phase: Phase	Company Address:			

Depth Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		

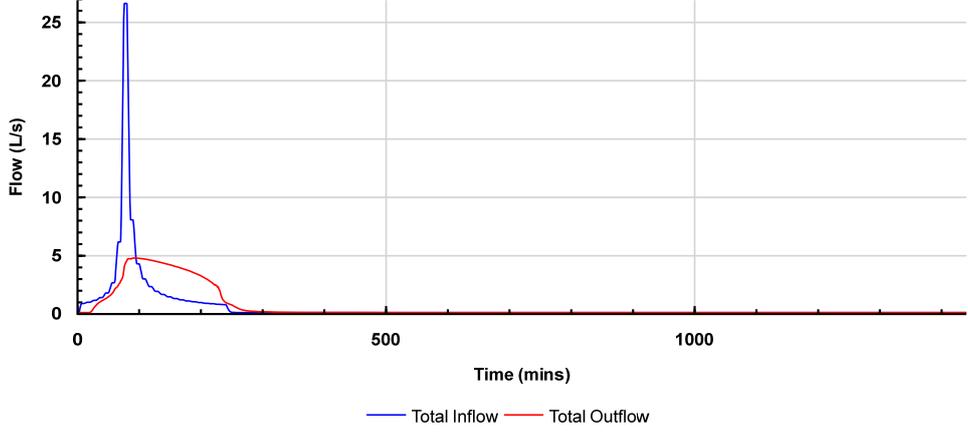


Dry Swale
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

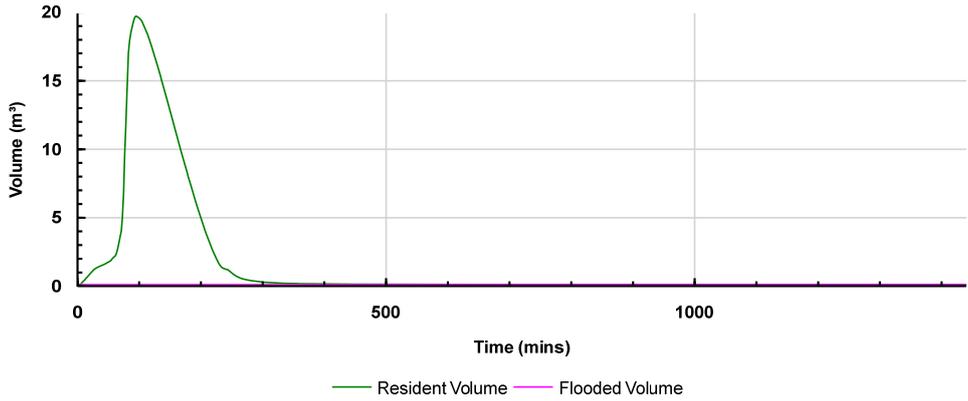
Type : Swale

Graphs

Flow Graph



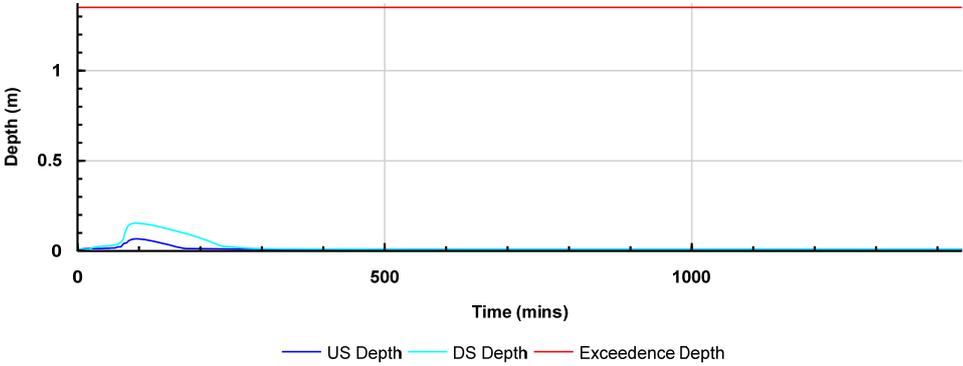
Volume Graph



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Stormwater Control Results Storm Phase: Phase	Company Address:		



Depth Graph



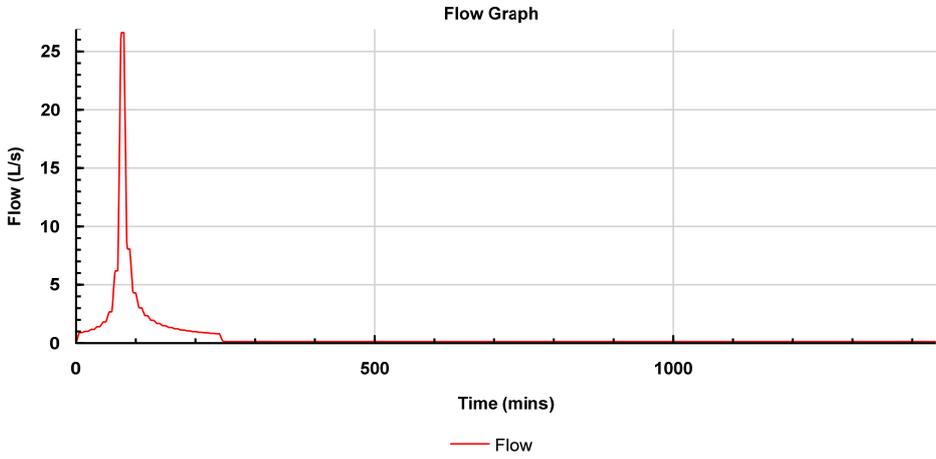
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.000
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs



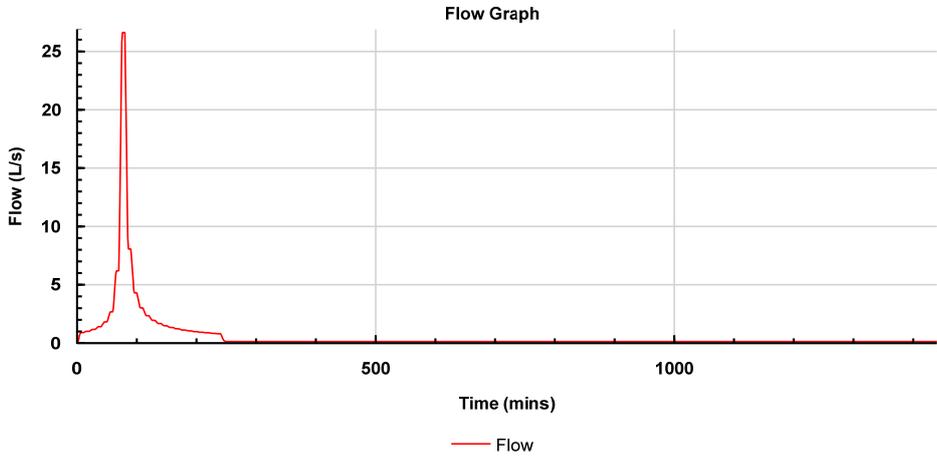
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



1.001
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

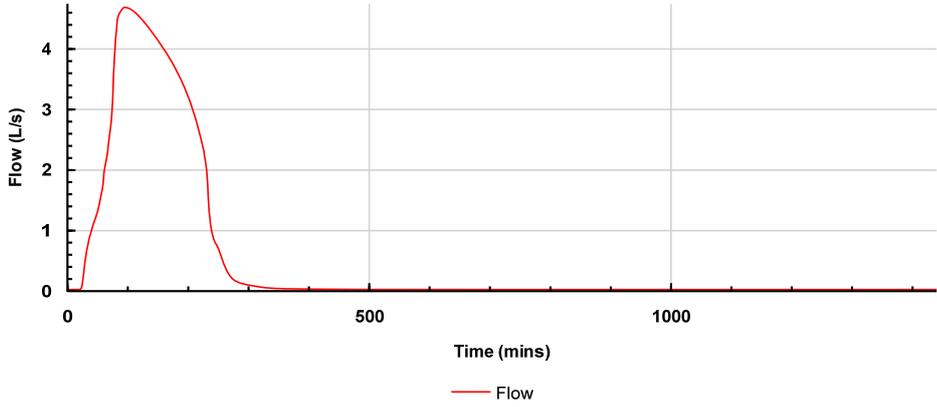


1.004
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs

Flow Graph



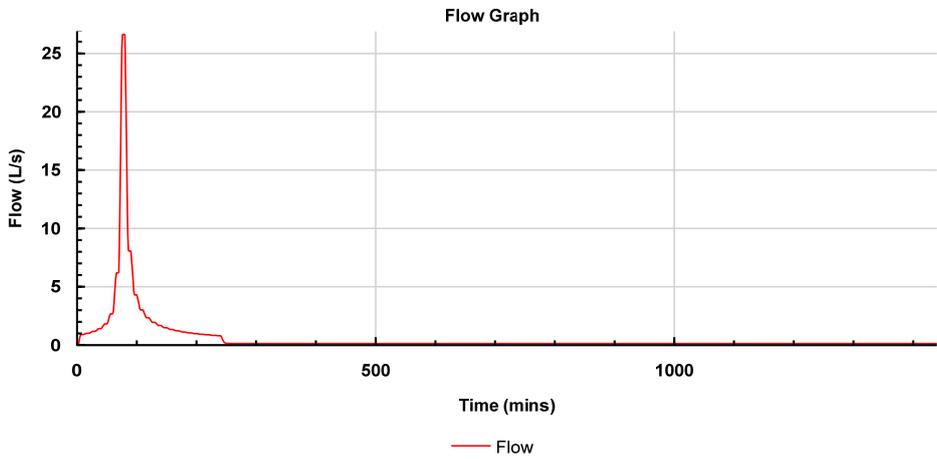
Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		



Pipe
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs



Project: Wooden Sticks Hotel Drainage	Date: 15/09/2022		
	Designed by: DR	Checked by: DN	Approved By:
Report Details: Type: Connection Results Storm Phase: Phase	Company Address:		

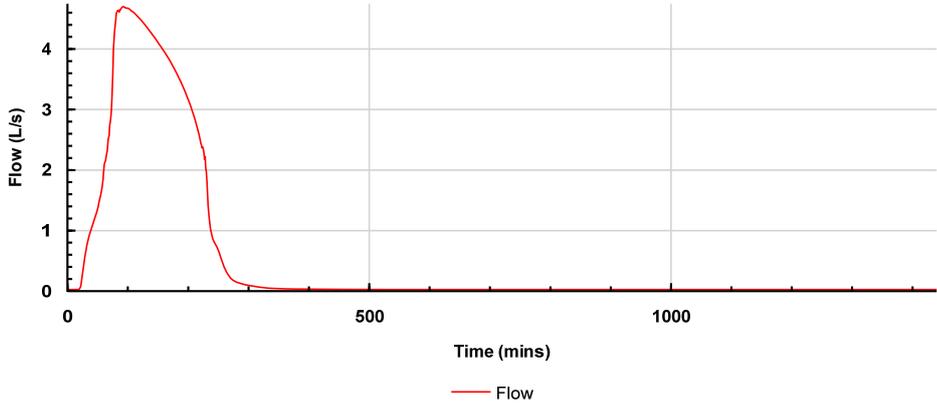


Pipe (1)
Wooden Sticks: Increase Rainfall (%): +0: Wooden Sticks 2yr

Type : Pipe

Graphs

Flow Graph



Appendix G

Sanitary Design Sheet



65 Sunray Street
Whitby, Ontario
L1N 8Y3
905-686-6402

REGIONAL MUNICIPALITY OF DURHAM
SANITARY SEWER DESIGN SHEET

Project Name: **WOODEN STICKS**
Project No. **11225804**

PREPARED BY: **A.DEB**
CHECKED BY: **D.MARKS**
DATE: **AUG 26, 2022**

STREET	FROM MH	TO MH	RESIDENTIAL					COMMERCIAL		INDUST.		INSTIT.		FLOW IN L/s					PROPOSED SEWER					PRESENT CONDITION				
			LOT AREA		POP. DENSITY	POPULATION		PEAK FLOW FACTOR	LOT AREA	FLOOR SPACE INDEX	LOT AREA		RESIDENTIAL FLOW		COMM. 2.08	INDUST. 2.08	INSTIT. 1.29	TOTAL FLOW IN	PIPE LENGTH (m)	PIPE SIZE (mm)	SLOPE (%)	CAPACITY (L/s)	VELOCITY (m/s)					
			UNIT (Ha)	ACCUM. (Ha)		UNIT	ACCUM.				UNIT (Ha)	ACCUM. (Ha)	UNIT (Ha)	ACCUM. (Ha)											INFIL. * 0.26 (L/s)	SEWAGE 0.0042 (L/s)	FLOW IN (L/s)	
Wooden Sticks Golf	PLUG	MH1A	0.24	0.24	1.5	81	81	3.80									0.06	1.29				1.35	106.00	200	1.00	34.22	1.06	4.0%
Wooden Sticks Golf	MH1A	MH2A		0.24	1.5		81	3.80									0.06	1.29				1.35	70.30	200	1.00	34.22	1.06	4.0%
Wooden Sticks Golf	MH2A	EXMH-AF13-0074		0.24	1.5		81	3.80									0.06	1.29				1.35	22.50	200	0.40	21.64	0.67	6.3%
SaleVille Development	MH8A	EXMH-AF13-0074	2.16	2.16	3.0	39	39	3.80					2.75	2.75			0.56	0.62			3.55	4.73	32.50	200	0.40	21.64	0.67	21.9%
Elgin Park Drive Easement	EXMH-AF13-0074	EXMH-L57-0073		2.40	3.5		120	3.80									0.62	1.92			3.55	6.09	17.90	200	0.30	18.74	0.58	32.5%
	EXMH-L57-0073	EXMH-L57-0068		2.40	3.5		120	3.80									0.62	1.92			3.55	6.09	68.70	200	0.30	18.74	0.58	32.5%
Button Crescent	EXMH-L57-0100	EXMH-L57-0101	2.05	2.05	3.5	10	10	3.80									0.53	0.16				0.69	109.00	200	2.84	57.66	1.78	1.2%
Button Crescent	EXMH-L57-0101	EXMH-L57-0065		2.05	3.5		11	21	3.80								0.53	0.34				0.87	106.00	200	3.50	64.01	1.97	1.4%
Button Crescent	EXMH-L57-0065	EXMH-L57-0068		2.05	3.5		1	22	3.80								0.53	0.35				0.88	12.00	200	1.80	45.91	1.42	1.9%
Button Crescent	EXMH-L57-0068	EXMH-L57-0069	2.17	6.62	3.5	6	148	3.80					2.75	2.75			1.72	2.36			3.55	7.63	65.50	200	0.30	18.74	0.58	40.7%
Button Crescent	EXMH-L57-0069	EXMH-L57-0070		6.62	3.5		3	151	3.80								1.72	2.41			3.55	7.68	21.00	200	0.30	18.74	0.58	41.0%
Button Crescent	EXMH-L57-0070	EXMH-L57-0071		6.62	3.5		6	157	3.80								1.72	2.51			3.55	7.77	53.00	200	0.30	18.74	0.58	41.5%
Button Crescent	EXMH-L57-0071	EXMH-L57-0072		6.62	3.5		3	160	3.80								1.72	2.55			3.55	7.82	30.80	200	0.30	18.74	0.58	41.7%
Button Crescent	EXMH-L57-0072	EXMH-L57-0064		6.62	3.5		6	166	3.80								1.72	2.65			3.55	7.92	81.20	200	0.30	18.74	0.58	42.2%
Button Crescent	EXMH-L57-0064	EXMH-L57-0063	4.62	11.24	3.5	33	199	3.80					2.75	2.75			2.92	3.18			3.55	9.65	36.90	200	0.30	18.74	0.58	51.5%
Button Crescent	EXMH-L57-0063	EXMH-L57-0062		11.24	3.5		5	204	3.80								2.92	3.26			3.55	9.73	86.10	200	0.30	18.74	0.58	51.9%
Button Crescent	EXMH-L57-0062	EXMH-L57-0061		11.24	3.5		204	3.80									2.92	3.26			3.55	9.73	13.70	200	0.30	18.74	0.58	51.9%
Button Crescent	EXMH-L57-0061	EXMH-L57-0092		11.24	3.5		4	208	3.80								2.92	3.32			3.55	9.79	83.90	200	0.30	18.74	0.58	52.2%
Button Crescent	EXMH-L57-0092	EXMH-L57-0091	1.09	12.33	3.5	16	224	3.80									3.21	3.58			3.55	10.33	46.60	200	0.30	18.74	0.58	55.1%
Button Crescent	EXMH-L57-0091	EXMH-L57-0090		12.33	3.5		2	226	3.80								3.21	3.61			3.55	10.36	51.40	200	0.30	18.74	0.58	55.3%
Button Crescent	EXMH-L57-0090	EXMH-L57-0103	0.40	12.73	4.5	2	228	3.80									3.31	3.64			3.55	10.50	42.30	250	0.30	33.98	0.67	30.9%

NOTES: PRELIMINARY

INFILTRATION: 0.26L/s = 22.5 m3/ha/day
SEWAGE: 0.0042L/s = 364 L/person/day
COMM./INDUST: 2.08L/s = 180.0 m3/ha/day
INSTITUTIONAL: 1.29L/s = 112 m3/ha/day

Appendix H

**Best Management Practises (BMP) and
Low Impact Development (LID) Options**

BMP/LID measure	Proposed? (Y/N/M)	Brief description / reasoning	Suitability for management ¹⁴ (H/M/L)			
			Water Balance	Water Quality	Erosion	Water Quantity
Lot level controls						
Rooftop detention	N	<p>Capture and store stormwater runoff on raised rooftop areas prior to controlled release.</p> <p>These are generally suited to flat roofs where they can, if included with green roofs, provide a medium for plant growth and rainwater storage. The proposed hotel is understood to have pitched roofs that do not allow for green roof installation. The parking lot has no roof areas.</p>	L	L	L	H
Parking lot storage through catch basin restrictors or orifices in the storm sewer	N	<p>Grading the parking lot to provide a degree of storage volume on its exposed surface by restricting the peak rate of the lot drainage system.</p> <p>As space is available around the parking lot to include green LID measures, that provides a range of benefits and ensures the parking lot surface is kept free of pooling water, this LID is not proposed.</p>	L	L	L	H
Reduced percentage grade of lot	N	<p>Developing the new parking lot provides an opportunity to reduce grading of area and how it connects to adjacent elevations. This could help to slow the flow of any runoff but will not be a dedicated LID feature, merely a by-product of the design.</p>	H	M	M	L
Disconnecting roof leaders and directing the flow to soak away pits	N	<p>The only new roof is the proposed hotel. The roof leaders will be directed to a LID in the open space to the north of the building. The use of soak away pits in proximity to the foundations of the structure is not necessary when open green LIDs can be provided that deliver a range of benefits to stormwater runoff.</p>	H	M	M	L

¹⁴ Table 1.3: Stormwater Management Practices - <https://www.ontario.ca/document/stormwater-management-planning-and-design-manual-0>

Porous pavement	N	The proposed parking lot could be constructed of pervious pavement (either entirely or just in the parking bays) to encourage infiltration and filtration. Use of infiltration-based methods whilst an effective method of disposal is expensive to construct with complex maintenance requirements. Space is available around the parking lot and hotel to use alternative LID measures to manage runoff rates/volumes.	NA	NA	NA	NA
Rain gardens	N	These are generally shallow landscaped depressions that can reduce runoff rate and volumes and treat pollution through the use of engineered soils and vegetation. These are typically used where space is limited, but at this location larger green LIDs can be used effectively in place of small-scale features.	NA	NA	NA	NA
Water reuse systems	M	Depending on client needs and demand for captured water, some water reuse could be implemented as part of the new hotel structure.	NA	NA	NA	NA
Conveyance controls						
Grassed swales	Y	Flat-bottomed grass lined open channels designed to convey, treat, and often attenuate storm water runoff. Where necessary, check dams can be used to manage overall gradient and reduce peak flows. Both areas of the proposed development can be directed to a swale for treatment and conveyance downstream.	H	M	M	M
Pervious pipe systems	N	A perforated pipe in a stone-filled trench that enables the water flowing in the pipe to infiltrate into the surrounding ground. The site has available space to use open green LIDs and infiltration from the pipe trench will only provide limited treatment to runoff volumes.	H	H	M	L
Pervious catch-basins	N	A catch basin that is designed to permit stormwater discharge to the ground below via infiltration. Space is available on site to provide larger green LID features that will offer greater treatment and management of storm water.	H	M	M	L

Bio swales	M	Flat-bottomed vegetated open channel with gentle slopes designed to convey, treat, and often attenuate storm water runoff.	H	M	M	M
		Grassed swales are proposed to convey runoff and enable an opportunity for infiltration of stormwater. Depending on location and surrounding vegetation, a bio swale may be preferred in place of a grassed swale.				
Filter strips	N	Uniformly graded and gently sloping strips of grasses or other dense vegetation that are designed to treat runoff from adjacent impermeable areas by promoting sedimentation, filtration, and infiltration.	H	M	M	L
		Whilst these offer treatment to runoff they do not provide an opportunity to capture and attenuate runoff volume and are needed in support of other LID features. Also, they require topography which is generally flatter than what is likely to be experienced on this development.				
Buffer strips	N	Similar in nature to filter strips but with larger more dense vegetation.	H	M	M	L
		As above these do not provide an opportunity to capture and attenuate runoff volume and are needed in support of other LID features.				
End of pipe controls						
Infiltration and biofiltration basins	N	Infiltration basins are above-ground pond systems which are constructed in highly pervious soils. Water infiltrates to ground via the base of the basin and either recharges the groundwater system or is collected by an underground perforated pipe network and discharged to a downstream outlet.	M	H	M	L
		The Government of Ontario Stormwater Management Planning and Design Manual requires such features to be positioned in ground where the minimum percolation rate is 50mm/hr or greater. This rate is not currently anticipated to be achieved at this site and so is discounted.				

Infiltration trenches	Y	An aggregate filled subsurface trench where infiltration to the below ground is promoted. The use of alternative larger footprint measures will provide greater treatment and control to runoff. In accordance with the Government of Ontario Stormwater Management Planning and Design Manual, these features suit sites with lower soil percolation rates such as this site and are less impacted by topography. Suitable for roof drainage.	H	H	M	L
Manufactured Treatment Devices (i.e., oil/grit separators or filters)	N	Oil grit separators can, when sized properly, provide MOE enhanced levels of treatment and contribute to the overall treatment train. The inclusion of other BMP/LID options at this property mean this is not required.	L	M	L	L
Sand filters	N	Measures used to clean storm water runoff but with little impact on rate or volumes.	L	H	L	L
Dry ponds	N	Similar to a basin, a pond that can dry out entirely and remain dry until the next storm event. Preferred in areas where larger catchment areas are being received by the pond. Unlikely to have sufficient catchment area to support this feature.	L	M	H	H
Wet ponds	N	A pond with a permanent depth of water contained within in. Outlets are typically located part of the way down the total available depth to maintain a constant depth of water. The Government of Ontario Stormwater Management Planning and Design Manual recommends these features have catchment areas in excess of 5ha making it unsuitable for this site.	L	H	H	H
Wetlands	N	Areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. The Government of Ontario Stormwater Management Planning and Design Manual recommends these features have catchment areas in excess of 5ha making it unsuitable for this site.	L	H	H	H

Hybrid Ponds	N	A pond with areas of permanent depths of water but with the rest able to dry out and act more in keeping with a basin.	NA	NA	NA	NA
Filtration Devices	N	Engineered devices used to filter stormwater runoff for a given set of pollutants or chemicals.	NA	NA	NA	NA
Adsorptive Materials	N	Engineered materials designed to absorb a given set of pollutants or chemicals, thereby removing them from stormwater flows.	NA	NA	NA	NA
Underground Storage	N	Storage chambers are generally plastic in construction and provide a below ground void space to store water prior to discharge downstream at controlled rates. These features themselves do not provide treatment to runoff but allow an opportunity for infiltration to occur to the ground below them when unlined.	NA	NA	NA	NA



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