Catch basin rating curves: guidance document

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Catch Basin Rating Curves – Guidance Document

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ABSTRACT

A series of 1659 tests were performed measuring the conveyance of twelve (12) different catch basin inlet configurations for various road orientations. The catch inlet combinations include single and double round herringbone grates (OPSD 400.070 and DWG. No. S19), single and double square herringbone grates (OPSD 400.020), square grate with square bars (MT-310), high capacity inlet (Stepcon 5103), circular open cover (type B) (OPSD 401.010), circular closed cover (type A) (OPSD 401.010) and single and double curb mounted inlets (DWG. No. S22 and DWG. No. S28).

These tests resulted in 116 catch basin inlet rating curves which are presented in this document. The experiments were performed using a full scale model roadway at the Ocean, Coastal and River Engineering Research Centre of the National Research Council Canada in Ottawa. Water flows ranging from 0.001 - 0.41 m^3/s were delivered to the model roadway and six (6) road grades ranging from 0.5 - 10.0% and cross-slopes of 0.0, 2.0 and 4.0% were examined.

In this document the experimental setup and methodology are reviewed. The 116 best fit catch basin inlet ratings curves are provided. The experimental data on which the rating curves are based along with the uncertainty analyses are provided. An example of the analysis to obtain the best fit ratings curves from the experimental data is reviewed.

TERMS OF USE

The data in this report is provided as is. Any users of this data should understand that there are differences in obtaining results in a laboratory setting and the application in the field. Those differences include but are not limited to the uniformity of the road surface in advance of and near the inlet and the precise setting of the inlet into the surface of the roadway or curb. The authors do not recommend the extrapolation of these results beyond the maximum incident water depths identified.

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1. Introduction

The National Research Council of Canada's Ocean, Coastal and River Engineering Research Centre (NRC-OCRE) has prepared this report for Infrastructure Canada as a guide to inform engineers on new catch basin inlet rating curves that have been developed through experimental testing. This document is an update to the original Poirier and Provan (2022) version.

Municipalities throughout Canada utilize catch basin inlet ratings curves to determine the amount of flow that passes through a certain catch basin inlet under various roadway conditions. These rating curves relate the hydraulic head above the catch basin inlet to the inflow capacity of a specific inlet type and are used in the design of urban roadway drainage. In addition, they are key inputs into urban hydrodynamic flood models. The rating curves play a crucial role in the accuracy of the hydrodynamic model predictions because they govern the conveyance through each catch basin inlet in the model. Some of the rating curves that are currently in use have been adopted from experimental tests completed by Burgi and Gober (1978), Bouchard and Townsend (1983), and Marsalek (1982 and 1986). The selection of inlets covered is different from those performed in the previous studies and the present tests have examined the highest flow rates to date in an effort to better understand potential catch-basin conveyance in extreme flood conditions.

A series of 1140 tests was undertaken in Poirier and Provan (2021) followed by a series of 519 tests undertaken in Poirier and Provan (2023) in an effort to better understand the performance (conveyance) of catch basin inlets that are commonly used in Canadian municipalities. These tests help to improve the capacity to design, analyze and predict the flows through stormwater systems during flood events. The reports by Poirier and Provan (2021, 2023) were focused on the measurements, while this document is focused on the best fit curves. These results aim to help Canadian municipalities improve the resiliency of their infrastructure in the face of a changing climate by better defining input parameters and uncertainties. A total of twelve catch basin inlet configurations were examined at six road grades ranging from 0.5 - 10.0% and cross-slopes of 0.0, 2.0 and 4.0%. Each setup was exposed to 13 flow conditions ranging from 0.001 – 0.41 m^3/s that were sent onto the model roadway.

2. Experimental Overview

The experiments were carried out in the National Research Council's (NRC's) Coastal Wave Basin (CWB) test facility. The facility is located in the NRC's Ocean, Coastal and River Engineering Research Centre (OCRE) in Ottawa, Canada. This section is an overview of the experiments carried out in Poirier and Provan (2021, 2023). For a more detailed description of the experiments and the analysis refer to the original reports. The experimental setup consisted of a model roadway, the water supply system and the measurement tank system. A sketch of the experimental setup is provided in Figure 1.

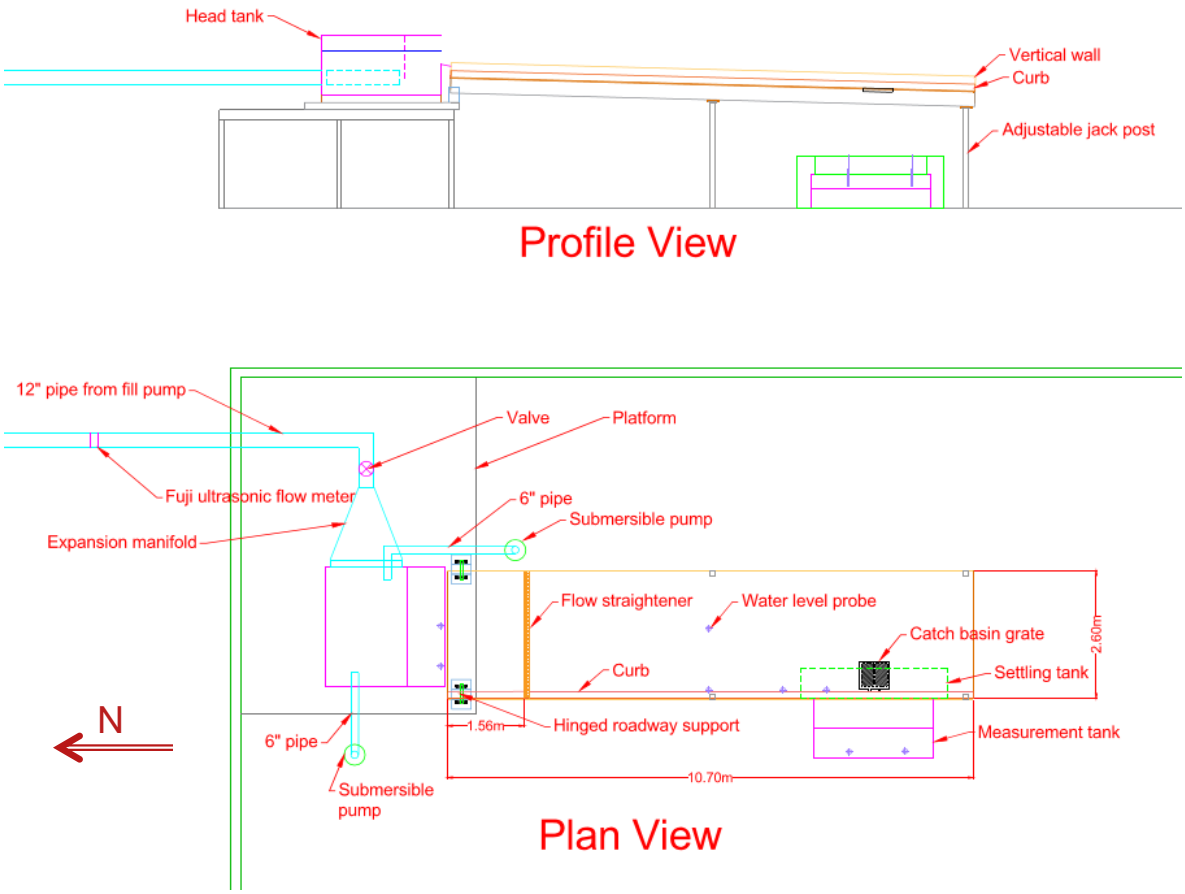

Figure 1. Sketch of the test setup

The full scale model roadway was 10.70 m long and 2.60 m wide and was supported at six locations. Twelve catch basin inlets are discussed in this report. The setup in Figure 1 is used for the 8 inlets studied in Poirier and Provan (2021) and it was used for the first inlet studied in Poirier and Provan (2023). The three subsequent configurations from Poirier and Provan (2023) examined curb mounted inlets. A representation of a sidewalk was constructed along one side of the model roadway to accommodate these inlets resulting in a narrower road surface in the model (1.55 m) as shown in Figure 2. The width of the road surface in Figure 1 is 2.46 m wide when accounting for the width of the curb. The curb height is approximately 14 cm high for the configuration in Figure 1 and approximately 17.5 cm in the configuration in Figure 2.

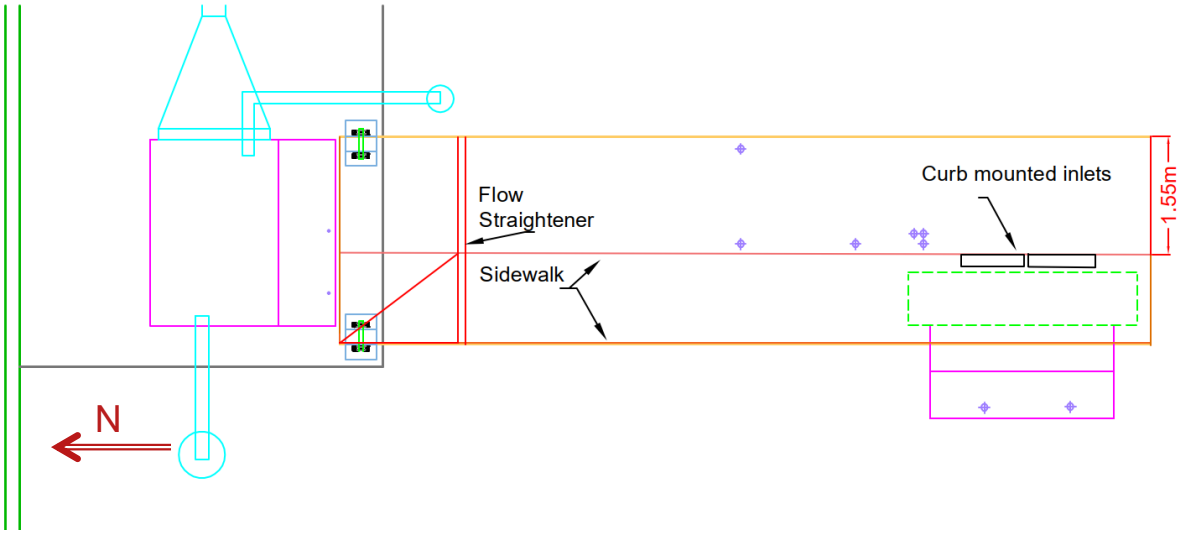

Figure 2. Model roadway sketch with sidewalk for curb inlets

The model was constructed from lumber and the surface was covered with a water-proof material (WeatherWatch) which has a similar manning's roughness coefficient to asphalt (0.013 $s/m^{1/3}$). Walls were installed on each side of the roadway to contain the water within the roadway and were skinned with tin to reduce friction (as much as possible) between the flowing water and the walls. Two hinged roadway supports at the upstream end of the road were situated on an I-beam which was supported by a pair of hinges (see Figure 1). The six supports of the roadway, situated in each corner and one along each long side, were adjusted to provide the road grades of 0.5, 1.0, 2.5, 5.0, 7.5 and 10.0% and the cross-slopes of 0.0, 2.0 and 4.0%. For further details of the road model and the adjustments see Poirier and Provan (2021).

A flow straightener was installed 1.56 m from the upstream end of the model roadway where the head tank is located. The flow straightener is illustrated in the Plan View of Figure 1 as well as in Figure 2 and a photo is provided in Figure 3. In Figure 3a the roadway is shown in the original configuration used for testing catch basin covers. In Figure 3b the roadway is shown in the modified configuration used for testing curb mounted inlets which includes the model sidewalk. A flow diverter was added to the top of the sidewalk, which is partially shown in the bottom right corner of Figure 3b, in order to avoid excessive water flow onto the sidewalk. Figure 3 shows how the installation of the sidewalk for the curb inlets has reduced the road surface width when compared to the catch basin covers.

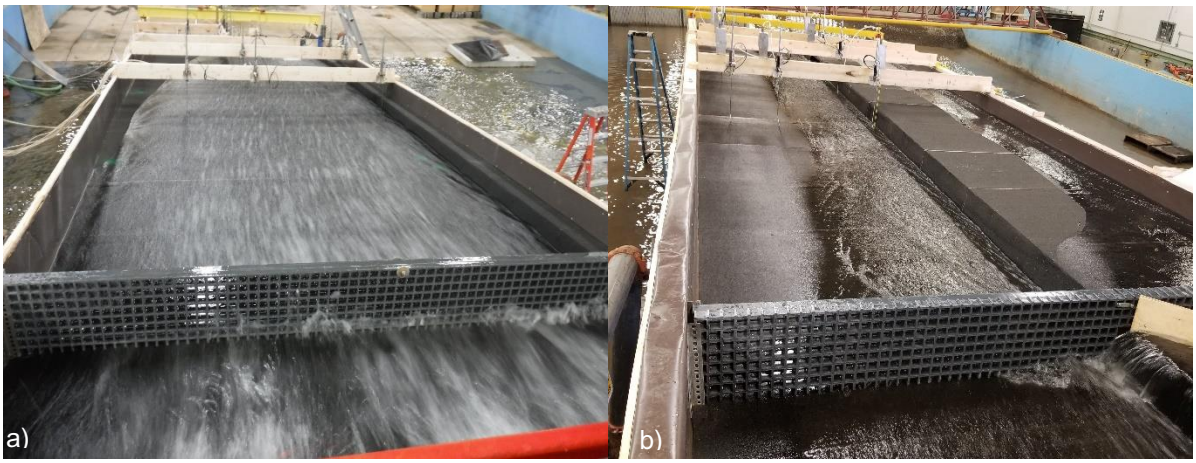

Figure 3. Photo of the model roadway setup with flow straightener for; a) the catch basin cover tests, and b) the curb inlet tests

Water was supplied to the model via a large pump that pumped water from the laboratory sump into a head tank located at the upstream end of the roadway as illustrated in the Profile View of Figure 1 and shown in Figure 4. Additional flow to the head tank was provided via two 6 inch submersible pumps. This allowed for the model to be supplied with a variable flow rate up to a maximum of 0.41 m^3/s. The water from the head tank flowed onto the roadway and through the flow straightener. For most tests the water traveled freely down the road. Some water flowed through the catch basin inlet and into a measurement tank while the remaining water bypassed the inlet and flowed over the end of the roadway onto the basin floor. One ponding test was performed for each inlet studied in Poirier and Provan (2023). For these tests the road was set to a grade of 0.5% and a 0.0% cross-slope. The end of the model roadway was blocked and all of the water was forced through the inlet. The water level was increased until the water flowed over the end of the roadway, resulting in a water depth of approximately 35 cm in advance of the inlet or the maximum pump capacity of 0.41 m^3/s was achieved. All of the water eventually flowed into the basin and was drained to the sump for reuse.

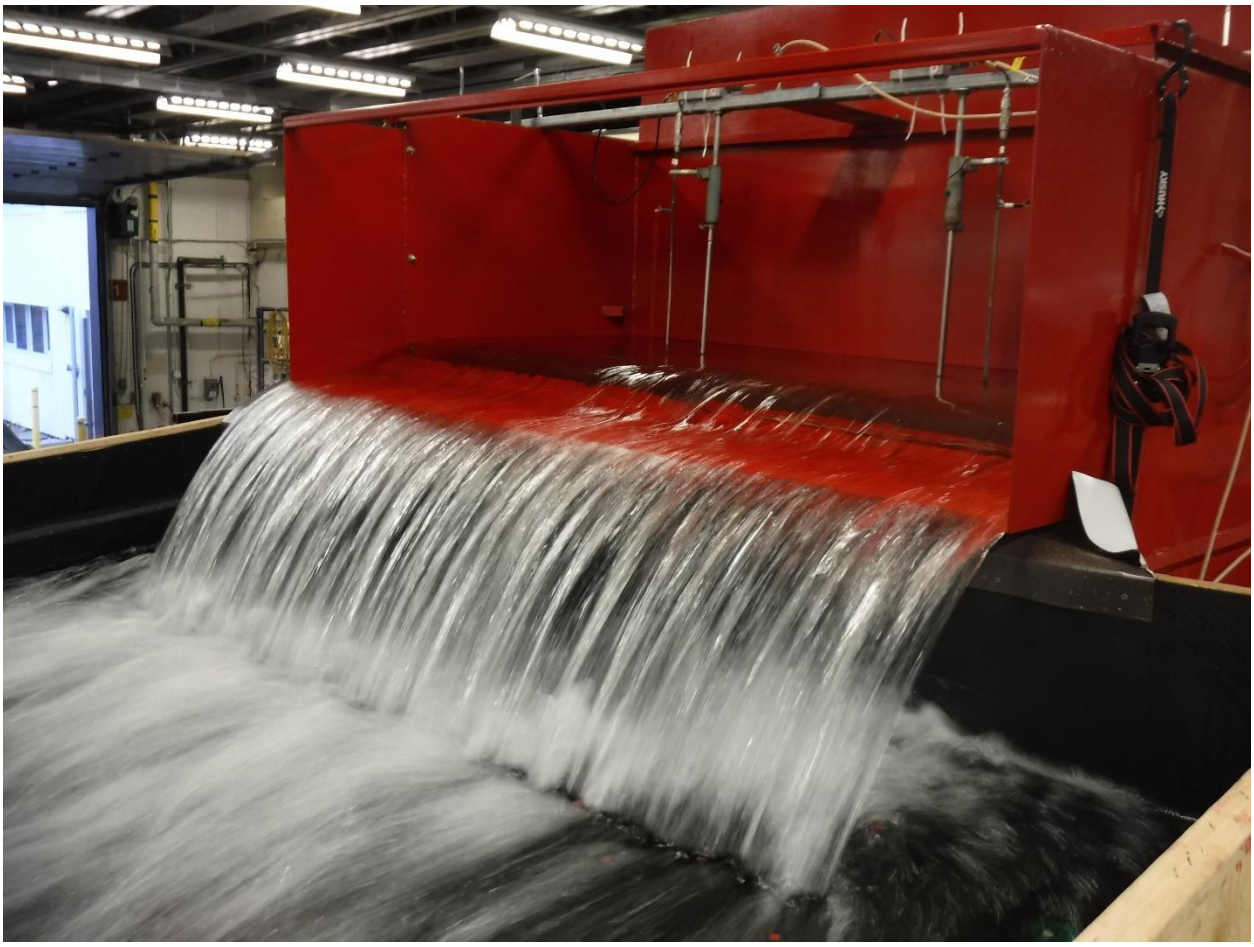

Figure 4. Photo of the head tank supplying water to the upstream end of the model roadway.

2.1. Measurements

The main objective of the experiment was to relate the flow through the catch basin inlets for various water depths upstream of the opening. The water depth upstream of the catch basin inlets was measured using capacitance wire water level gauges (Long 1992, Akamina 2009). Two additional sensors, an acoustic sensor and a point gauge, shown in Figure 5, were used to validate the results recorded by the capacitance wire water level gauges.

The water depth measurements used in this study are defined as the water depth above the road surface at the location of the capacitance wire water level gauge (RD6), 0.03 m from the curb and 2.97 m from the end of the model roadway. Additional capacitance wire water level gauges were also installed in advance (up-stream) of the catch basins to better understand the incoming flow. Those results are only provided in Poirier and Provan (2021, 2023). The primary source of water depth is the RD6 wire gauge. In instances where the water level is too low to be properly measured by the RD6 gauge, data from other sensors are used with the data from RD6 to assess the water depth.

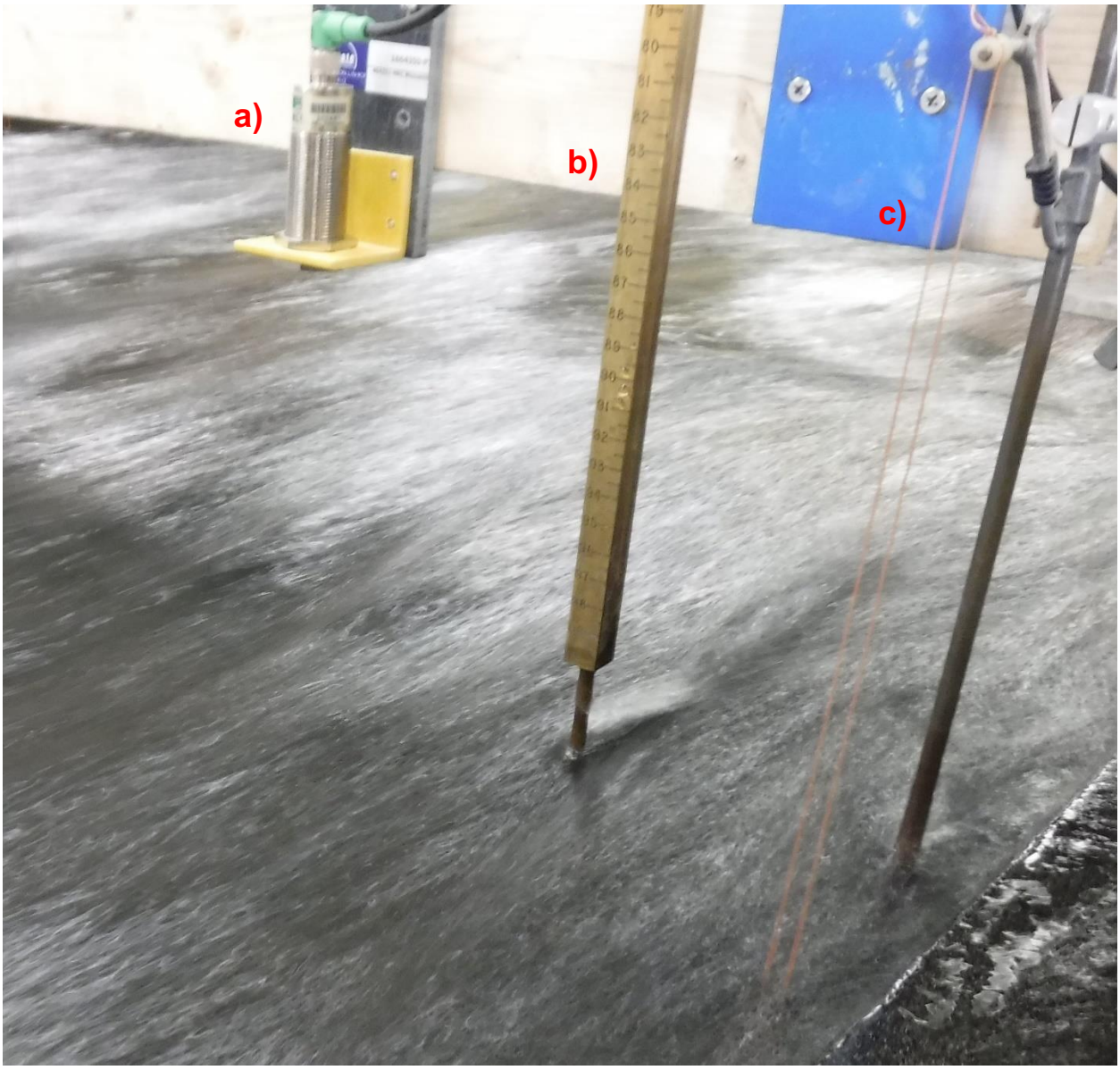

Figure 5. Types of water level gauges used in this study; a) UltraLab ULS, b) point gauge and c) capacitance wire gauge.

The catchment flow, or conveyance, was measured by directing the water captured by the catch basin inlet first into a stainless steel settlement tank and then into a measurement tank, both shown in Figure 6. The measurement tank was equipped with a sharp-crested weir. There was a very wide range of flow rates that were measured by the measurement tank throughout the test program (0.0001 – 0.41 m^3/s). The two primary methods to measure the inlet flow were; measuring the water height above the sharp-crested weir and measuring the fill rate of the tank. All of the measurement techniques used to measure the flow into the catch basin inlet are described in detail in Poirier and Provan (2021, 2023).

Figure 6. Photo of the settlement and measurement tanks that were used to capture the water that flowed through the catch basin inlet.

2.2. The Catch Basin inlets

A total of twelve catch basin inlet combinations were tested. The twelve grates are described in Table 1. All of the catch basin inlets were installed along the curb near the downstream end of the roadway as illustrated in Figure 1 and Figure 2. Because the dimensions for each configuration are different, the limits in the distance of each inlet from the end of the roadway and from the curb are also included in Table 1. Images for each of the twelve catch basin inlet combinations are shown in Figure 7 through Figure 18.

Table 1. Tested catch basin inlet combinations

		From end of road (m)		From curb (m)	
Type of Catch Basin Grate	Catch Basin Grate Specifications	min	max	min	max
Round Frame Single Catch Basin	per OPSD 400.07	1.70	2.32	0.05	0.68
Round Frame Double Catch Basin	per OPSD 400.07	1.69	2.32	0.06	0.68
		0.86	1.49	0.06	0.68
Herringbone Single Catch Basin	per OPSD 400.020	1.68	2.30	0.05	0.66
Herringbone Double Catch Basin	per OPSD 400.020	1.68	2.30	0.05	0.66
		0.87	1.48	0.05	0.65
Horizontal Bars Single Catch Basin	per MT-310	1.68	2.30	0.05	0.66
High Inlet Capacity Catch Basin	per Stepcon 5103 (Galvanized)	0.99	2.21	0.02	0.79
Circular Open Cover (Type B)	per OPSD 401.010	1.70	2.32	0.05	0.68
Circular Closed Cover (Type A)	per OPSD 401.010	1.70	2.32	0.05	0.68
"FISH" Type Round Catch Basin Cover	DWG. No. S19	1.70	2.32	0.05	0.68
Curb Inlet "FISH" Type Catch Basin Frame	DWG. No. S22	1.55	2.32	N/A	N/A
Double Curb Inlet "FISH" Type Catch Basin Frame	DWG. No. S22	1.55	2.32	N/A	N/A
		0.72	1.49	N/A	N/A
Curb Inlet "FISH" Type Catch Basin Frame and Cover for CBMH	DWG. No. S28	1.49	2.28	N/A	N/A

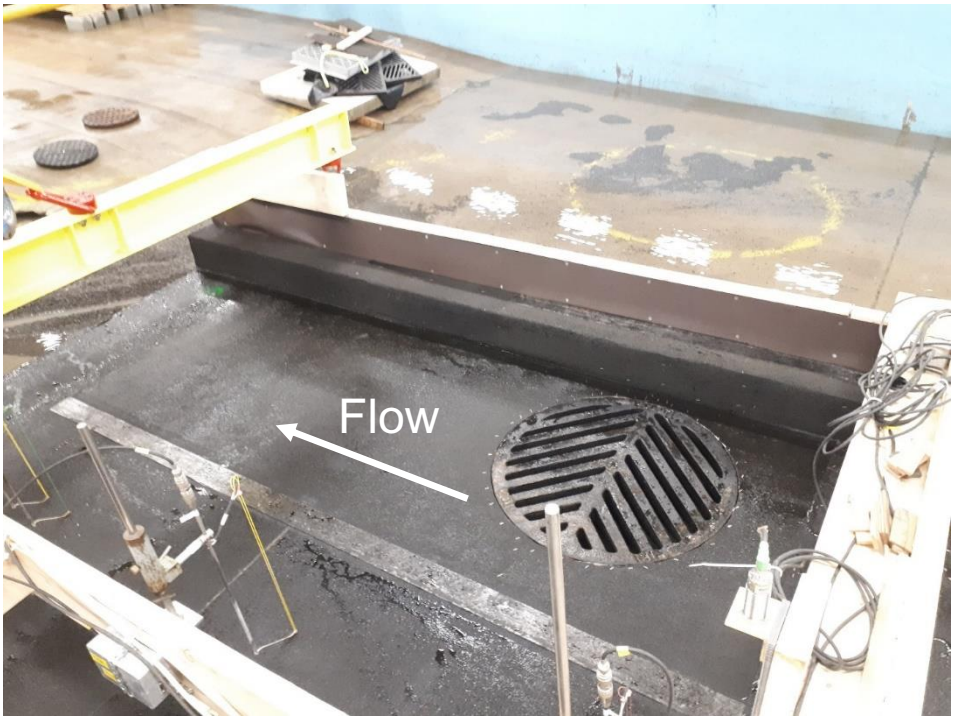

Figure 7. Single round grate with herringbone pattern per OPSD 400.070 (#1)

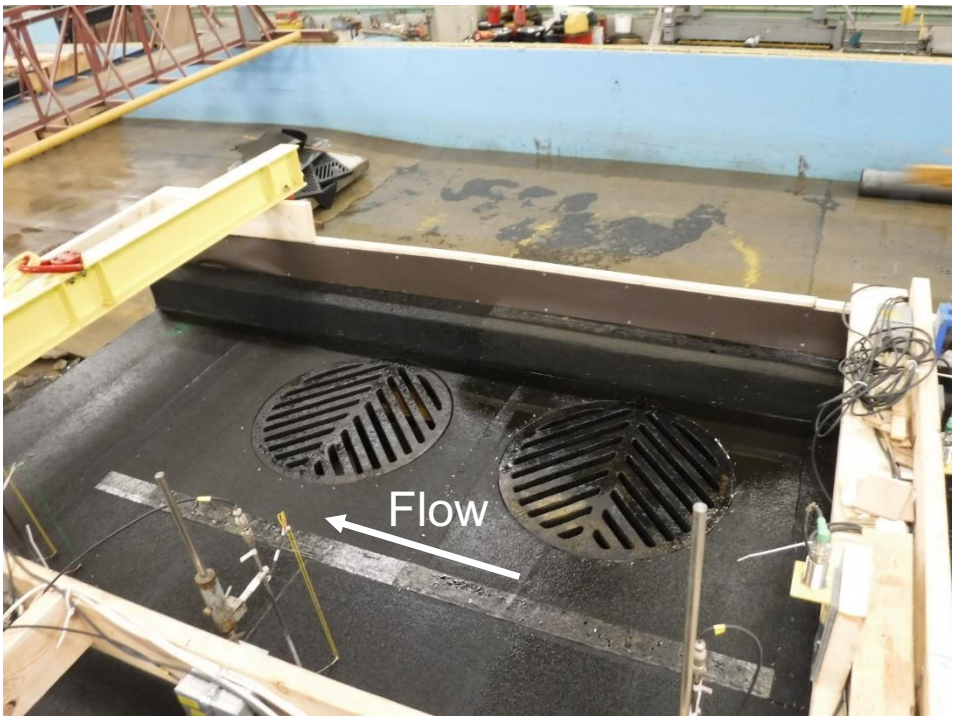

Figure 8. Double round grate with herringbone pattern per OPSD 400.070 (#2)

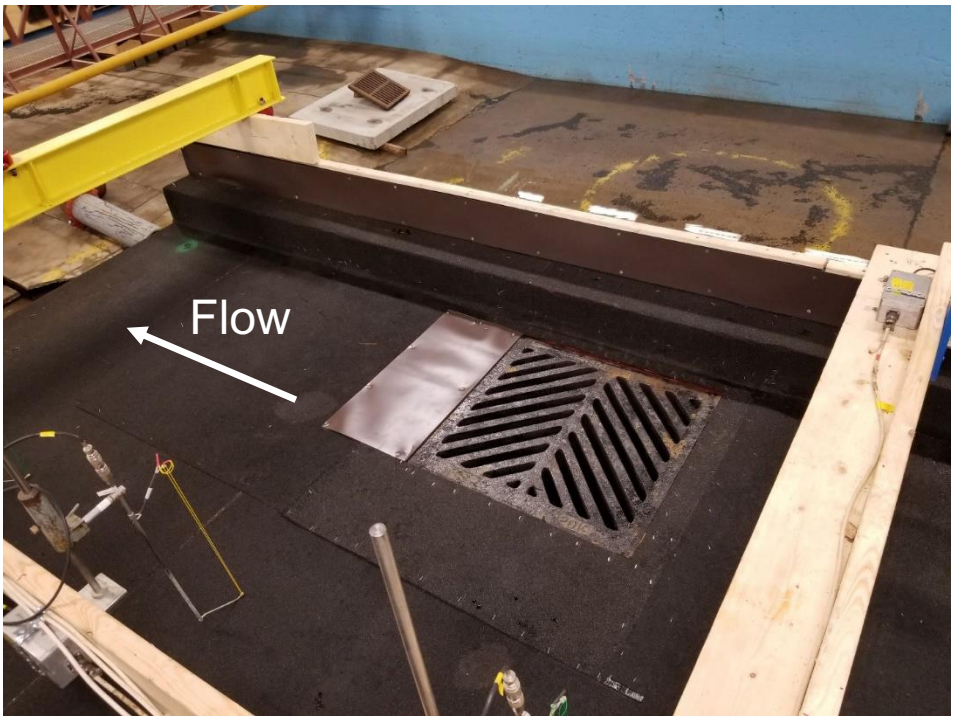

Figure 9. Single square grate with herringbone pattern per OPSD 400.020 (#3)

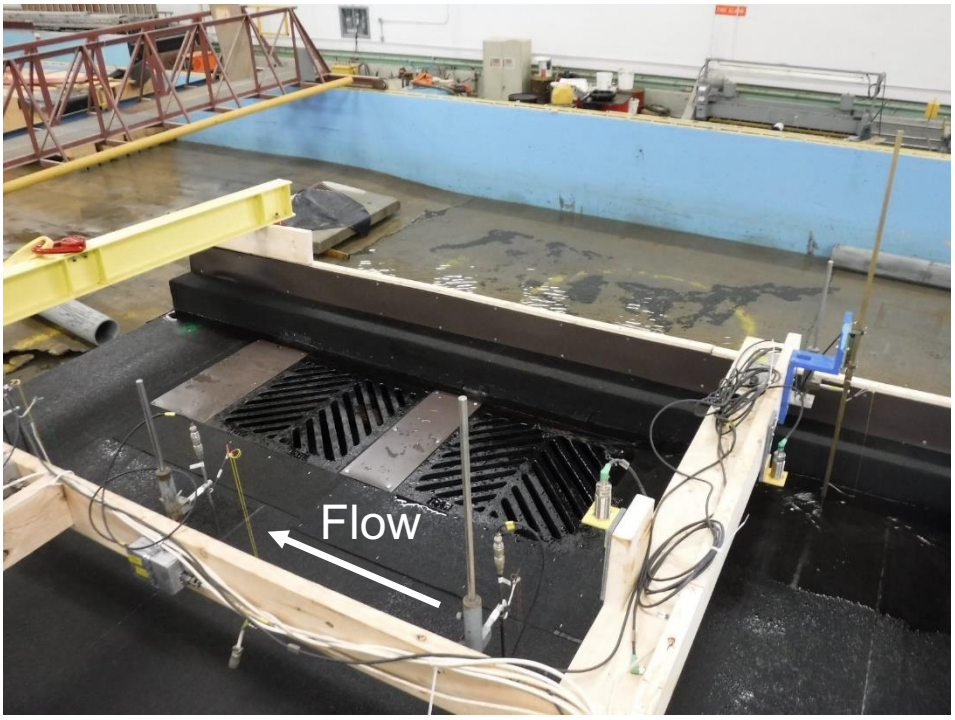

Figure 10. Double square grate with herringbone pattern per OPSD 400.020 (#4)

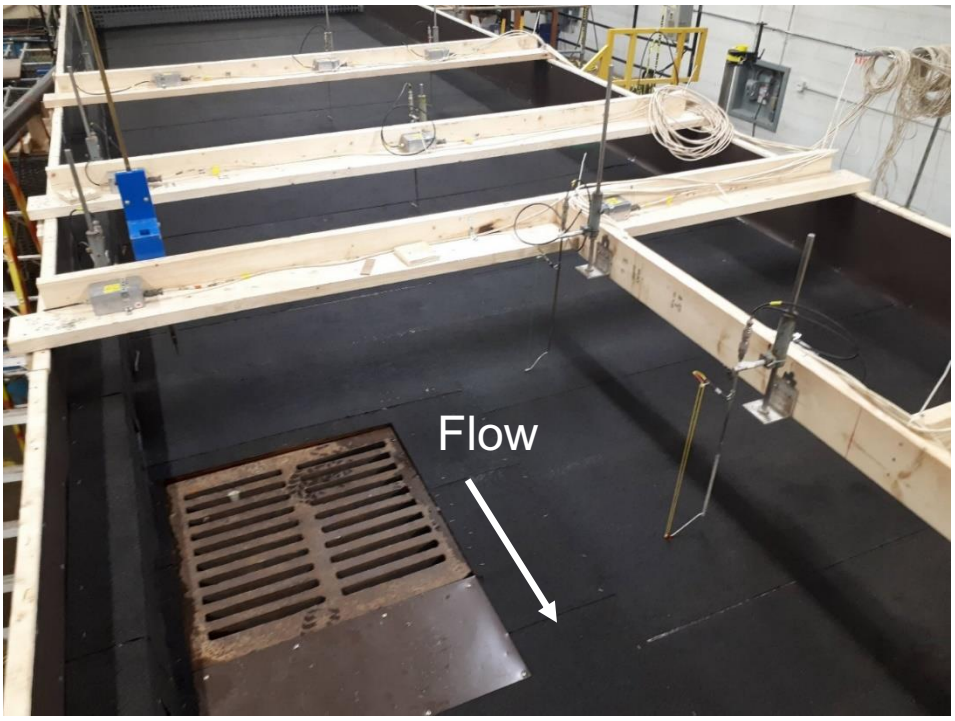

Figure 11. Square grate with horizontal bars per MT-310 (#5)

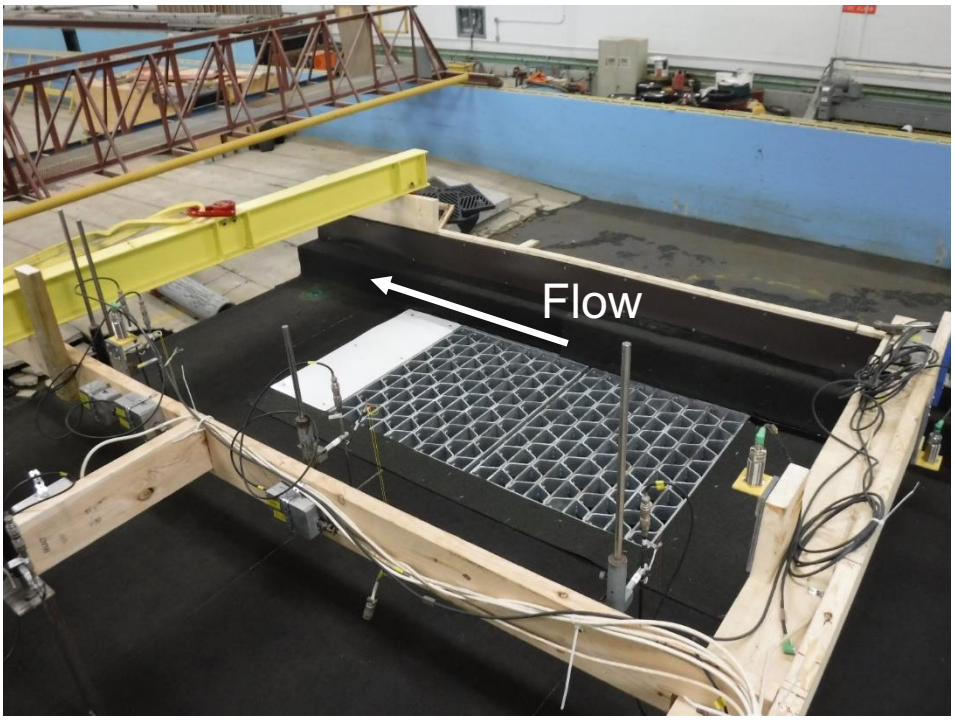

Figure 12. High inlet capacity catch basin per Stepcon 5103 (#6).

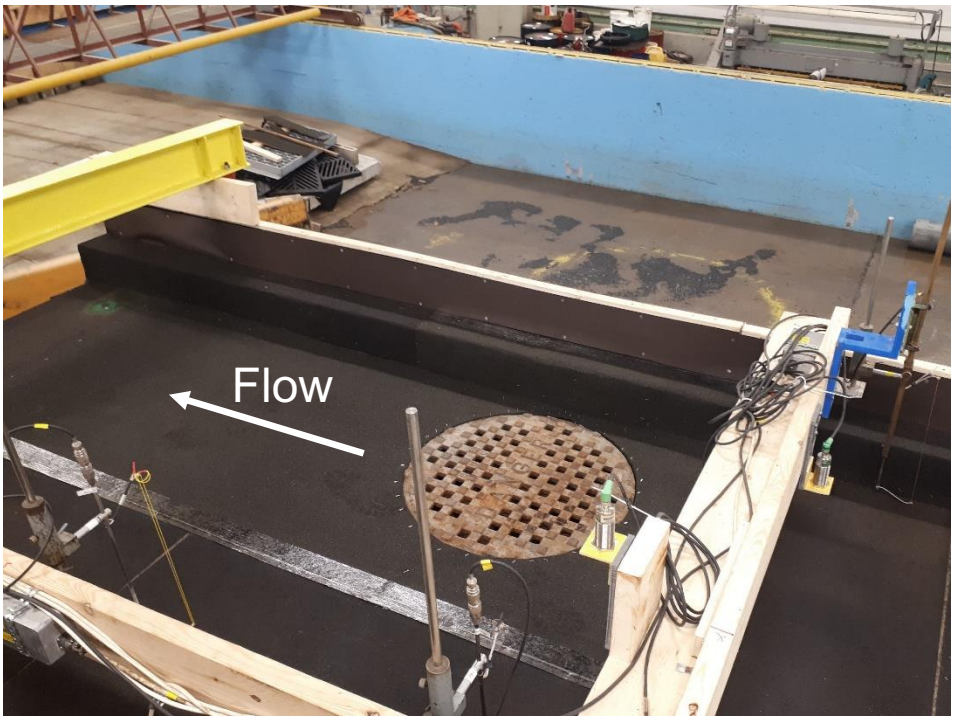

Figure 13. Circular open cover – Type B per OPSD 401.010 (#7)

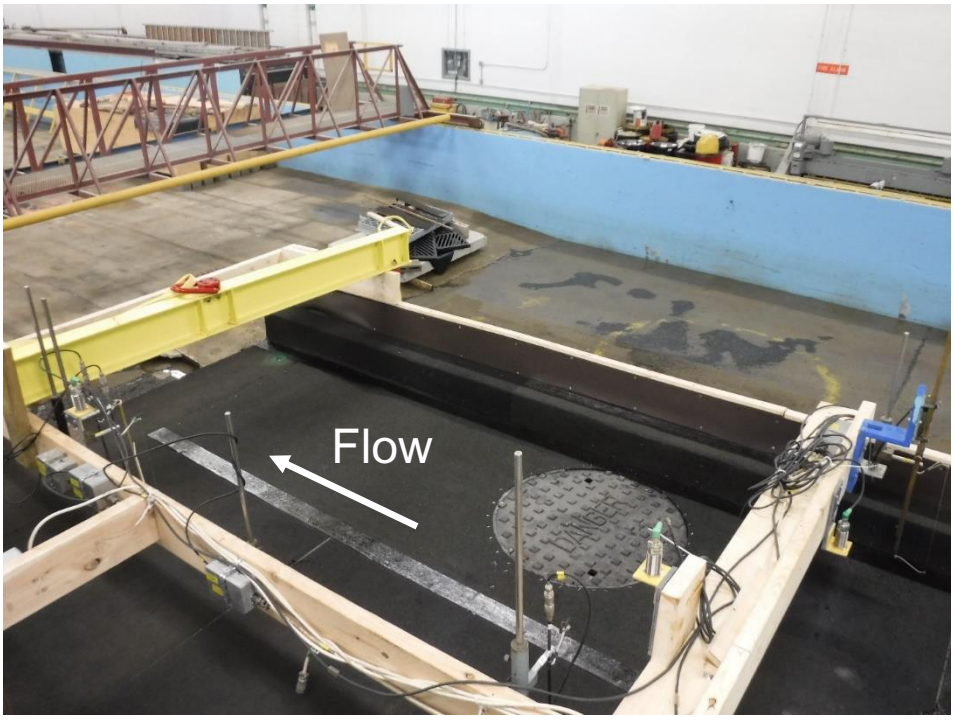

Figure 14. Circular closed cover – Type A per OPSD 401.010 (#8)

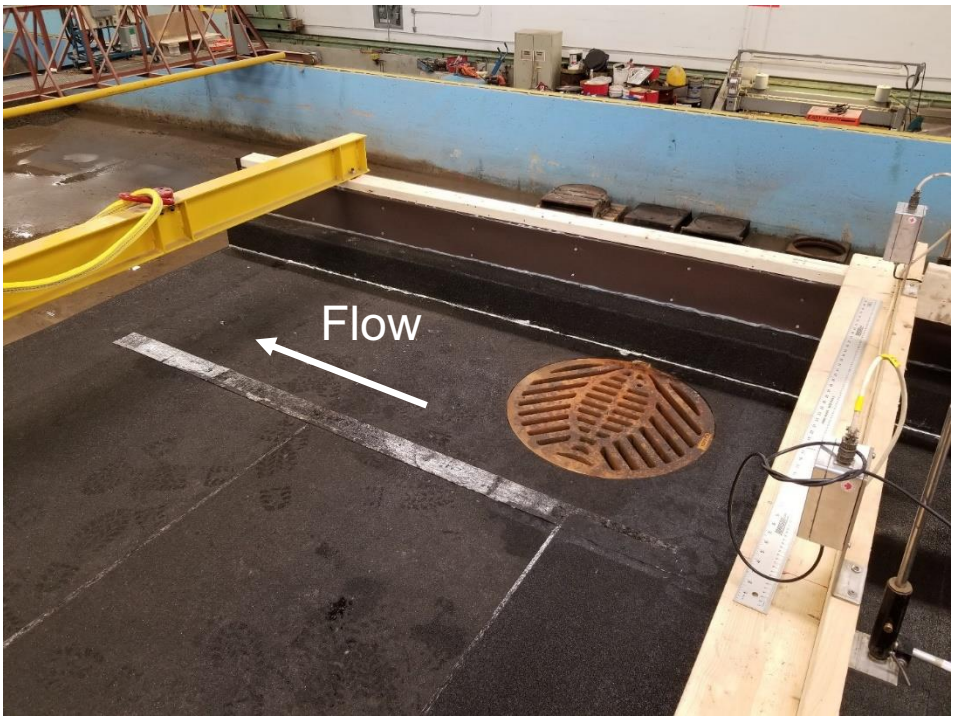

Figure 15. “FISH” type round catch basin cover per DWG. No. S19 (#9)

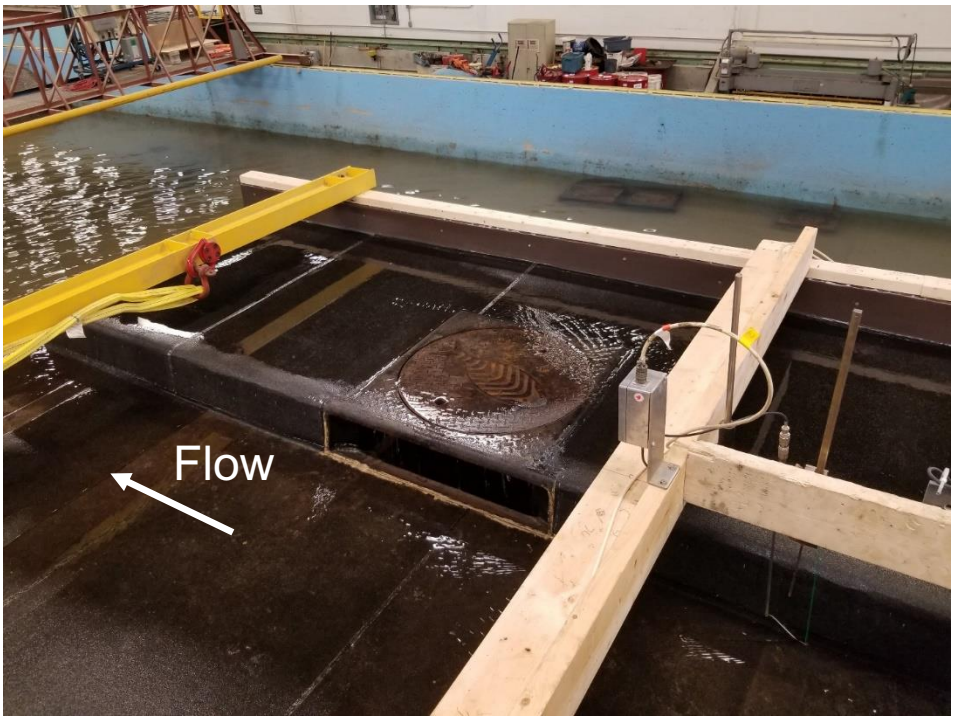

Figure 16. Curb inlet “FISH” type catch basin frame per DWG. No. S22 (#10)

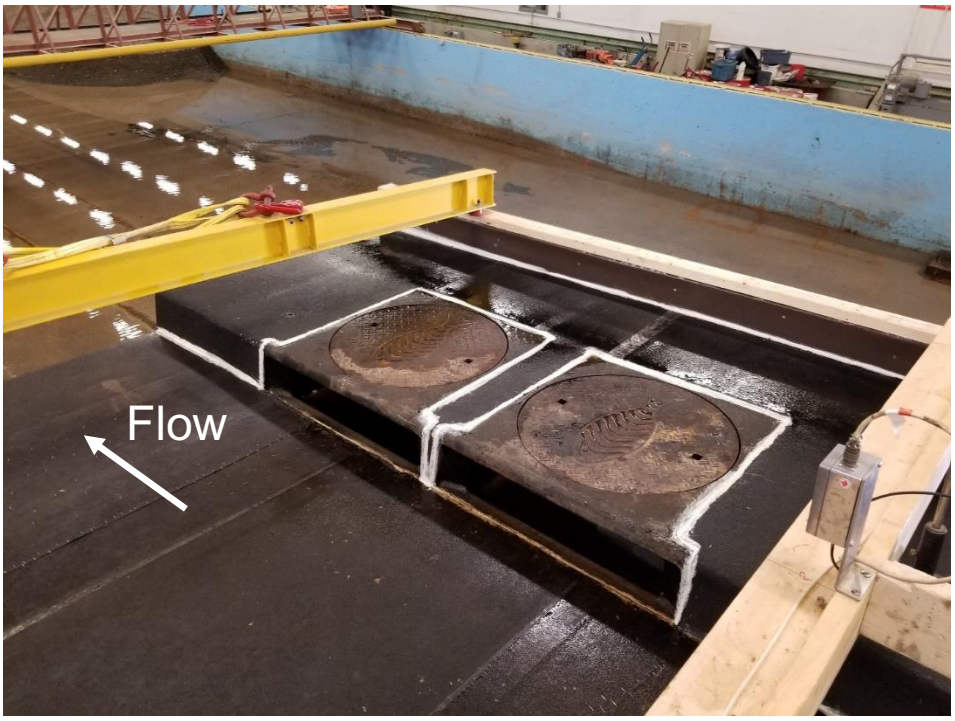

Figure 17. Double curb inlet “FISH” type catch basin frame per DWG. No. S22 (#11)

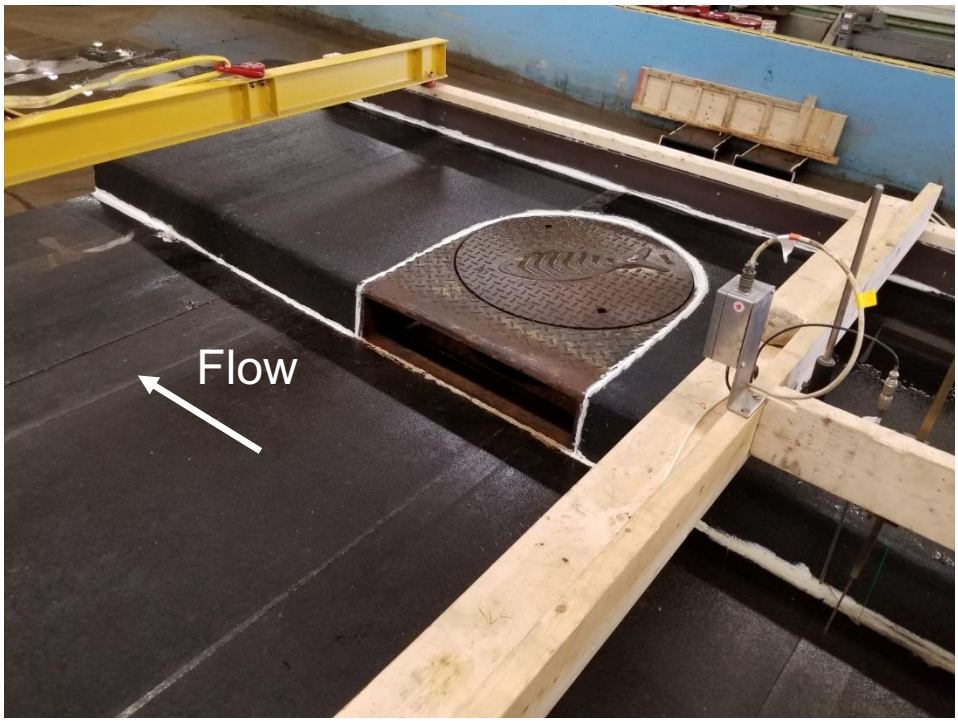

Figure 18. Curb inlet “FISH” type catch basin frame and cover for CBMH per DWG. No. S28 (#12)

Inlets #1 to #5 (Figure 7 - Figure 11) are representative of catch basin grates typically used throughout Canada. Inlet #9, shown in Figure 15, is a minor modification on inlet #1. Inlet #6, shown in Figure 12, is a high capacity inlet which is often used in ditches. It has a much larger open area than the other inlets. Inlets #7 in Figure 13 and #8 in Figure 14 are covers for maintenance holes (as opposed to catch basin grates) and are not designed to drain water from the roadway. They do have openings and can allow water into the sewer system during high flow events. Inlets #10 to #12 (Figure 16 - Figure 18) are curb inlet frames which form no obstacle on the side of the roadway and as such they are more bicycle friendly.

3. Test Parameters

A summary of the controlled test parameters (water flow, catch basin grate, road grade and cross-slope) is provided in Table 2. The head tank water flow was controlled by adjusting the pump settings. For each road configuration 13 flows from 0.001 – 0.41 m^3/s were sent onto the roadway. This allowed the water depth upstream of the catch basin to cover an appropriate range for the tests (~ 0.007 - 0.35 m). An example of the roadway flow under a high flow condition is shown in Figure 19.

Table 2. Summary of the test parameters.

Water Depth	Type of Catch Basin Grate	Road Grade	Cross Slope
At least 13 different incident water depths for each test series. Water depths vary with test parameters.	#1 - Round Frame Single Catch Basin	0.50%	0.00%
	#2 - Round Frame Double Catch Basin	1.00%	2.00%
	#3 - Herringbone Single Catch Basin	2.50%	4.00%
	#4 - Herringbone Double Catch Basin	5.00%	
	#5 - Horizontal Bars Single Catch Basin	7.50%	
	#6 - High Inlet Capacity Catch Basin	10.00%	
	#7 - Circular Open Cover (Type B)		
	#8 - Circular Closed Cover (Type A)		
	#9 - "FISH" Round Catch Basin Cover (S19)		
	#10 - Single Curb Inlet Frame (S22)		
	#11 - Double Curb Inlet Frame (S22x2)		
	#12 - Single Curb Inlet Frame for CBMH (S28)		

Figure 19. Water flowing from the head tank to the roadway during a high flow condition.

4. Example Catch Basin Rating Curve

This section will show one example of the calculation of a catch basin rating curve and the associated best fit curve parameters. In this report the experimental measurements of catch basin inlet flow versus incident water depth on the roadway are provided from Poirier and Provan (2021, 2023). The RD6 measurements are utilized as the water depth unless the water depth is too low for the sensor. In those cases the RD6 results are used with the acoustic sensor and the point gauge data to provide an appropriate confidence interval for the water depth measurement.

The calculation of the catch basin rating curve begins with the experimental measurements including uncertainties such as shown in Table 3. The measurements from Table 3 correspond to inlet #1, the round herringbone single catch basin at a 2.0% cross-slope and a 2.5% grade. Similar measurements for all of the tested catch basin inlets can be found in Appendix A and the data from Table 3 is specifically found in Table A.1. The data from Table 3 is also plotted in Figure 20.

Table 3. Sample of experimental measurements of incident water depth and catchment flow with uncertainties for inlet #1 (single round herringbone grate)

cross-slope (%)	2.0			
Grade (%)	2.5			
	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)
	0.017	0.0009	0.001	5.8E-06
	0.020	0.0021	0.001	1.3E-05
	0.023	0.0050	0.001	3.1E-05
	0.028	0.012	0.001	0.003
	0.034	0.019	0.001	0.004
	0.048	0.031	0.002	0.005
	0.058	0.038	0.003	0.005
	0.064	0.044	0.004	0.006
	0.068	0.047	0.005	0.006
	0.076	0.053	0.006	0.007
	0.086	0.059	0.006	0.007
	0.095	0.065	0.007	0.008
	0.103	0.069	0.008	0.008

No simple equation is capable of providing an appropriate fit to the data illustrated in Figure 20. As a result, two quadratic equations were chosen to fit to the data which intersect at their inflection point, approximately 0.03 m of incident water depth. Not every data set is fit to the same model. In fact the simplest model possible is used in each case. The various models used in this report include a single linear equation, a single quadratic equation, two linear equations, one linear and one quadratic equation as well as the pair of quadratic equations used in this example.

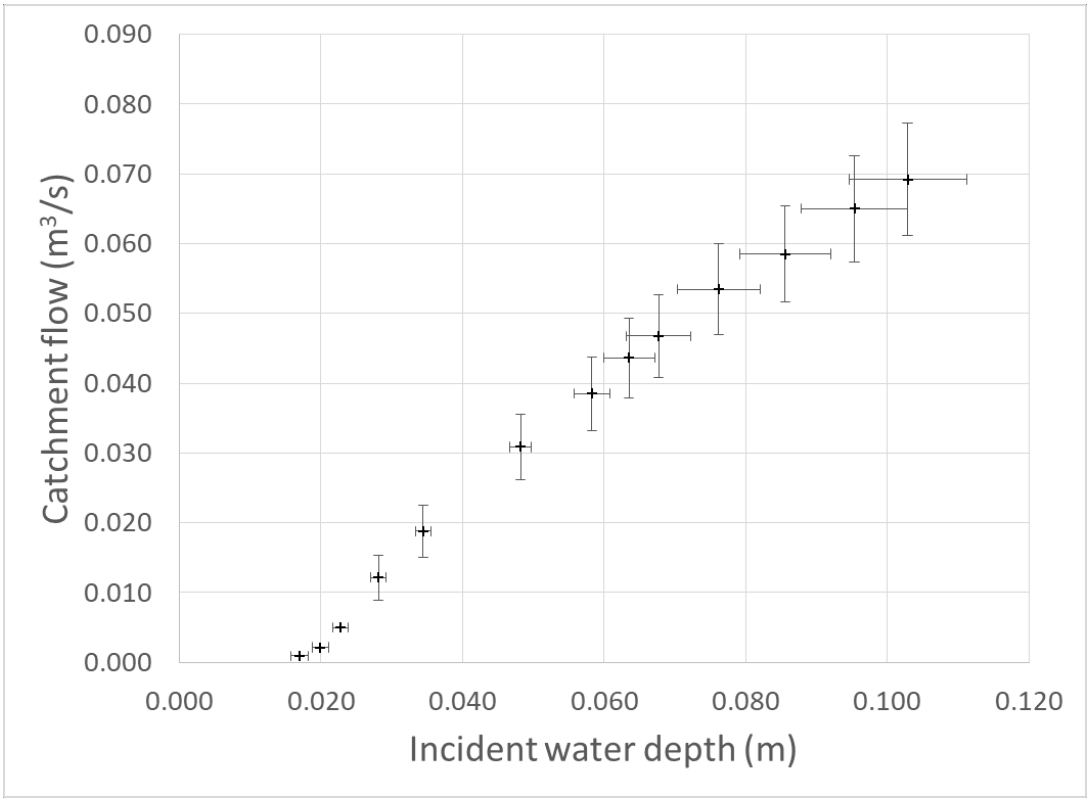

Figure 20. Example of experimental measurements with uncertainties for inlet #1 (single round herringbone grate) at a 2.0% cross-slope and 2.5% road grade.

In order to fit the model equation, $f(x)$ to the experimental data a weighted least squares method is used. r_i is the difference between the i^{th} measured inflow, y_i and the model value at the i^{th} measured incident water depth, x_i as shown in equation (1).

$$r_i = y_i - f(x_i) \tag{1}$$

The least squares equation to be minimized is shown in equation (2). For each of the i measurements the weighting factor W_{ii} is the inverse of the sum of the inflow measurement uncertainty σ_{y_i} and the product of the slope at i, m_i and the measurement uncertainty on the water depth, σ_{x_i} all squared.

$$S = \sum_i^n W_{ii} \cdot {r_i}^2 = \sum_i^n \frac{1}{\left(\sigma_{y_i} + m_i \sigma_{x_i}\right)^2} \cdot {r_i}^2 \tag{2}$$

For analyses where two functions are used, the data points on each side of the intersection of the two curves are generally used in each analysis. The sum in equation (2) is minimized using the GRG Nonlinear function in the excel solver add-in. Each function is minimized separately unless this leads to a result where the two functions do not intercept. In that case the intercept is forced and the sum from the two functions is solved concurrently to obtain all of the parameters for both functions. The best fit functions for the illustrated example are included in Table 4 along with all others for inlet #1.

In Table 4 we note that all of the examples for inlet #1 have a quadratic best fit function for incident water depths from the minimum to the intercept as described by equation (3).

$$f_1(x_i) = a_1 {x_i}^2 + b_1 x_i + c_1 \tag{3}$$

While seven road orientations have a quadratic best fit function from the intercept to the maximum incident water depth as described by equation (4) five others are described by the linear fit shown in equation (5).

$$f_2(x_i) = a_2 {x_i}^2 + b_2 x_i + c_2 \tag{4}$$

$$f_2(x_i) = a_2 x_i + b_2 \tag{5}$$

Table 4: Best fit parameters for inlet #1, single round herringbone grate. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	3.96E+01	3.77E+01	4.13E+01	6.75E+01	1.45E+01	1.34E+01	1.14E+01	1.09E+01	1.59E+01	2.02E+01	1.36E+02	1.86E+01
b1	-1.47E+00	-1.12E+00	-1.01E+00	-1.61E+00	-1.54E-01	-1.24E-01	-3.62E-01	-1.25E-01	-2.82E-01	-3.89E-01	-4.35E+00	-3.17E-01
c1	1.44E-02	9.11E-03	6.12E-03	1.03E-02	8.21E-04	6.93E-04	3.27E-03	-3.82E-04	1.24E-03	1.79E-03	3.55E-02	1.30E-03
a2	2.36E+00	7.39E-01	-2.97E+00	-3.16E+00	-5.77E+00	-8.39E+00	6.65E-01	5.93E-01	6.34E-01	6.75E-01	-1.72E+00	-2.28E+00
b2	4.65E-01	-9.73E-03	1.15E+00	1.06E+00	1.25E+00	1.48E+00	-1.99E-02	-6.02E-03	-4.86E-03	-9.05E-03	8.80E-01	9.20E-01
c2	-1.06E-02		-1.76E-02	-1.20E-02	-1.66E-02	-2.06E-02					-1.40E-02	-1.62E-02
depth (m)												
intercept	0.025	0.035	0.032	0.025	0.053	0.017	*0.045*	0.056	0.050	0.039	0.020	0.024
min	0.018	0.016	0.017	0.013	0.011	0.009	0.022	0.018	0.016	0.016	0.015	0.015
max	0.123	0.116	0.103	0.091	0.082	0.079	0.152	0.144	0.129	0.119	0.112	0.105

In Figure 21 the best fit data resulting from the illustrated example is overlaid onto the measurement data for inlet #1 at a cross-slope of 2.0% and a road grade of 2.5%. The orange triangles range from the minimum measured water depth to one measurement beyond the intercept and the grey points range from one point below the intercept to the maximum incident water depth. This highlights the data used to produce the two best fit curves. The data tables in Appendix B and the figures in Section 5 include the minimum, maximum, intercept and regular points in between. A point at zero depth and zero flow was also included as a reasonable assumption however the roughness of the roadway and the height of installation of the inlet could impact that value.

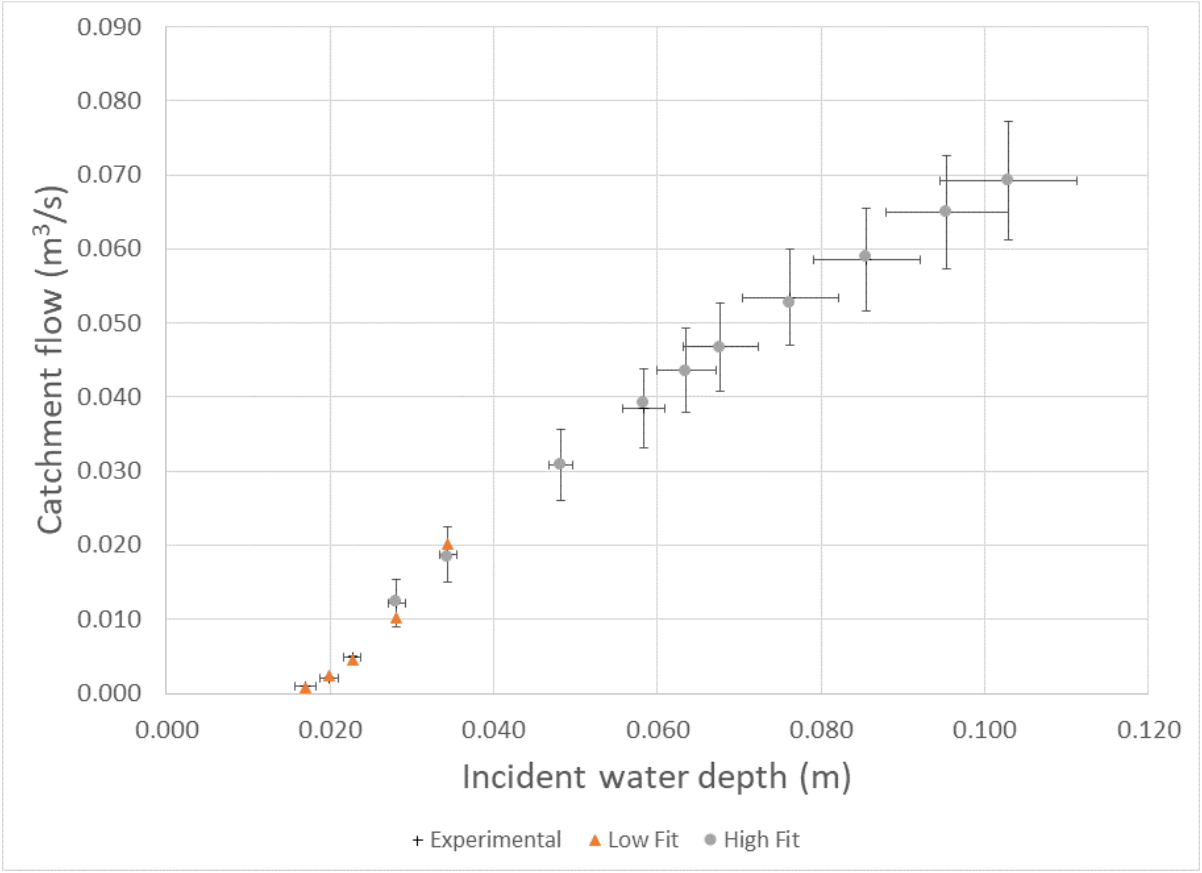

Figure 21. Example of best fit data overlaid onto experimental measurements for inlet #1 (single round herringbone grate) at a 2.0% cross-slope and 2.5% road grade. Experimental measurements with error bars are shown as crosses, orange triangles indicate the fit from minimum to the intercept and the grey points indicate the fit from intercept to the maximum.

5. Results

This section includes the best fit function parameters for all twelve of the different catch basin inlets tested for each of the various road orientations examined during the tests performed in the National Research Council's Coastal Wave Basin.

5.1. Catch Basin Inlet #1 – Single Round Herringbone

The best fit function parameters corresponding to the single round grate with herringbone pattern, inlet #1 can be found in Table 4. The one instance where the intercept value is underlined and italicized indicates that the original best fit curves for the two best fit functions resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The best fit parameters for inlet #1 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 22.

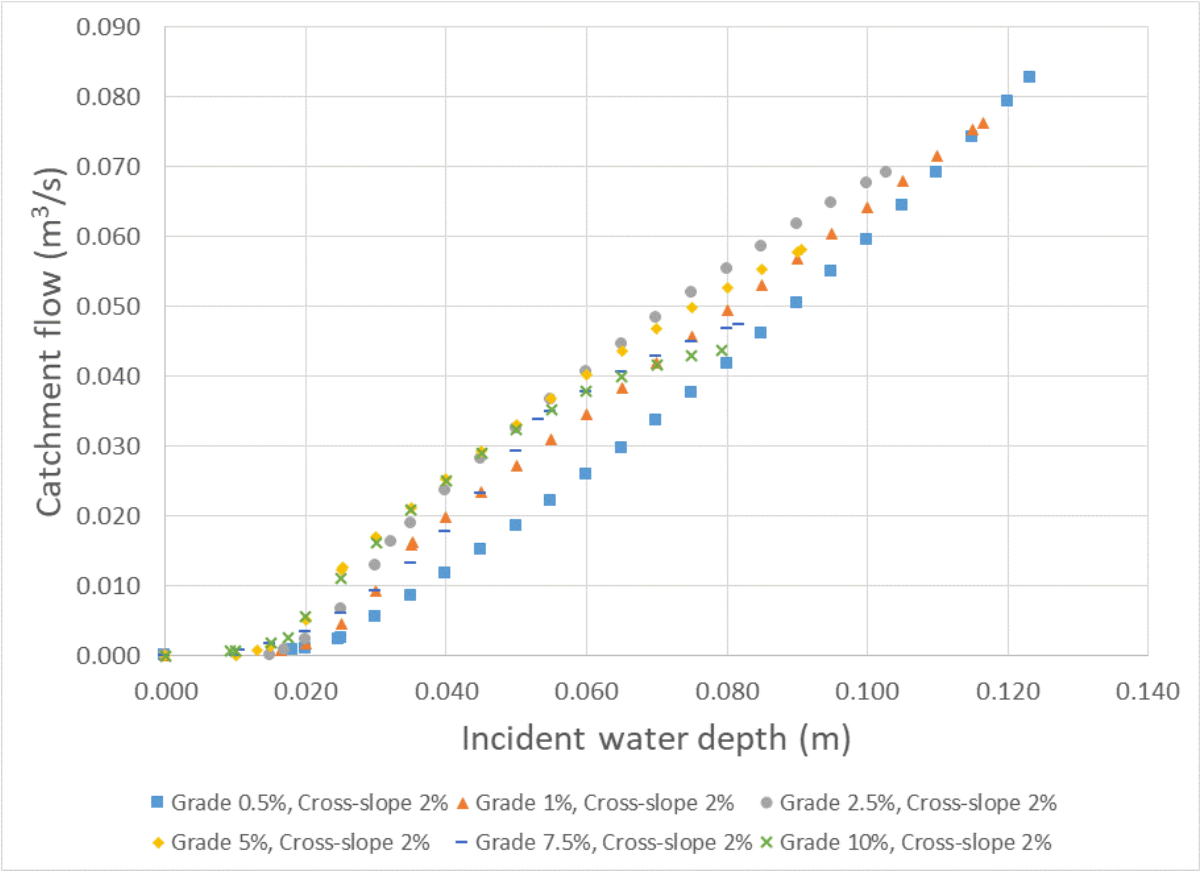

Figure 22. Best fit curves of inlet flow 2.0% cross-slope, single round herringbone grate (#1) – OPSD 400.070

The Table 4 best fit parameters for inlet #1, single round grate with herringbone pattern at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 23. The calculated best fit catchment flow values illustrated in Figure 22 and Figure 23 were included in Appendix B (Table B.1).

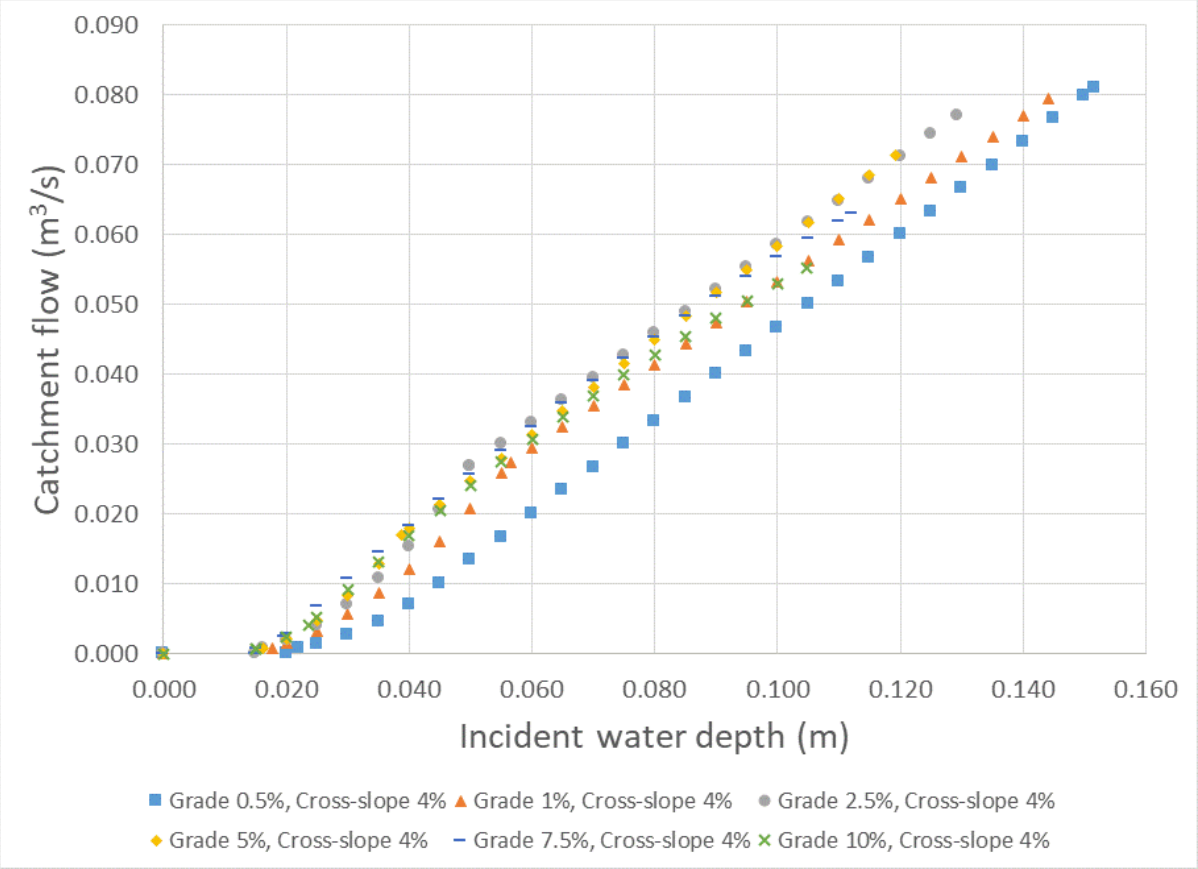

Figure 23. Best fit curves of inlet flow 4.0% cross-slope, single round herringbone grate (#1) – OPSD 400.070

5.2. Catch Basin Inlet #2 – Double Round Herringbone

The best fit function parameters corresponding to the double round grate with herringbone pattern, inlet #2 can be found in Table 5. Instances where the intercept value is underlined and italicized indicate that the original best fit curves for the two best fit functions resulted in no intercept and the intercept of the incident water depth values had to be forced in solving the weighted least squares equation. The best fit parameters for inlet #2 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 24.

Table 5: Best fit parameters for inlet #2, double round herringbone grate. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	1.04E+01	3.02E+01	1.50E+01	4.63E+01	3.24E+01	4.83E+01	1.24E+01	1.15E+01	3.25E+01	7.90E+00	1.47E+01	2.16E+01
b1	-1.55E-01	-5.83E-01	4.78E-02	-1.07E+00	-5.52E-01	-1.06E+00	-4.37E-01	3.02E-03	-1.19E+00	3.69E-01	6.59E-02	-1.35E-01
c1	2.91E-04	2.91E-03	-2.44E-03	6.95E-03	3.03E-03	6.49E-03	4.62E-03	-3.11E-03	1.15E-02	-8.01E-03	-4.68E-03	-2.35E-04
a2	-1.78E+01	1.25E+00	-1.08E+01	-3.14E-01	-1.07E+01	-1.03E+01	1.33E+00	5.89E+00	1.30E+00	1.67E+00	1.58E+00	1.57E+00
b2	5.29E+00	-2.48E-02	3.03E+00	1.73E+00	2.87E+00	2.73E+00	-5.72E-02	3.16E-01	-3.24E-02	-5.77E-02	-4.39E-02	-3.33E-02
c2	-2.56E-01		-8.84E-02	-3.51E-02	-6.48E-02	-5.48E-02		1.03E-03				
depth (m)												
intercept	0.082	*0.030*	*0.058*	*0.030*	*0.040*	*0.032*	0.061	0.067	0.028	0.061	*0.052*	0.034
min	0.017	0.015	0.012	0.011	0.011	0.010	0.021	0.018	0.016	0.017	0.017	0.010
max	0.125	0.117	0.102	0.089	0.081	0.078	0.153	0.143	0.131	0.119	0.110	0.091

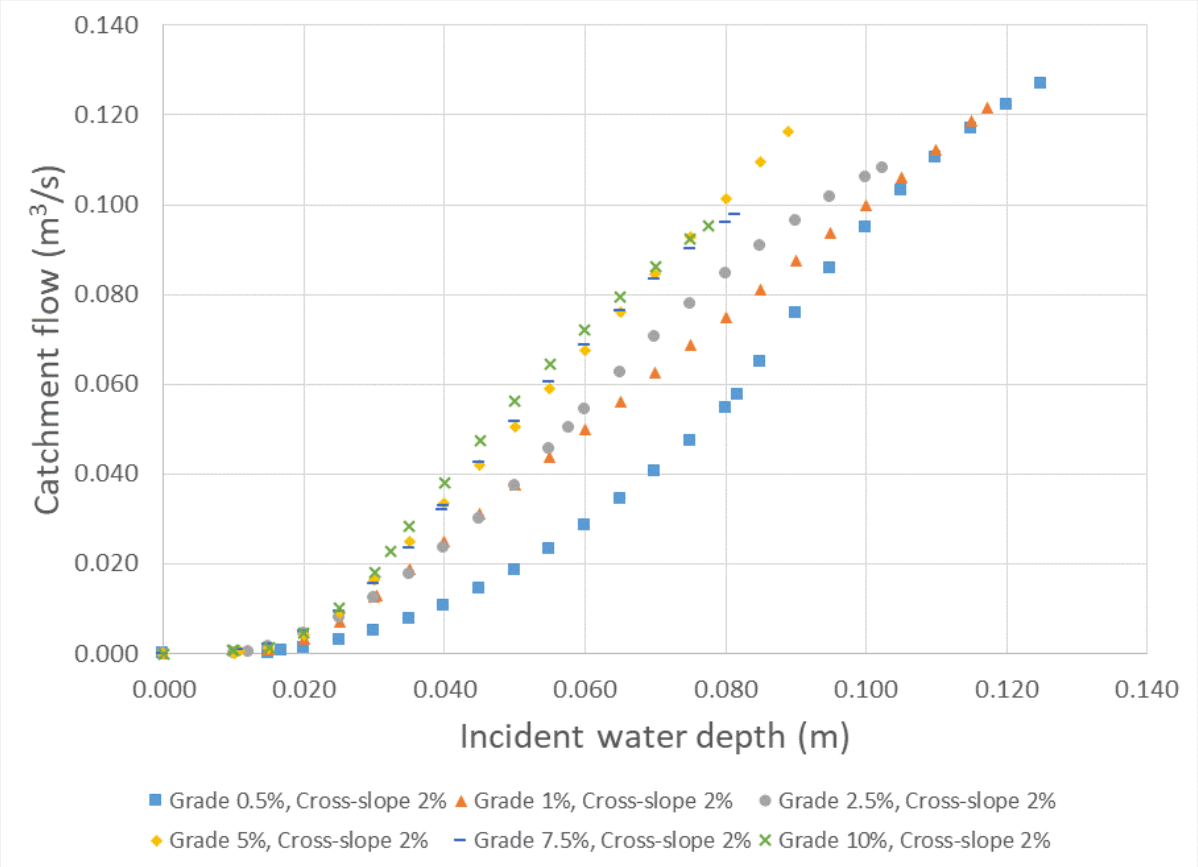

Figure 24. Best fit curves of inlet flow 2.0% cross-slope, double round herringbone grate (#2) – OPSD 400.070

The Table 5 best fit parameters for inlet #2, double round grate with herringbone pattern at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 25. The calculated best fit catchment flow values illustrated in Figure 24 and Figure 25 were included in Appendix B (Table B.2).

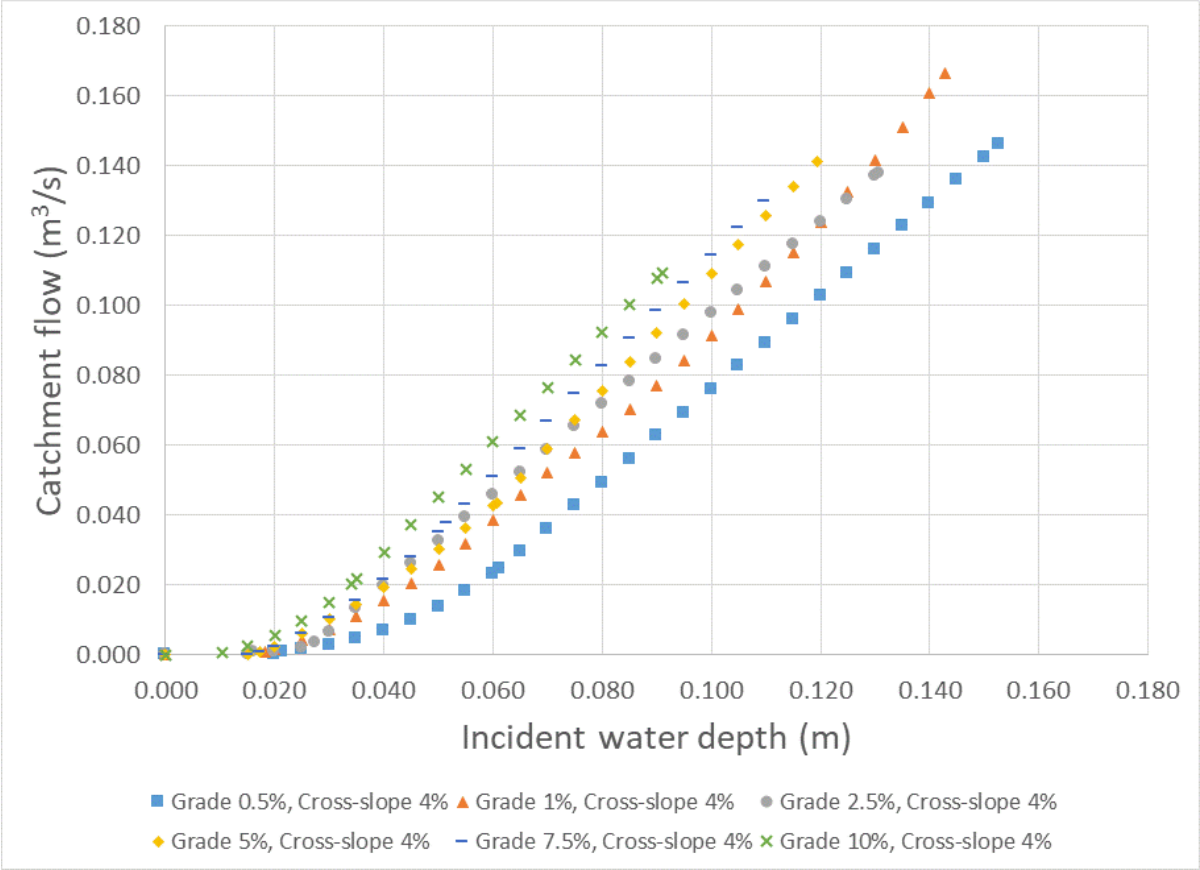

Figure 25. Best fit curves of inlet flow 4.0% cross-slope, double round herringbone grate (#2) – OPSD 400.070

5.3. Catch Basin Inlet #3 – Single Square Herringbone

The best fit function parameters corresponding to the single square grate with herringbone pattern, inlet #3 can be found in Table 6. The one instance where the intercept value is underlined and italicized indicates that the original best fit curves for the two best fit functions resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The best fit parameters for inlet #3 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 26.

Table 6: Best fit parameters for inlet #3, single square herringbone grate. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	1.19E+01	7.39E+00	1.71E+01	5.36E+01	3.67E-01	2.97E-01	1.08E+01	1.28E+01	2.85E+01	3.66E+01	2.02E+01	1.89E+01
b1	-2.75E-01	1.15E-01	-1.28E-02	-1.09E+00	-2.43E-03	-1.41E-03	-2.95E-01	-1.92E-01	-6.84E-01	-8.74E-01	-4.04E-01	-3.73E-01
c1	1.35E-03	-2.81E-03	-1.79E-03	6.39E-03			2.17E-03	5.56E-04	4.91E-03	6.18E-03	2.78E-03	3.03E-03
a2	8.49E-01	-3.75E+00	-4.05E+00	-5.86E+00	-8.43E+00	-8.12E+00	-7.12E-01	-2.39E+00	7.07E-01	-2.46E+00	-4.02E+00	-5.09E+00
b2	-2.50E-02	1.36E+00	1.32E+00	1.50E+00	1.75E+00	1.74E+00	8.63E-01	1.11E+00	-4.48E-03	1.12E+00	1.37E+00	1.54E+00
c2		-3.25E-02	-2.13E-02	-2.18E-02	-2.74E-02	-2.79E-02	-2.69E-02	-2.60E-02		-1.88E-02	-2.98E-02	-3.52E-02
depth (m)												
intercept	0.043	0.035	0.023	0.021	0.021	0.021	0.047	0.034	0.041	0.022	*0.037*	0.038
min	0.021	0.016	0.013	0.010	0.009	0.008	0.022	0.016	0.012	0.011	0.010	0.011
max	0.122	0.112	0.098	0.092	0.080	0.078	0.148	0.140	0.123	0.113	0.107	0.100

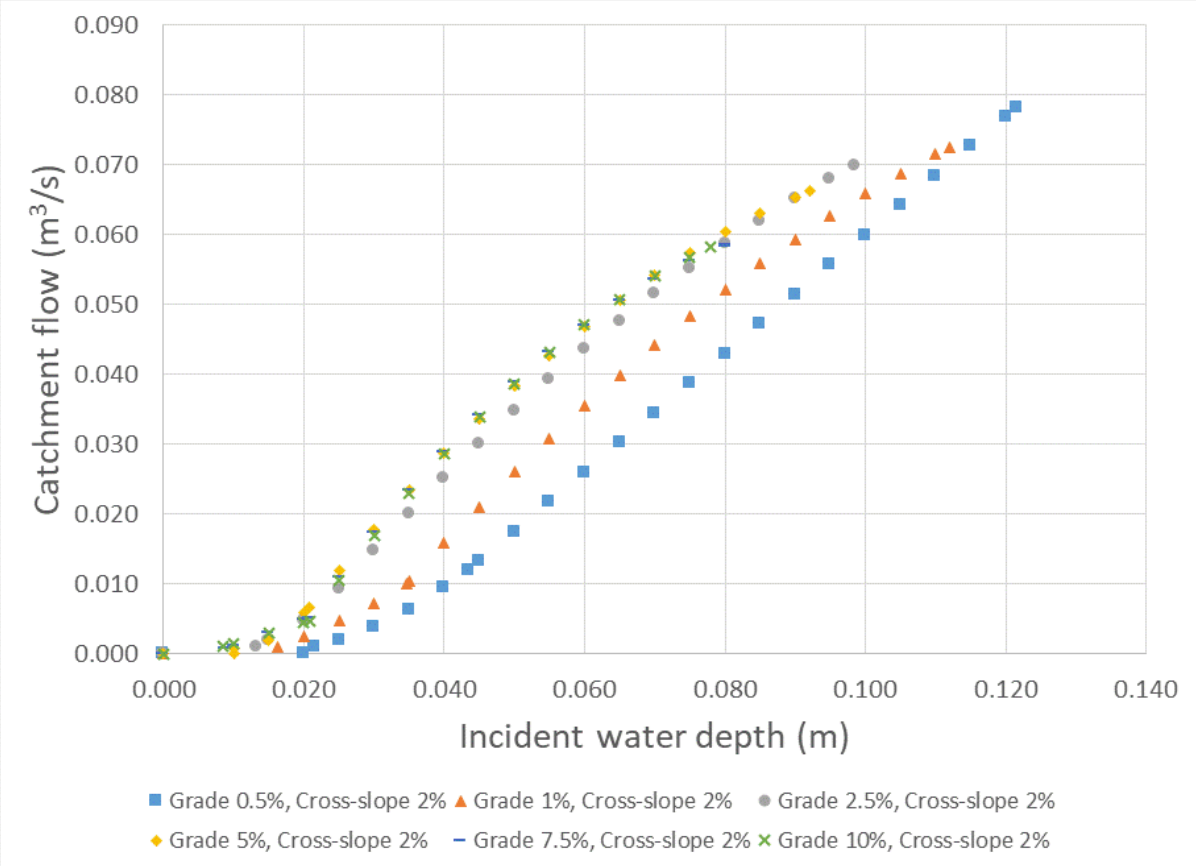

Figure 26. Best fit curves of inlet flow 2.0% cross-slope, single square herringbone grate (#3) – OPSD 400.020

The Table 6 best fit parameters for inlet #3, single square grate with herringbone pattern at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 27. The calculated best fit catchment flow values illustrated in Figure 26 and Figure 27 were included in Appendix B (Table B.3).

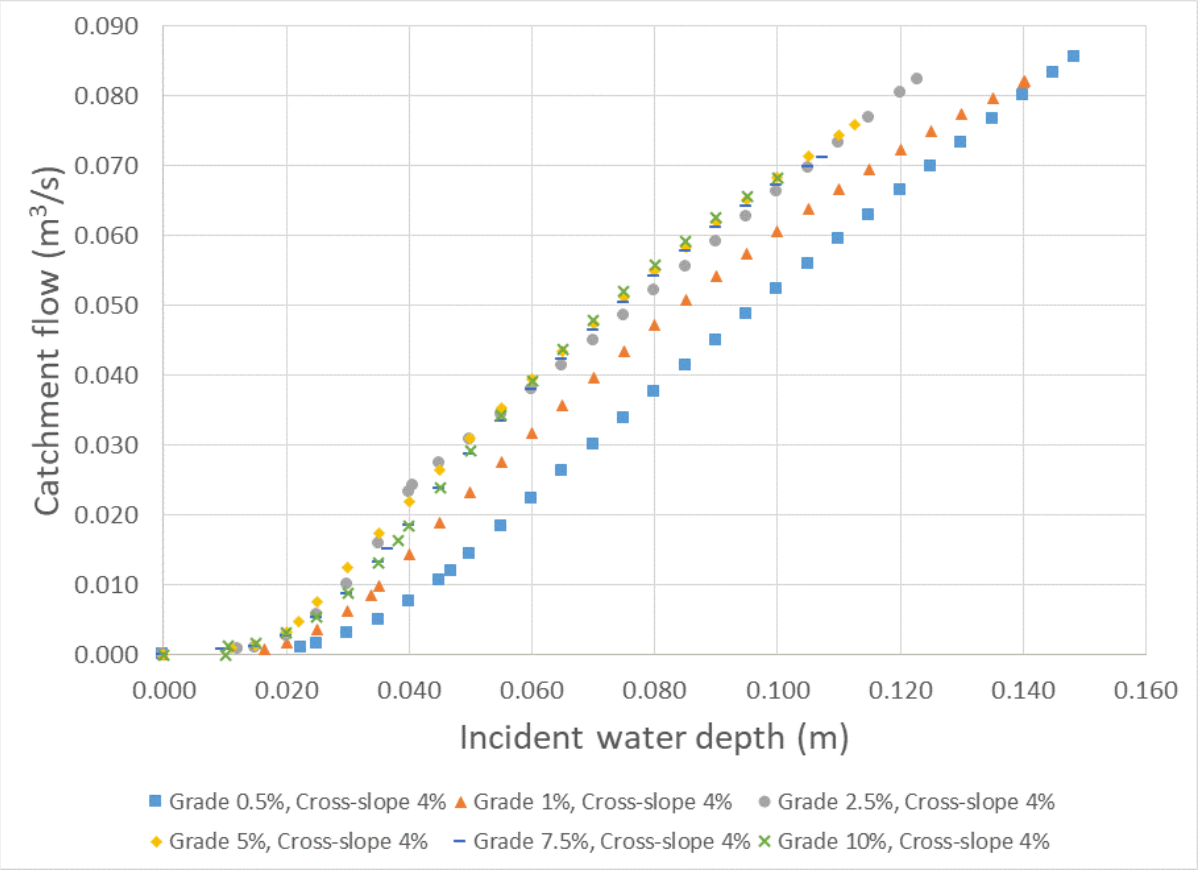

Figure 27. Best fit curves of inlet flow 4.0% cross-slope, single square herringbone grate (#3) – OPSD 400.020

5.4. Catch Basin Inlet #4 – Double Square Herringbone

The best fit function parameters corresponding to the double square grate with herringbone pattern, inlet #4 can be found in Table 7. Instances where the intercept values are underlined and italicized indicate that the original best fit curves for the two best fit functions resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The best fit parameters for inlet #4 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 28.

Table 7: Best fit parameters for inlet #4, double square herringbone grate. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	1.51E+01	1.46E+01	5.83E+01	2.61E+01	3.30E+01	3.83E+01	9.40E+00	1.40E+01	2.69E+01	1.29E+01	1.79E+01	2.30E+01
b1	-2.08E-01	7.60E-02	-1.15E+00	2.95E-02	-2.63E-01	-5.13E-01	-1.24E-01	-1.66E-01	-5.10E-01	1.77E-01	-5.71E-02	-3.52E-01
c1	3.19E-04	-2.40E-03	6.37E-03	-2.19E-03	2.42E-04	2.65E-03	-2.43E-04	-1.66E-05	2.44E-03	-3.65E-03	-1.81E-03	1.55E-03
a2	1.10E+01	1.34E+00	1.41E+00	1.78E+00	-1.73E+01	-1.22E+01	1.77E+00	1.47E+00	1.44E+00	-2.40E+01	-1.24E+01	-1.65E+01
b2	-1.97E-01	-2.95E-02	-2.14E-02	-3.03E-02	3.56E+00	2.87E+00	-9.24E-02	-4.70E-02	-3.27E-02	6.24E+00	3.56E+00	3.97E+00
c2	6.08E-03				-7.25E-02	-5.18E-02				-2.44E-01	-1.08E-01	-1.17E-01
depth (m)												
intercept	0.039	*0.043*	0.025	0.040	*0.038*	0.027	0.082	0.051	*0.036*	0.066	0.067	*0.055*
min	0.015	0.012	0.010	0.010	0.009	0.009	0.018	0.017	0.016	0.013	0.013	0.012
max	0.123	0.112	0.096	0.086	0.078	0.074	0.144	0.141	0.125	0.112	0.105	0.098

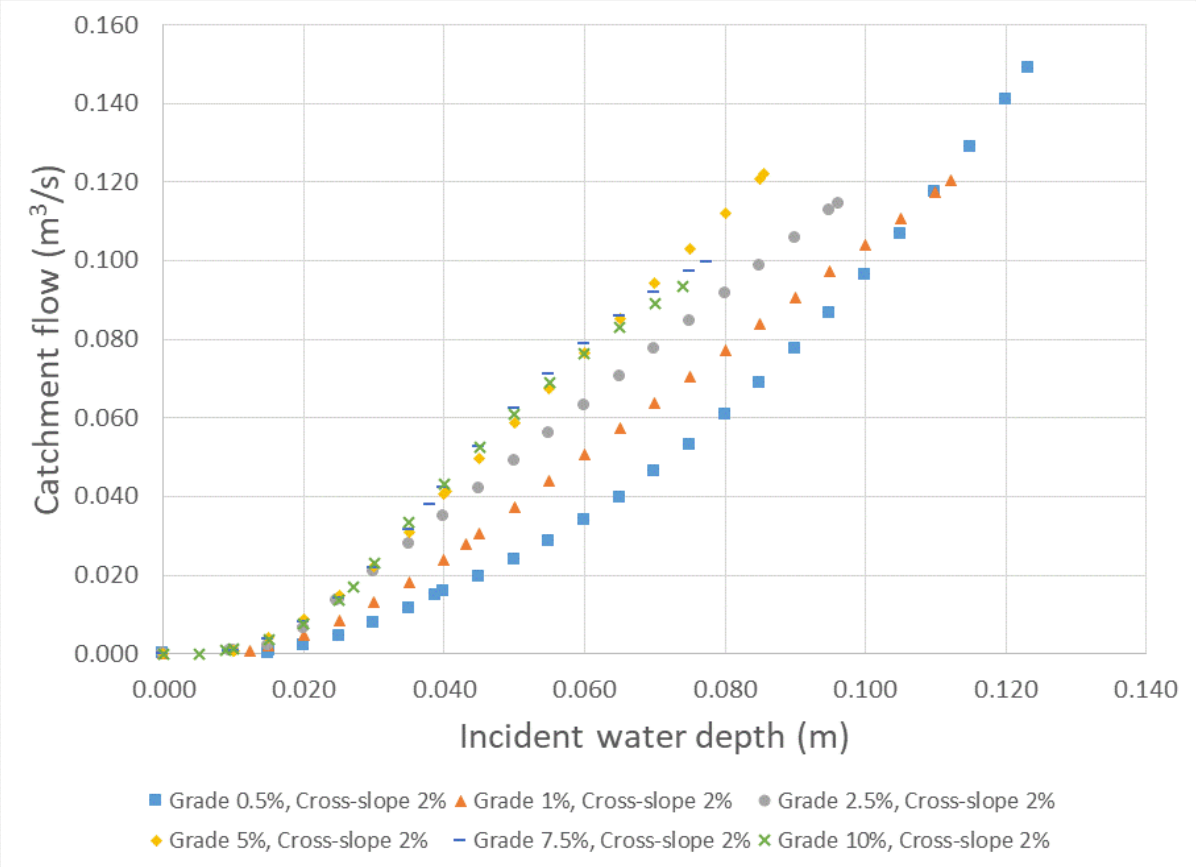

Figure 28. Best fit curves of inlet flow 2.0% cross-slope, double square herringbone grate (#4) – OPSD 400.020

The best fit parameters for inlet #4, double square grate with herringbone pattern at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 29. The calculated best fit catchment flow values illustrated in Figure 28 and Figure 29 were included in Appendix B (Table B.4).

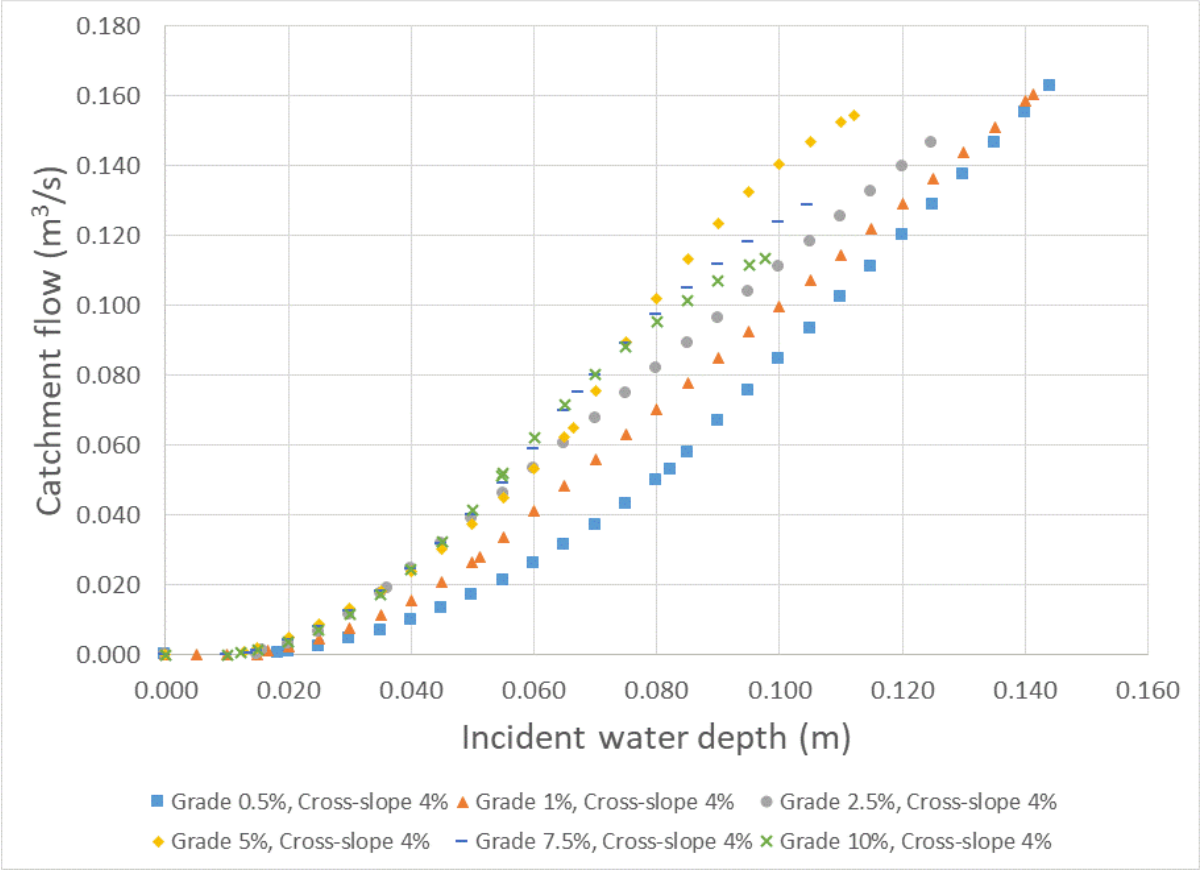

Figure 29. Best fit curves of inlet flow 4.0% cross-slope, double square herringbone grate (#4) – OPSD 400.020

5.5. Catch Basin Inlet #5 – Single Square with Horizontal Bars

The best fit function parameters corresponding to the single square grate with horizontal bars, inlet #5 can be found in Table 8. The best fit parameters for inlet #5 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 30.

Table 8: Best fit parameters for inlet #5, single square grate with horizontal bars. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	3.51E+00	1.45E+01	1.01E+02	2.67E+01	-4.34E+00	8.27E-01	8.36E+00	1.43E+01	9.32E+01	5.92E-01	5.38E+00	6.75E-01
b1	2.33E-01	-1.42E-01	-2.82E+00	-3.04E-01	1.27E+00	-1.02E-02	-2.23E-01	-3.90E-01	-3.52E+00	-7.59E-03	2.07E-01	-9.97E-03
c1	-5.59E-03	-7.91E-04	2.08E-02	6.91E-04	-1.75E-02		1.62E-03	2.75E-03	3.40E-02		-2.77E-03	
a2		-3.93E+00	-5.23E+00	-6.55E+00		-1.20E+01	6.90E-01	-7.46E-01	7.14E-01	-1.86E+00	-4.25E+00	-6.06E+00
b2		1.39E+00	1.43E+00	1.54E+00		2.13E+00	-2.33E-02	8.27E-01	-1.09E-02	9.69E-01	1.33E+00	1.57E+00
c2		-3.24E-02	-2.07E-02	-2.31E-02		-4.08E-02		-2.13E-02		-1.62E-02	-2.95E-02	-3.73E-02
depth (m)												
intercept		0.037	0.023	0.035		0.034	0.051	0.034	0.029	0.026	0.033	0.043
min	0.020	0.017	0.014	0.011	0.015	0.013	0.012	0.014	0.018	0.015	0.014	0.016
max	0.123	0.112	0.099	0.091	0.083	0.079	0.154	0.140	0.124	0.114	0.109	0.102

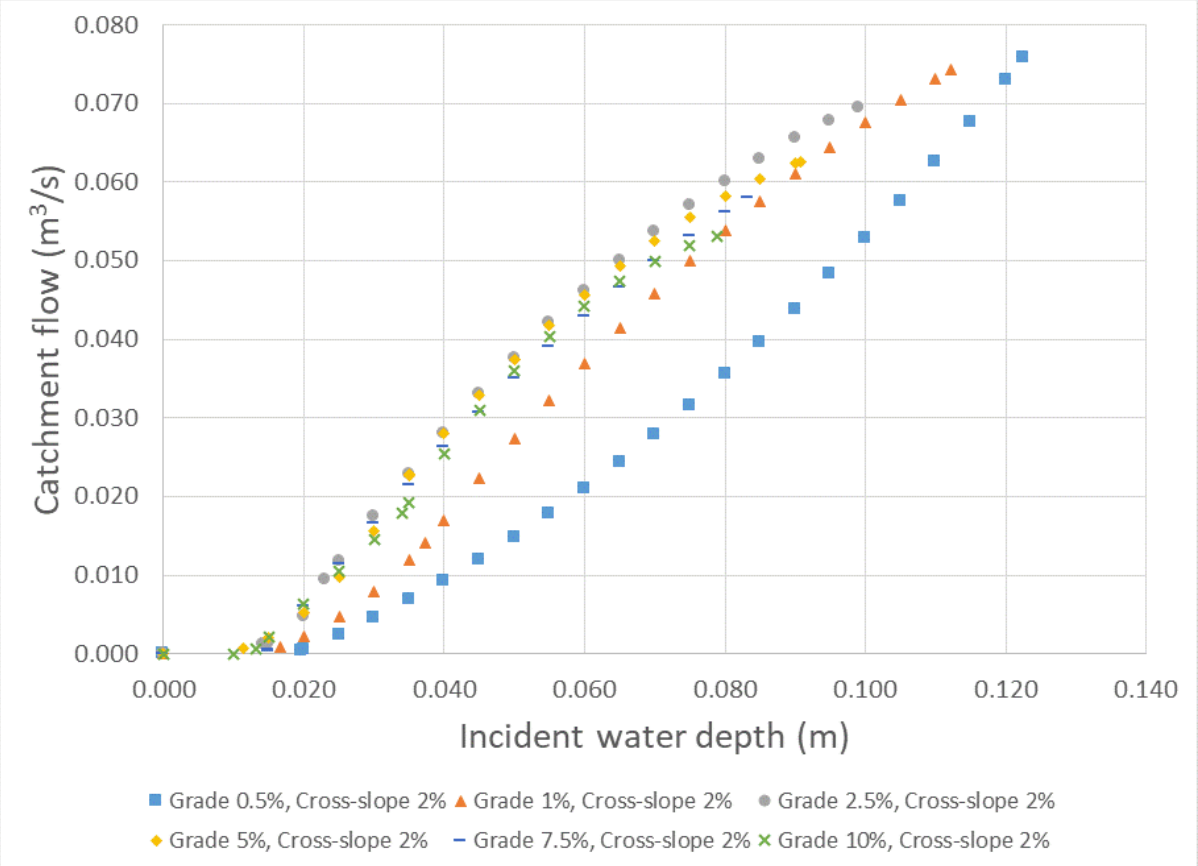

Figure 30. Best fit curves of inlet flow 2.0% cross-slope, single square grate with horizontal bars (#5) – MT-310

The best fit parameters for inlet #5, single square grate with horizontal bars at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 31. The calculated best fit catchment flow values illustrated in Figure 30 and Figure 31 were included in Appendix B (Table B.5).

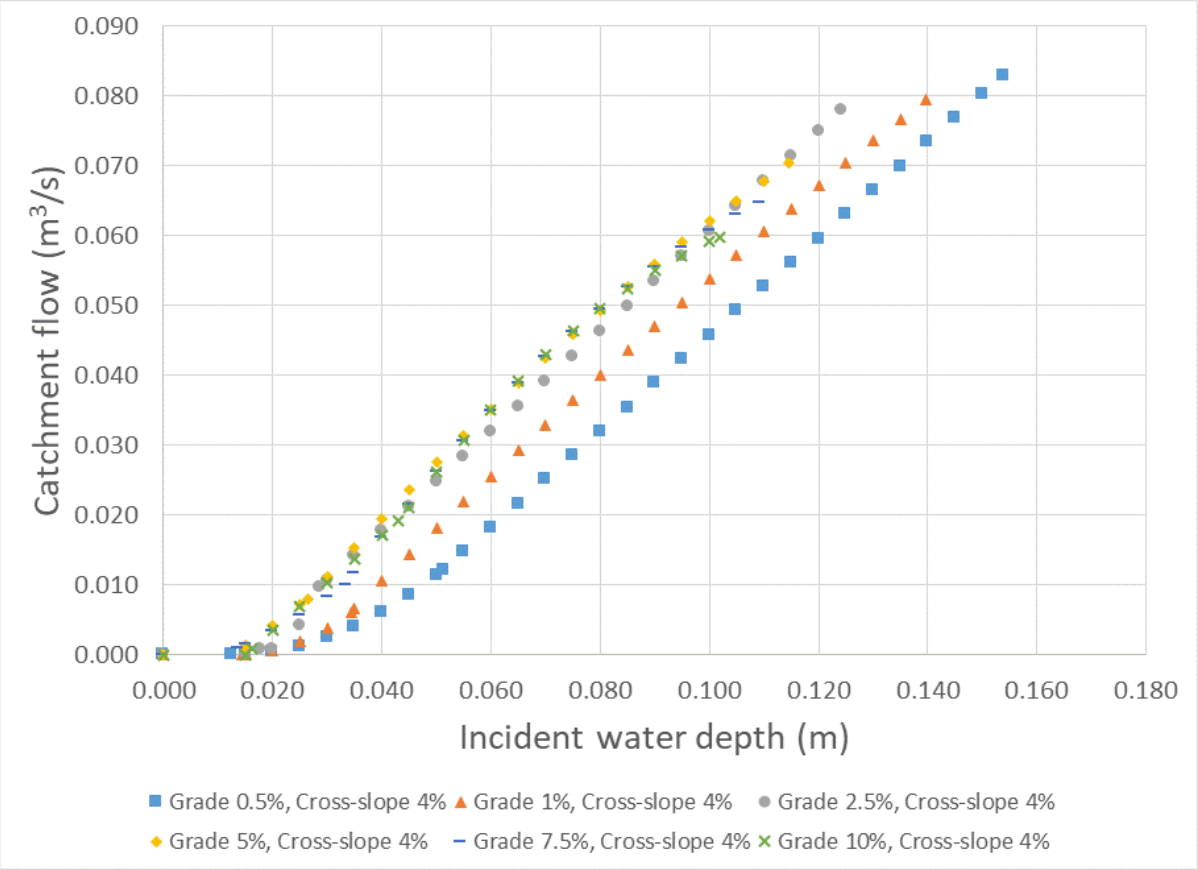

Figure 31. Best fit curves of inlet flow 4.0% cross-slope, single square grate with horizontal bars (#5) – MT-310

5.6. Catch Basin Inlet #6 – High Capacity Inlet

The best fit function parameters corresponding to the high capacity inlet, inlet #6 can be found in Table 9. Instances where the intercept values are underlined and italicized indicate that the original best fit curves for the two best fit functions resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The best fit parameters for inlet #6 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 32.

Table 9: Best fit parameters for inlet #6, high capacity inlet. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
a1	1.09E+01	1.46E+01	1.87E+01	3.96E+01	4.80E+01	3.29E+01	1.22E+01	1.19E+01	1.61E+01	1.56E+01	2.65E+01	2.44E+01
b1	1.55E-02	1.21E-01	2.41E-01	-6.52E-01	-8.85E-01	-3.95E-01	-3.71E-01	5.67E-02	-1.68E-02	1.91E-01	-4.53E-01	-4.04E-01
c1	-2.62E-03	-4.21E-03	-6.63E-03	3.24E-03	5.37E-03	2.15E-03	3.51E-03	-4.68E-03	-3.27E-03	-6.01E-03	2.19E-03	1.51E-03
a2	2.76E+00			3.29E+00	3.50E+00	3.51E+00				4.06E+00	3.75E+00	4.11E+00
b2	-1.47E-01			-9.48E-02	-9.50E-02	-9.13E-02				-2.05E-01	-1.53E-01	-1.68E-01
c2												
depth (m)												
intercept	0.075			*0.050*	*0.046*	0.033				0.072	0.059	0.052
min	0.016	0.016	0.015	0.011	0.011	0.007	0.021	0.018	0.016	0.016	0.013	0.015
max	0.122	0.113	0.101	0.090	0.084	0.081	0.151	0.144	0.129	0.116	0.111	0.104

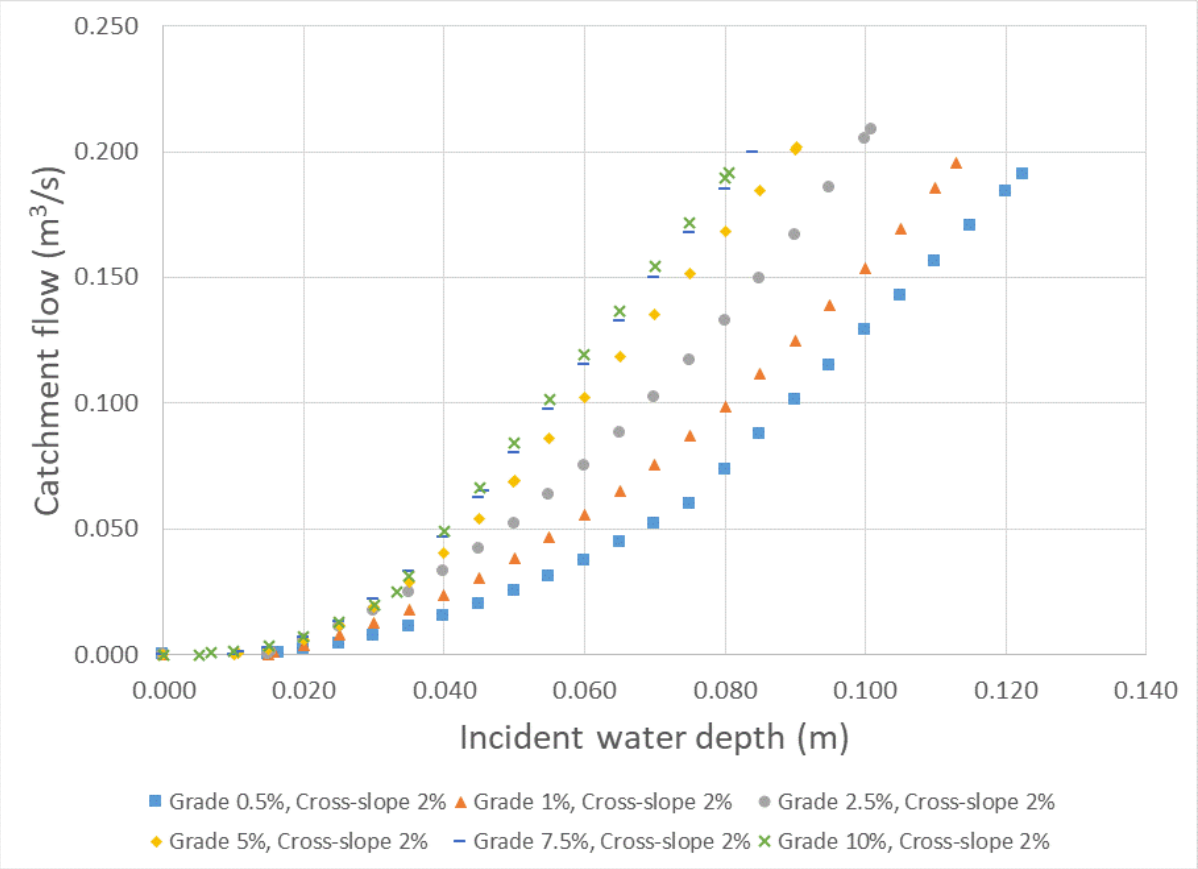

Figure 32. Best fit curves of inlet flow 2.0% cross-slope, high capacity inlet (#6) – Stepcon 5103

The best fit parameters for inlet #6, high capacity inlet at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 33. The calculated best fit catchment flow values illustrated in Figure 32 and Figure 33 were included in Appendix B (Table B.6).

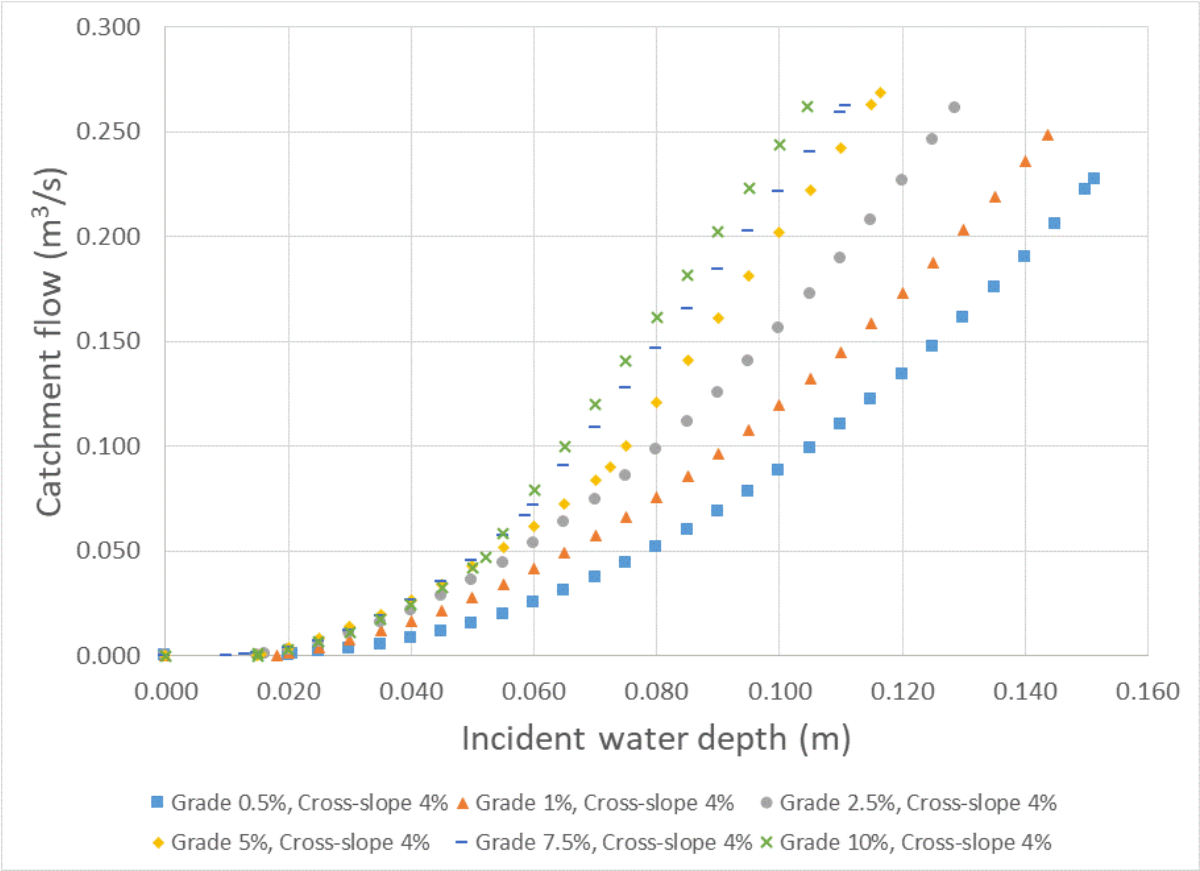

Figure 33. Best fit curves of inlet flow 4.0% cross-slope, high capacity inlet (#6) – Stepcon 5103

5.7. Catch Basin Inlet #7 – Circular Open Cover (Type B)

The best fit function parameters corresponding to the circular open cover (#7) can be found in Table 10. The best fit parameters for inlet #7 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 34.

Table 10: Best fit parameters for inlet #7, circular open cover. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0
a1	1.47E+01	6.58E-01	1.55E+01	8.18E-01	1.07E+02	4.88E-01
b1	-3.37E-01	-1.08E-02	9.22E-03	-1.05E-02	-2.74E+00	-4.24E-03
c1	2.22E-03		-2.52E-03		1.83E-02	
a2	-7.45E-01	-1.99E+00	-1.73E+00	-2.10E+00	-5.54E+00	-5.09E+00
b2	5.15E-01	6.30E-01	5.63E-01	5.53E-01	9.63E-01	8.93E-01
c2	-7.64E-03	-5.92E-03	-1.66E-03	-4.81E-05	-1.16E-02	-1.05E-02
depth (m)						
intercept	0.038	0.043	0.034	0.032	0.019	0.021
min	0.016	0.017	0.014	0.014	0.012	0.010
max	0.124	0.116	0.104	0.091	0.084	0.081

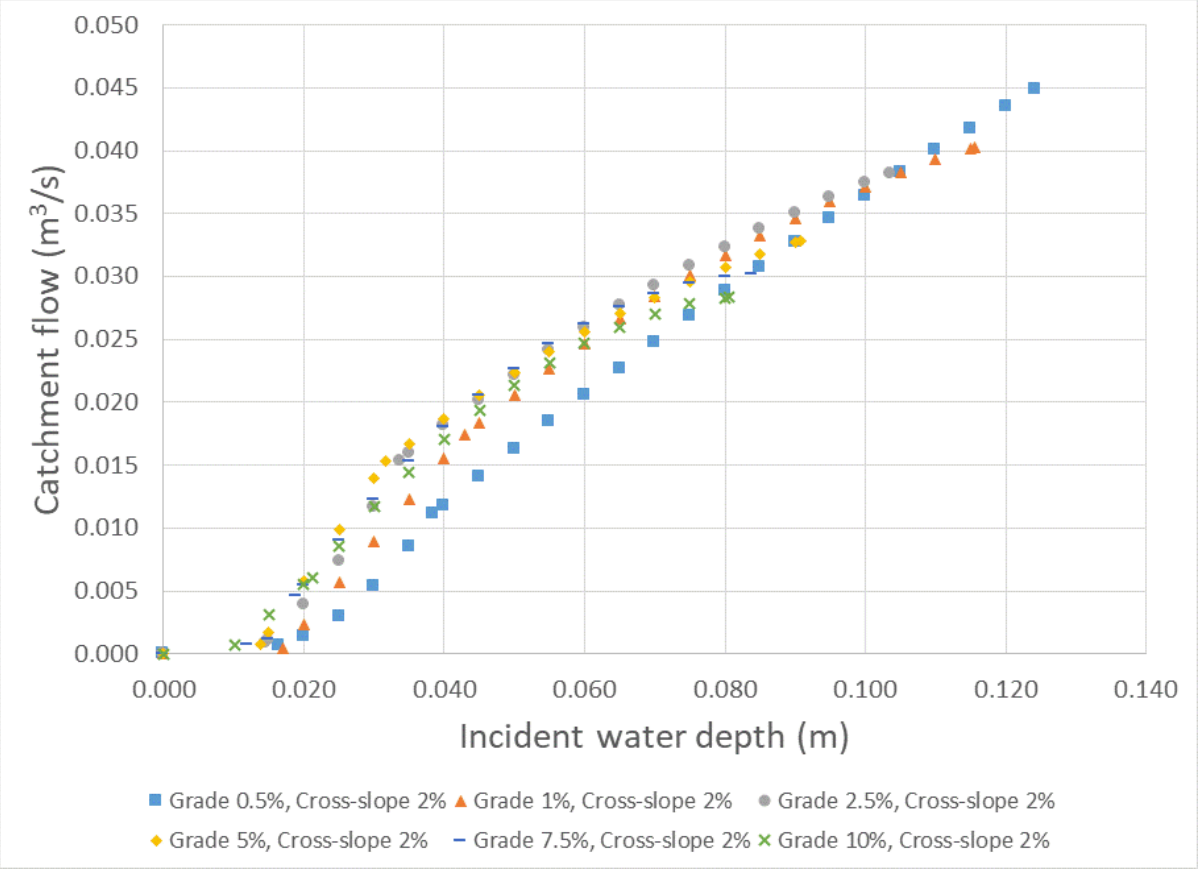

Figure 34. Best fit curves of inlet flow 2.0% cross-slope, circular open cover (#6) – OPSD 401.010

The calculated best fit catchment flow values illustrated in Figure 34 were included in Appendix B (Table B.7).

5.8. Catch Basin Inlet #8 – Circular Closed Cover (Type A)

The best fit function parameters corresponding to the circular closed cover (#8) can be found in Table 11. The best fit parameters for inlet #8 at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 35. The calculated best fit catchment flow values illustrated in Figure 35 were included in Appendix B (Table B.8).

Table 11: Best fit parameters for inlet #8, circular closed cover. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	2.0	2.0
Grade (%)	0.5	2.5
a1	6.22E-02	-3.29E-01
b1	-6.66E-04	4.19E-02
c1		-1.89E-04
a2	1.49E-02	9.07E-03
b2	5.62E-04	5.06E-04
c2		
depth (m)		
intercept	0.026	0.069
min	0.019	0.015
max	0.123	0.103

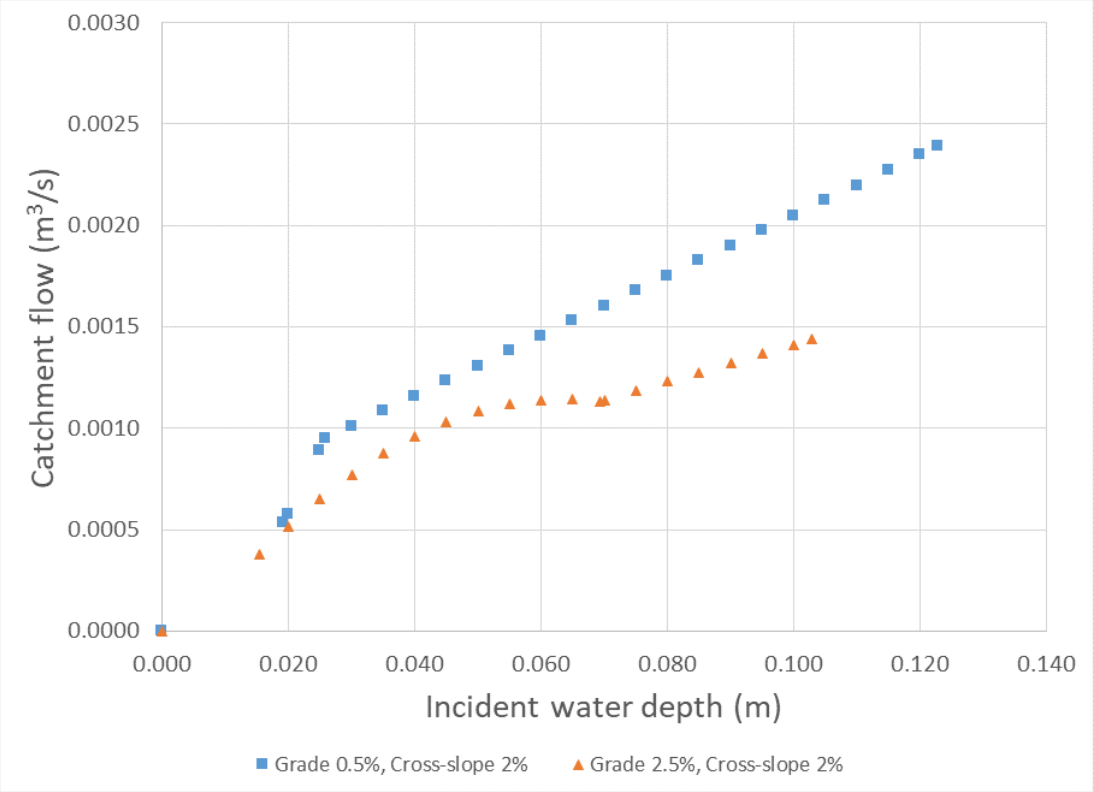

Figure 35. Best fit curves of inlet flow 2.0% cross-slope, circular closed cover (#8) – OPSD 401.010

5.9. Catch Basin Inlet #9 – S19 "FISH" Round Catch Basin Cover

The best fit function parameters corresponding to the "FISH" round catch basin cover (S19) can be found in Table 12. The intercept value for a cross-slope of 4.0% and a 0.5% grade is underlined and italicized. This indicates that the original two best fit functions resulted in no intercept and the intercept of the curves had to be forced when solving the weighted least squares equation.

Table 12: Best fit parameters for the S19 inlet, "FISH" round catch basin cover. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
a1	9.96E-01	2.77E+01	4.22E+01	8.08E+01	6.88E-01	1.82E+01	1.90E+01	6.68E+01	6.49E+01
b1	-1.11E-02	-8.10E-01	-1.03E+00	-2.29E+00	-7.47E-03	-6.52E-01	-4.26E-01	-2.61E+00	-2.21E+00
c1		6.02E-03	6.53E-03	1.66E-02		6.90E-03	2.11E-03	2.64E-02	2.01E-02
a2	3.42E-01	6.77E-01	-1.57E+00	-3.27E+00	-5.86E+00	-2.03E+00	-2.76E+00	5.76E-01	6.40E-01
b2	7.40E-02	-1.01E-02	8.46E-01	1.03E+00	1.32E+00	9.88E-01	1.08E+00	-2.00E-03	-4.16E-03
c2			-6.79E-03	-1.04E-02	-1.70E-02	-2.64E-02	-2.17E-02		
depth (m)									
intercept	0.077	0.039	0.034	0.028	0.018	*0.041*	0.035	0.036	0.032
min	0.015	0.016	0.010	0.014	0.013	0.023	0.010	0.021	0.018
max	0.119	0.124	0.114	0.101	0.086	0.162	0.114	0.129	0.113

The best fit parameters for the S19 inlet ponding test at a road grade of 0.5% and a cross-slope of 0.0% were used to produce the best fit curve which is illustrated in Figure 36.

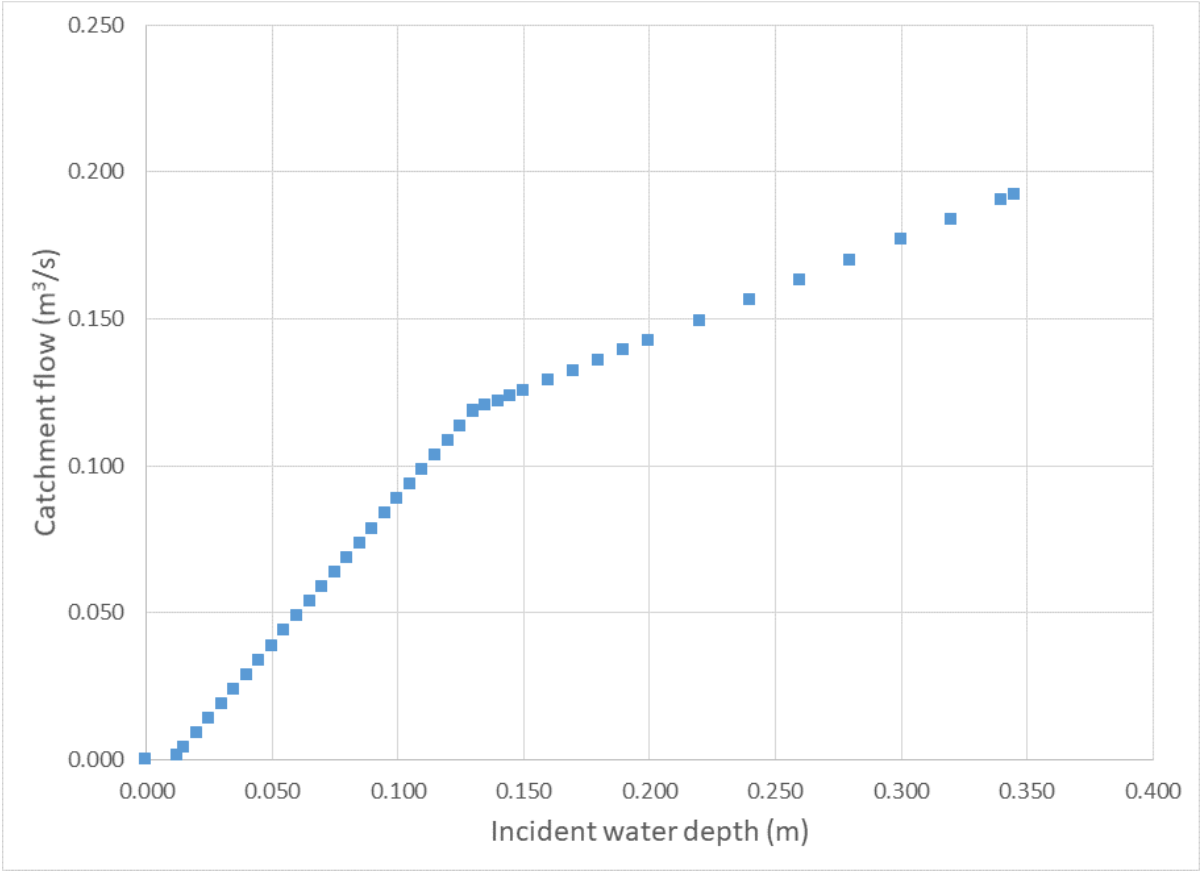

Figure 36. Best fit curve of inlet flow during ponding, “FISH” round catch basin cover (#9) – DWG. No. S19

The best fit parameters for the S19 inlet at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 37.

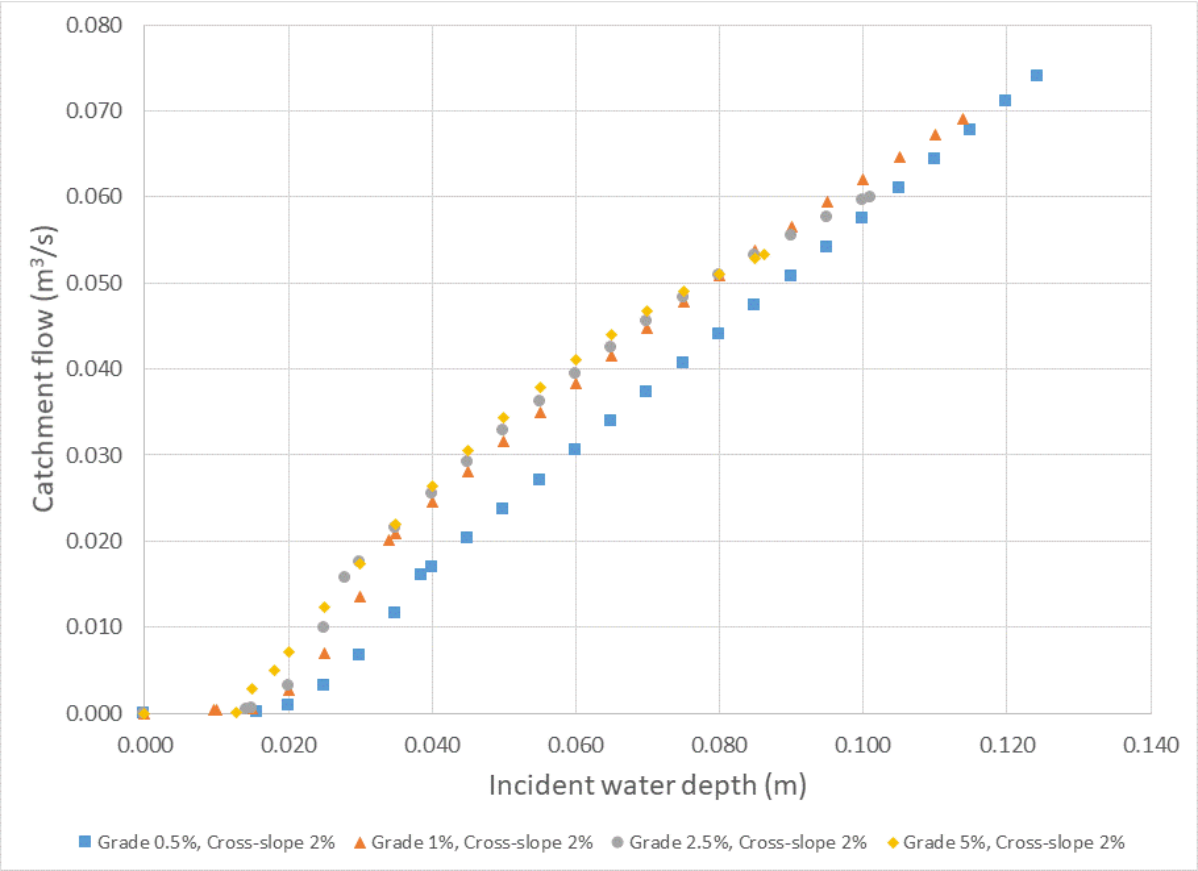

Figure 37. Best fit curves of inlet flow 2.0% cross-slope, “FISH” round catch basin cover (#9) – DWG. No. S19

The best fit parameters for the S19 inlet at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 38. The calculated best fit catchment flow values illustrated in Figure 36, Figure 37 and Figure 38 were included in Appendix B (Table B.9).

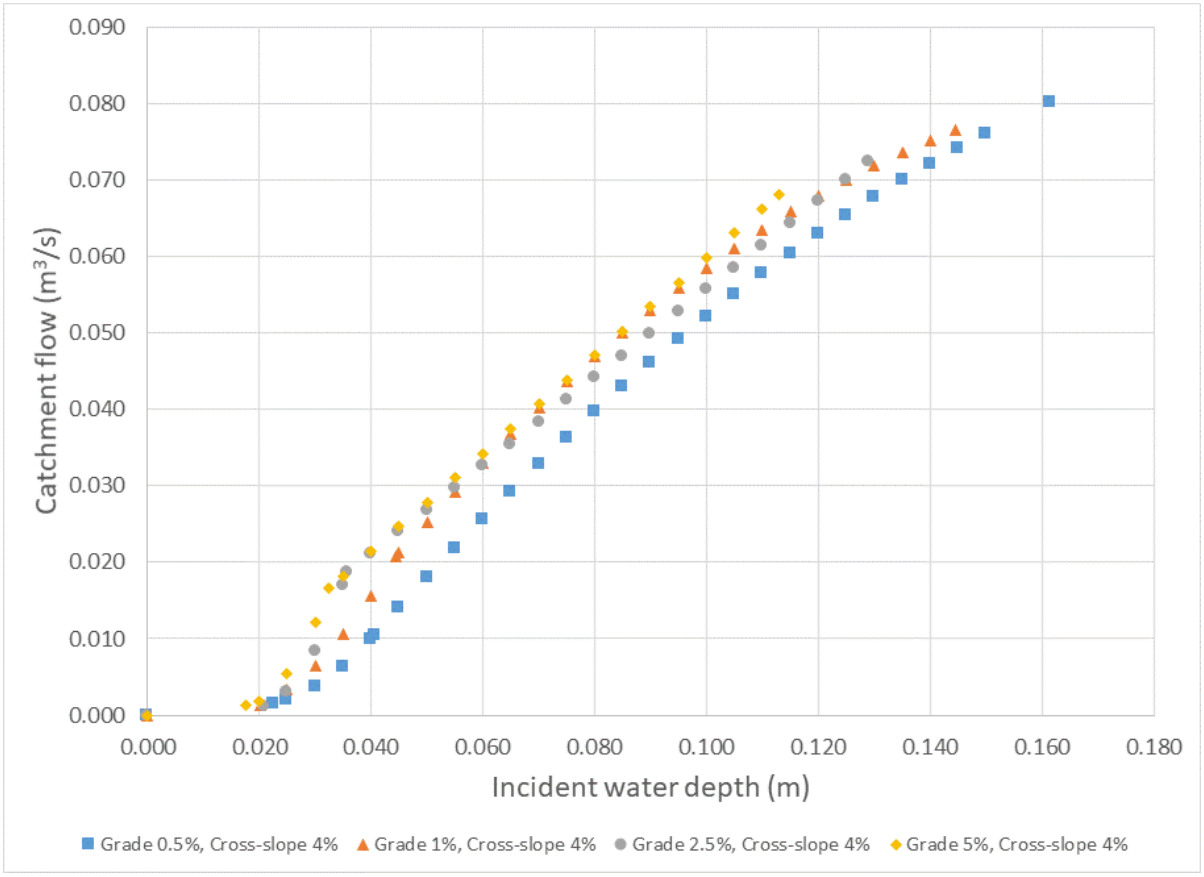

Figure 38. Best fit curves of inlet flow 4.0% cross-slope, “FISH” round catch basin cover (#9) – DWG. No. S19

5.10. Catch Basin Inlet #10 – S22 Single Curb Inlet Frame

The best fit function parameters corresponding to the single curb inlet frame (S22) can be found in Table 13. For a grade of 5.0% and a cross-slope of 2.0% the intercept values is underlined and italicized indicating that the original best fit curves resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The two instances where the max values are underlined and bold indicate that there was an asymptote in the experimental data corresponding approximately to the height of the curb as discussed in Poirier and Provan (2023). A similar asymptote may also be observed in the field but it is difficult to assess if it would have the same shape with the limited data available. For this reason the curves presented in this guidance document exclude the asymptote.

Table 13: Best fit parameters for the S22 single curb inlet frame. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
a1	7.80E-01	2.38E-01	5.49E-01	1.56E+00	2.47E+00	2.73E-01	1.78E-01	4.40E+00	2.27E+00
b1	5.35E-01	-3.07E-03	1.48E-01	7.84E-02	-3.30E-02	-3.94E-03	-2.25E-03	-1.23E-02	1.06E-02
c1	-4.45E-03		-1.98E-03	-6.81E-04	7.07E-04			-2.58E-04	-1.49E-04
a2	9.26E-02	6.60E-01		1.93E-01	2.09E-01		2.63E-01	2.48E-01	2.68E-01
b2	1.38E-01	1.06E-01		-1.86E-04	-2.88E-03		-5.15E-03	-3.63E-03	-7.28E-03
c2		2.45E-03							
depth (m)									
intercept	0.229	0.060		0.078	*0.018*		0.034	0.040	0.049
min	0.012	0.017	0.017	0.013	0.007	0.019	0.018	0.018	0.018
max	0.348	**0.171**	0.168	0.126	0.116	**0.187**	0.175	0.137	0.128

The best fit parameters for the S22 single curb inlet frame ponding test at a road grade of 0.5% and a cross-slope of 0.0% were used to produce the best fit curve which is illustrated in Figure 39.

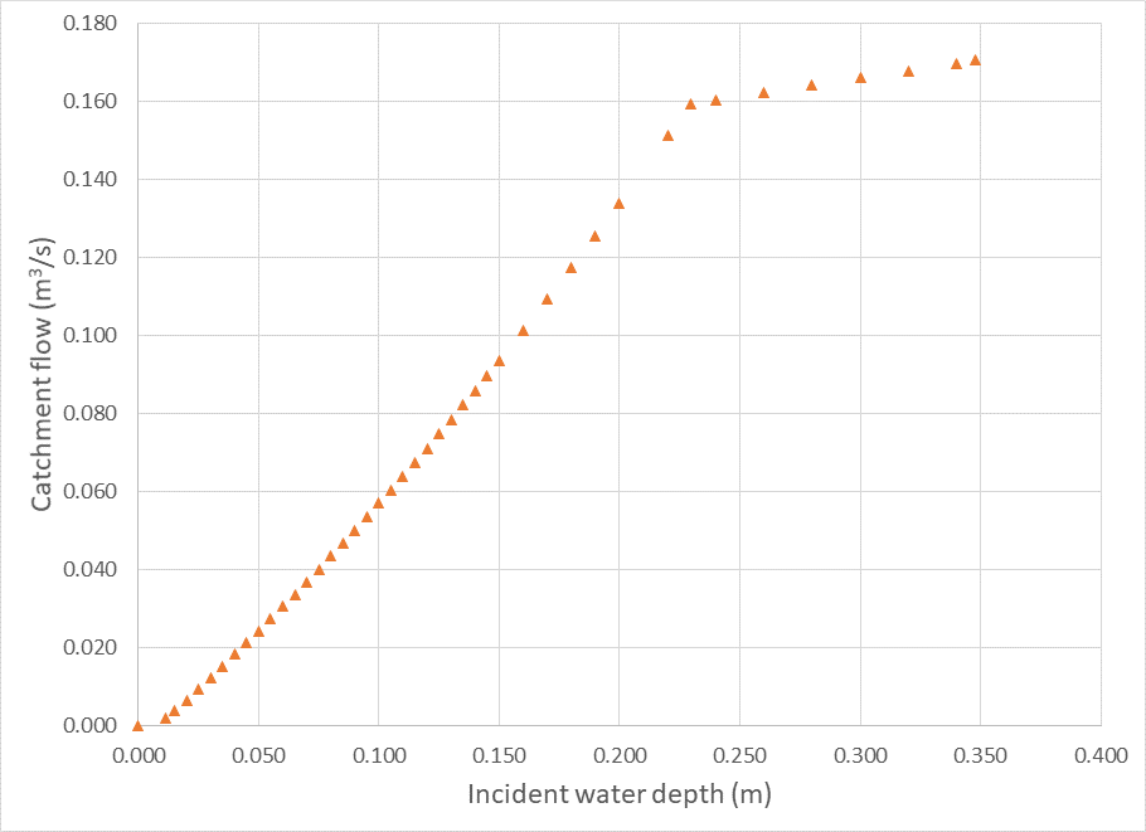

Figure 39. Best fit curve of inlet flow during ponding, single curb inlet frame (#10) – DWG. No. S22

The best fit parameters for the S22 single curb inlet frame at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 40.

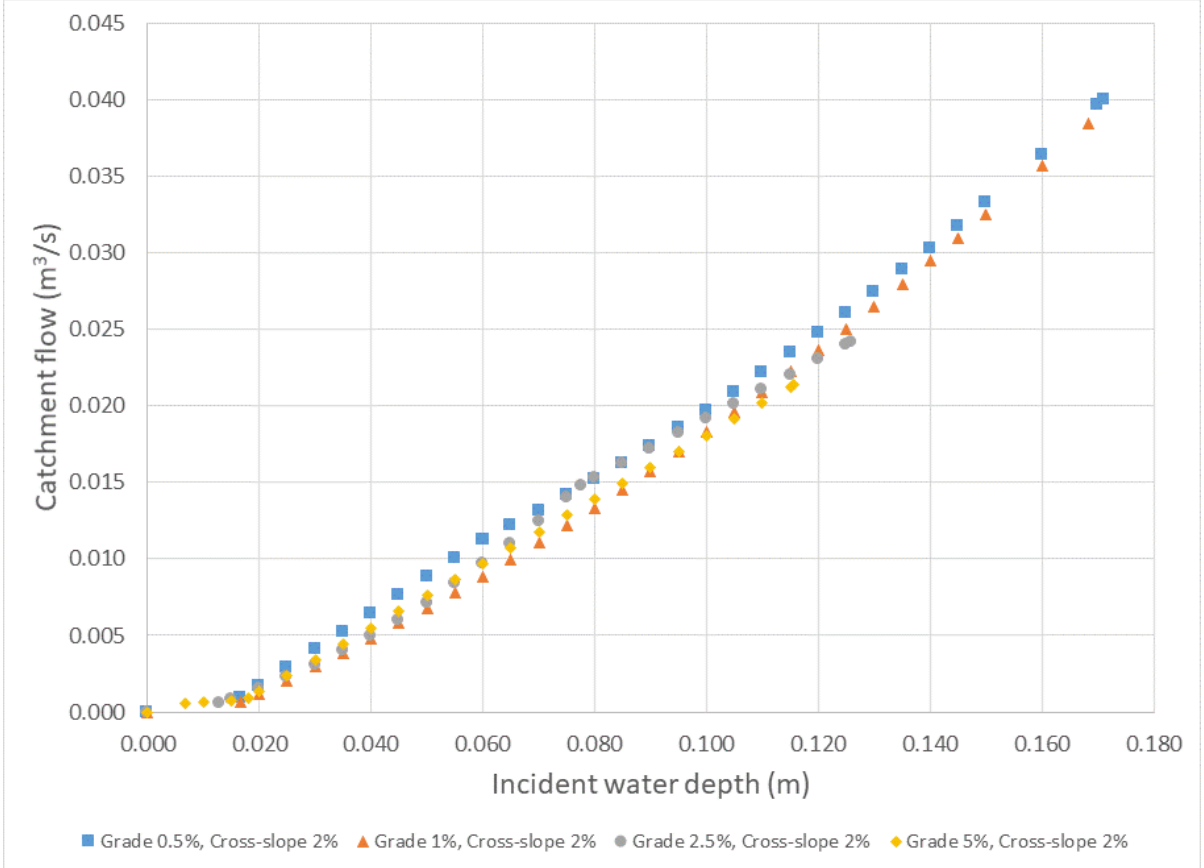

Figure 40. Best fit curves of inlet flow 2.0% cross-slope, single curb inlet frame (#10) – DWG. No. S22

The best fit parameters for S22 single curb inlet frame at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 41. The calculated best fit catchment flow values illustrated in Figure 39, Figure 40 and Figure 41 were included in Appendix B (Table B.10).

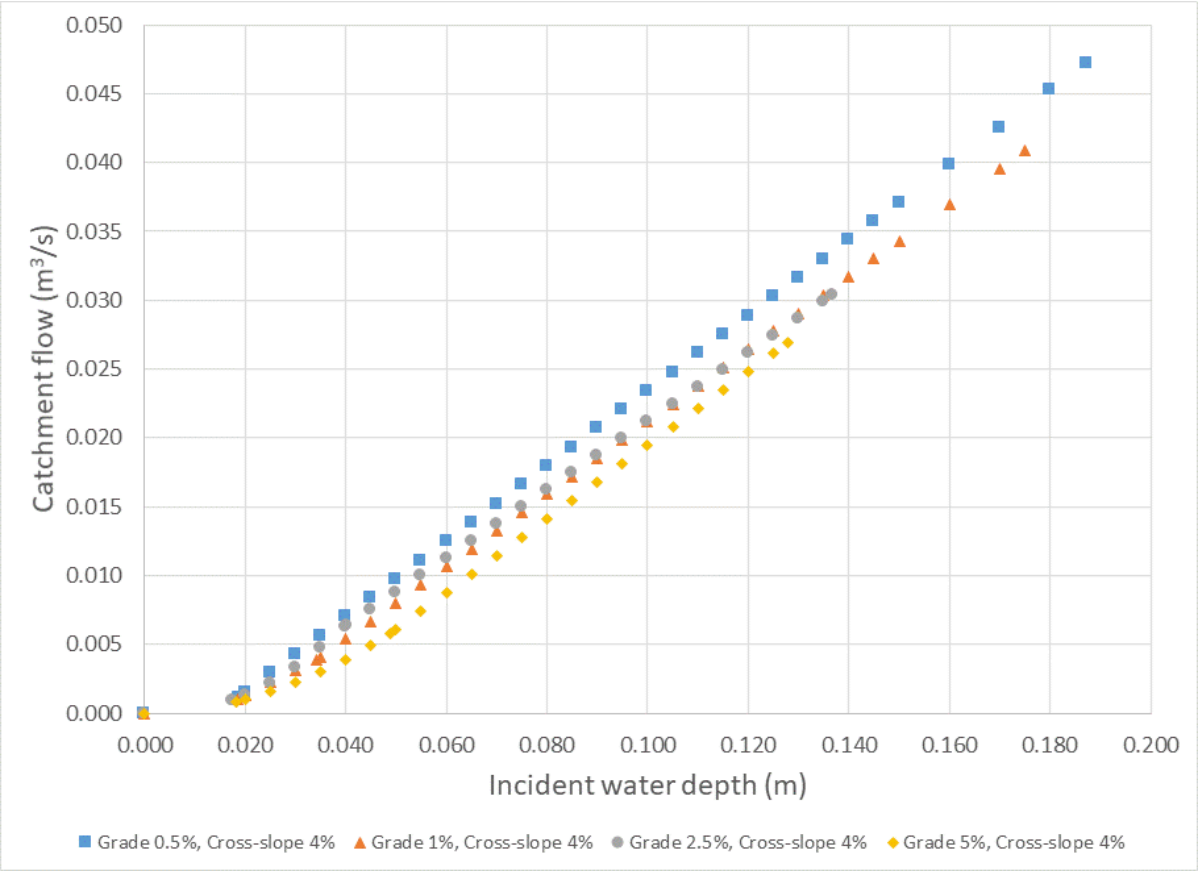

Figure 41. Best fit curves of inlet flow 4.0% cross-slope, single curb inlet frame (#10) – DWG. No. S22

5.11.Catch Basin Inlet #11 – S22(x2) Double Curb Inlet Frame

The best fit function parameters corresponding to the S22(x2) double curb inlet frame can be found in Table 14. The best fit parameters for the S22(x2) double curb inlet frame ponding test at a road grade of 0.5% and a cross-slope of 0.0% were used to produce the best fit curve which is illustrated in Figure 42.

Table 14: Best fit parameters for the S22(x2) double curb inlet frame. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
a1	7.80E-01	2.38E-01	5.49E-01	1.56E+00	2.47E+00	2.73E-01	1.78E-01	4.40E+00	2.27E+00
b1	5.35E-01	-3.07E-03	1.48E-01	7.84E-02	-3.30E-02	-3.94E-03	-2.25E-03	-1.23E-02	1.06E-02
c1	-4.45E-03		-1.98E-03	-6.81E-04	7.07E-04			-2.58E-04	-1.49E-04
a2	9.26E-02	6.60E-01		1.93E-01	2.09E-01		2.63E-01	2.48E-01	2.68E-01
b2	1.38E-01	1.06E-01		-1.86E-04	-2.88E-03		-5.15E-03	-3.63E-03	-7.28E-03
c2		2.45E-03							
depth (m)									
intercept	0.229	0.060		0.078	*0.018*		0.034	0.040	0.049
min	0.012	0.017	0.017	0.013	0.007	0.019	0.018	0.018	0.018
max	0.348	**0.171**	0.168	0.126	0.116	**0.187**	0.175	0.137	0.128

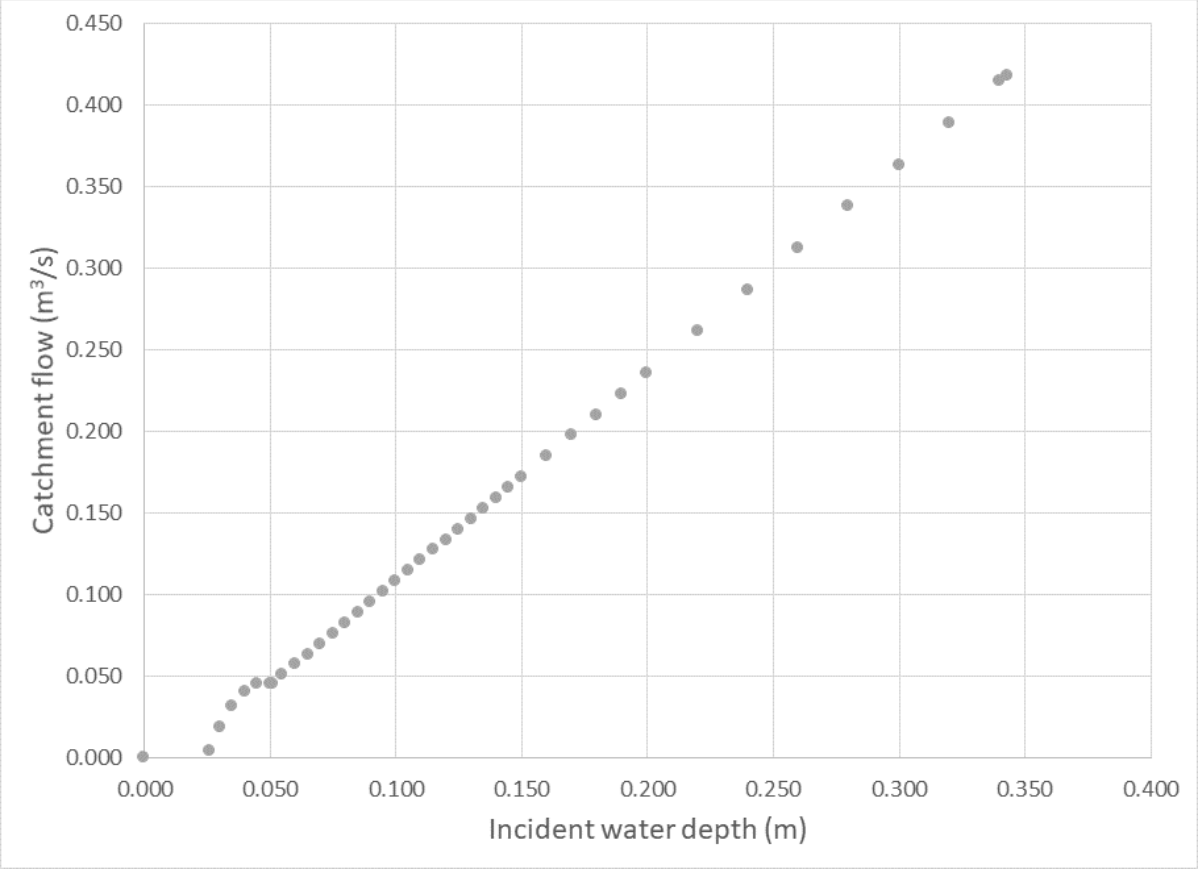

Figure 42. Best fit curve of inlet flow during ponding, double curb inlet frame (#11) – DWG. No. S22

The best fit parameters for S22(x2) double curb inlet frame at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 43.

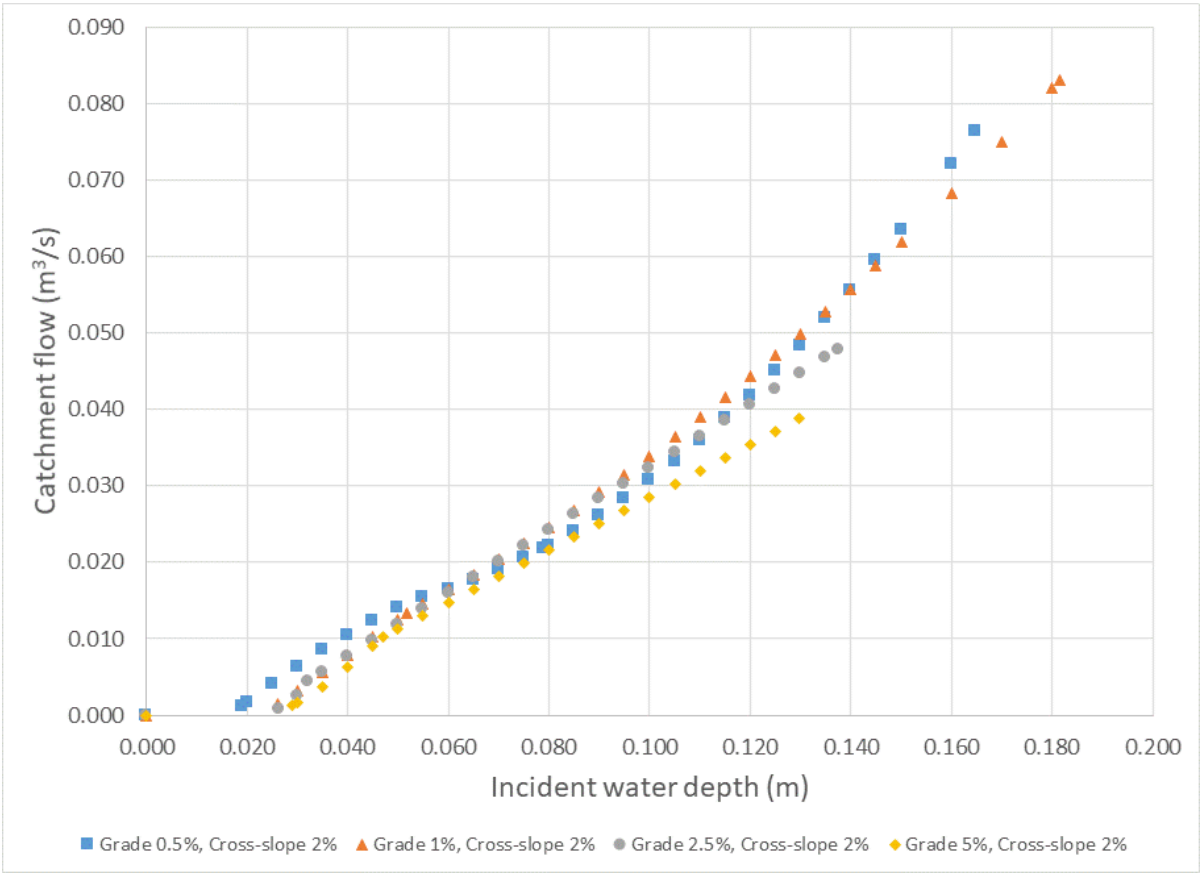

Figure 43. Best fit curves of inlet flow 2.0% cross-slope, double curb inlet frame (#11) – DWG. No. S22

The best fit parameters for the S22(x2) double curb inlet frame at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 44. The calculated best fit catchment flow values illustrated in Figure 42, Figure 43 and Figure 44 were included in Appendix B (Table B.11).

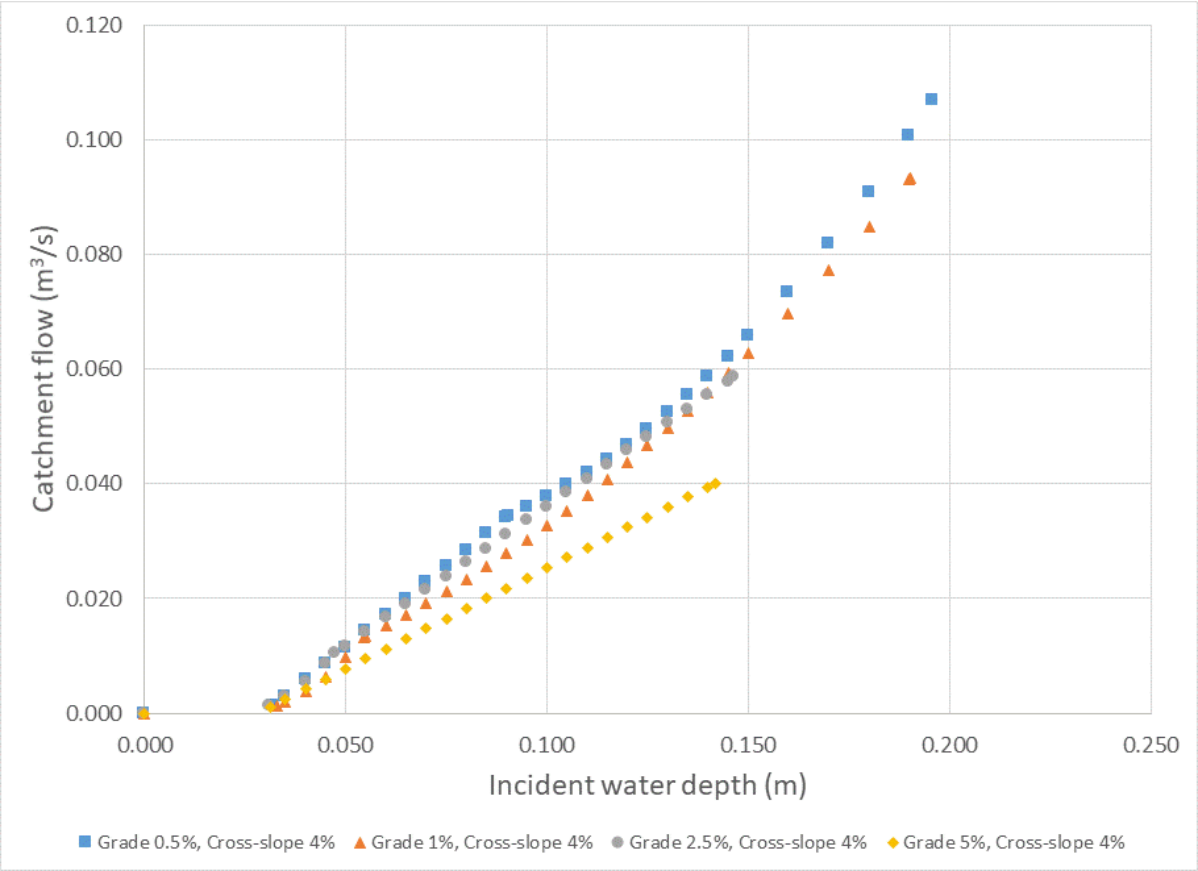

Figure 44. Best fit curves of inlet flow 4.0% cross-slope, double curb inlet frame (#11) – DWG. No. S22

5.12. Catch Basin Inlet #12 – S28 Single Curb Inlet Frame for CBMH

The best fit function parameters corresponding to the S28 single curb inlet frame for CBMH can be found in Table 15. For a grade of 5.0% and a cross-slope of 2.0% the intercept values is underlined and italicized indicating that the original best fit curves resulted in no intercept and the intercept of the incident water depth values had to be forced when solving the weighted least squares equation. The best fit parameters for the S28 single curb inlet frame for CBMH ponding test at a road grade of 0.5% and a cross-slope of 0.0% were used to produce the best fit curve which is illustrated in Figure 45.

Table 15: Best fit parameters for S28 single curb inlet frame for CBMH. Minimum and maximum measured incident water depths are included along with the water depths where the two functions intercept.

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
a1	2.13E-01	-1.21E+00	7.06E-01	3.49E+00	8.14E+00	3.62E-01	3.36E-01	3.05E-01	2.78E-01
b1	6.16E-01	3.57E-01	1.63E-01	1.28E-01	4.98E-02	-5.85E-03	-5.24E-03	-4.14E-03	-4.08E-03
c1	-3.73E-03	-3.54E-03	-1.19E-03	-1.81E-03	-1.81E-03				
a2	2.24E-01	2.63E-01		-9.04E-01	2.82E-01	2.09E+00	1.03E+00		3.35E-01
b2	1.37E-01	-3.69E-03		4.10E-01	-7.38E-04	-2.08E-01	1.05E-01		-6.23E-03
c2				-6.32E-03		2.42E-02	2.06E-03		
depth (m)									
intercept	0.308	0.079		*0.032*	0.033	0.071	0.038		0.038
min	0.012	0.016	0.015	0.014	0.014	0.020	0.019	0.017	0.018
max	0.352	0.195	0.167	0.127	0.112	0.183	0.176	0.133	0.124

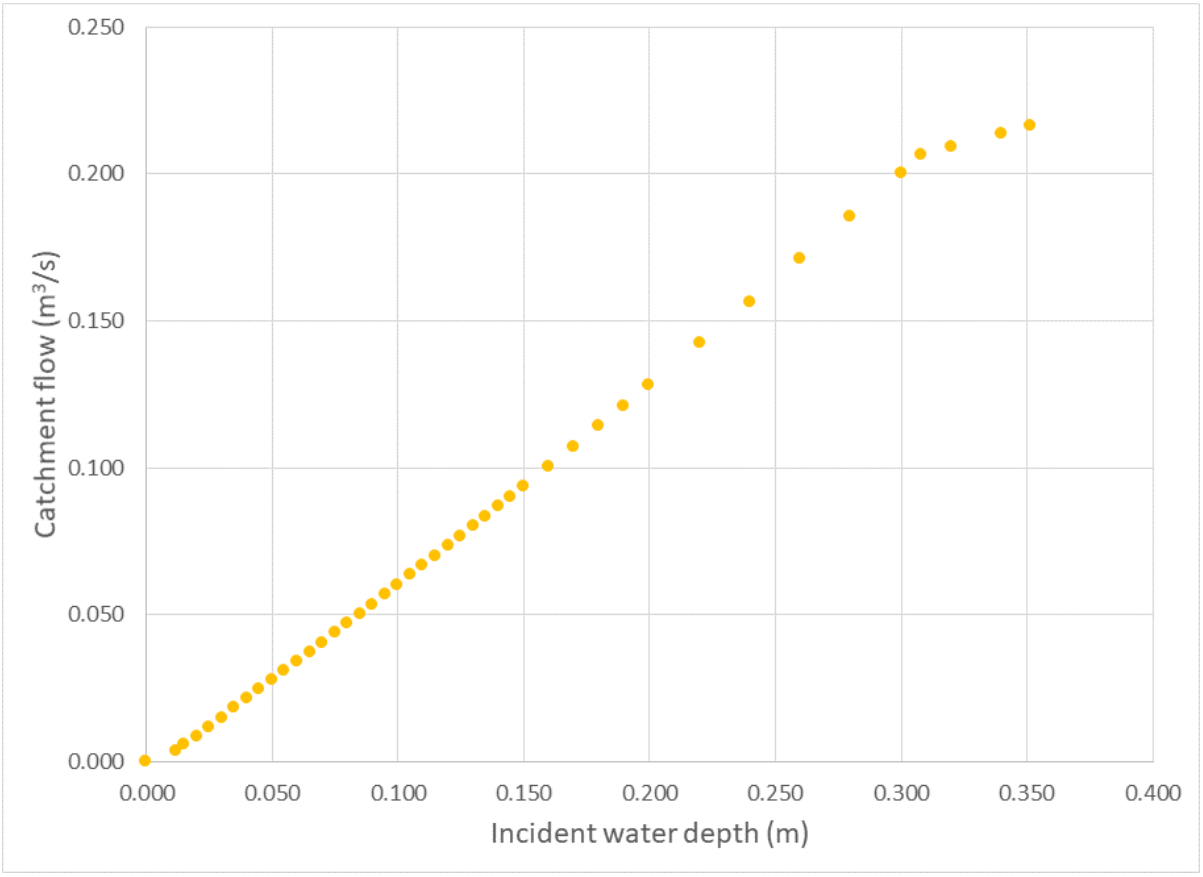

Figure 45. Best fit curve of inlet flow during ponding, single curb inlet frame for CBMH (#12) – DWG. No. S28

The best fit parameters for the S28 single curb inlet frame for CBMH at a cross-slope of 2.0% were used to produce the best fit curves illustrated in Figure 46.

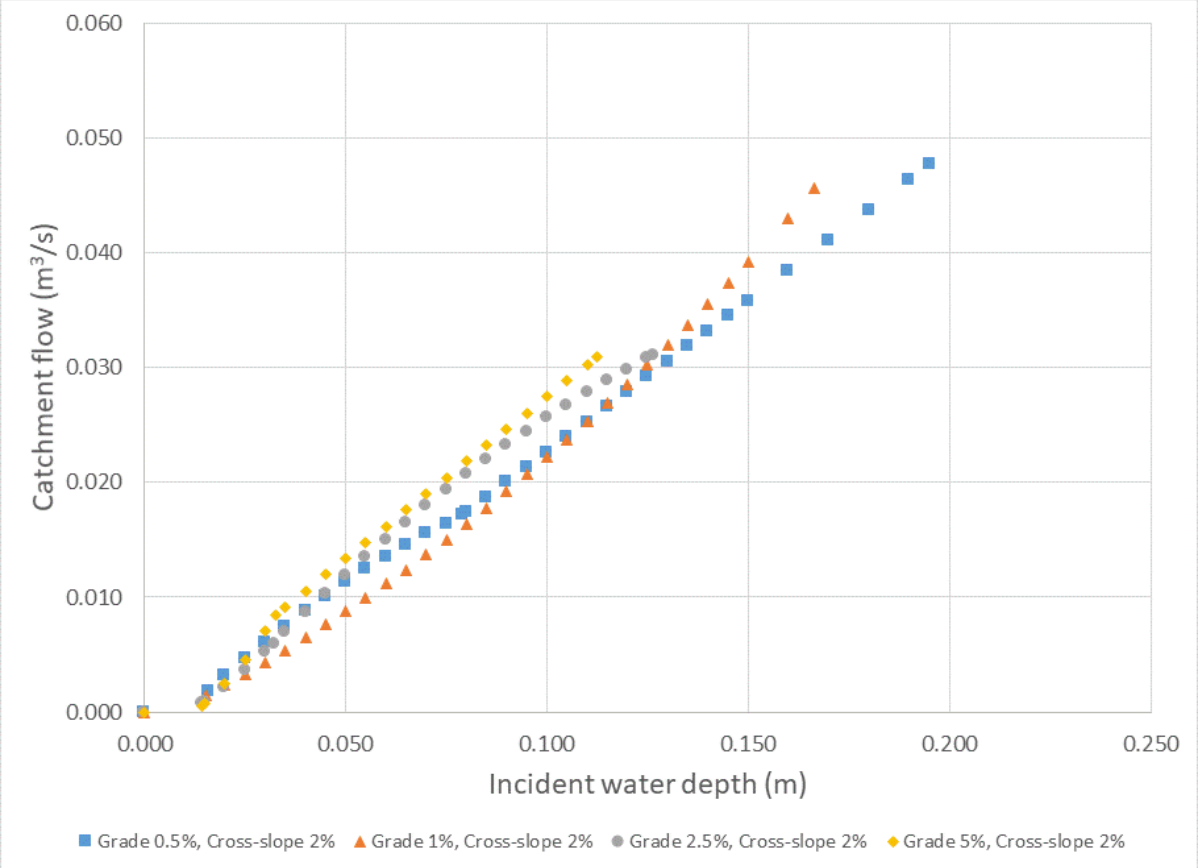

Figure 46. Best fit curves of inlet flow 2.0% cross-slope, single curb inlet frame for CBMH (#12) – DWG. No. S28

The best fit parameters for the S28 single curb inlet frame for CBMH at a cross-slope of 4.0% were used to produce the best fit curves illustrated in Figure 47. The calculated best fit catchment flow values illustrated in Figure 45, Figure 46 and Figure 47 were included in Appendix B (Table B.12).

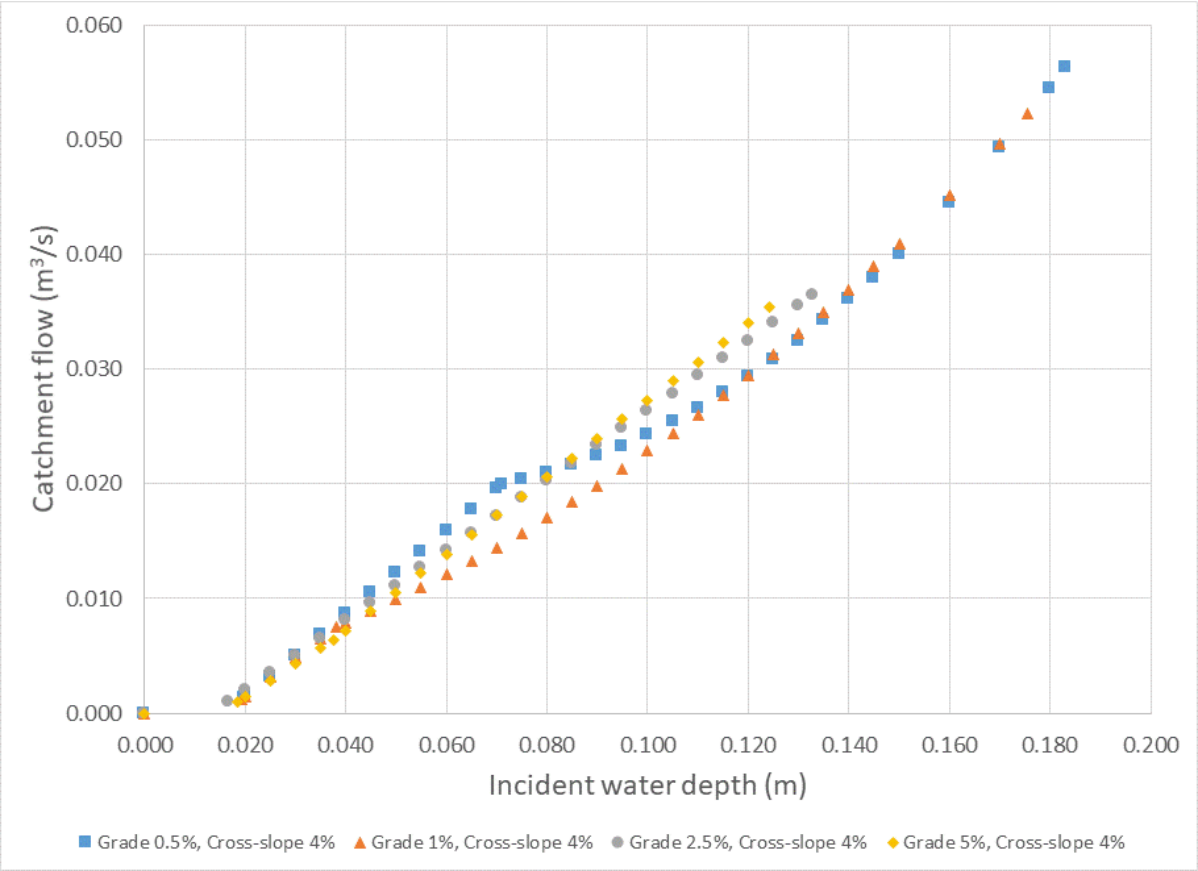

Figure 47. Best fit curves of inlet flow 4.0% cross-slope, single curb inlet frame for CBMH (#12) – DWG. No. S28

6. Summary and Recommendations

A series of 1659 tests was completed at the National Research Council of Canada's Ocean, Coastal and River Engineering Research Centre's Coastal Wave Basin of a full scale model roadway to study the conveyance of catch basin inlets. A total of twelve catch basin inlet configurations were examined at six road grades ranging from 0.5 - 10.0% and cross-slopes of 0.0, 2.0 and 4.0% and for each setup at least 13 water flows from 0.001 – 0.41 m^3/s were sent onto the model roadway. Inflows through the catch basin inlets as high as 0.41 m^3/s were measured through the double curb inlet (S22x2) during the ponding tests with the end of the roadway blocked and as low as 0.0001 m^3/s were measured on the 'FISH' type round catch basin cover (S19) at a grade of 0.5% and a cross-slope of 2.0%.

The main outputs from this work are Table 4 - Table 15 of best fit function parameters, Table A.1 - Table A.22 of experimental measurements with uncertainties and Table B.1 - Table B.12 of best fit data

tables which allow the reader to relate the incident water depth to the conveyance through of the twelve catch basin inlets.

The series of experiments performed here provides a tool for municipal engineers to better understand the conveyance capacity of different commonly used catch basin inlets under various roadway configurations.

7. Acknowledgements

The authors would like to acknowledge the financial support for this work from the City of Ottawa, the City of Toronto and Infrastructure Canada. Yehuda Kleiner from the NRC was instrumental in coordinating support from Infrastructure Canada to the benefit of other municipalities. Both municipal partners were active participants in ensuring that our work met the needs of Canadian Municipalities, who are the target audience for the work, by providing both their direct input and contacts from other municipalities to add their own input.

The authors would like to acknowledge the support from the team at the NRC-OCRE in Ottawa without whom the project would not be possible. We would also like to acknowledge the support, mentorship and help of Dr. Andrew Cornett to initiate the project.

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A. Appendix – Measured catch basin inflow data tables

This appendix includes all of the measured incident water depths and catchment, or catch basin inflow data tables along with the measurement uncertainties. The data from these tables are obtained from Poirier and Provan (2021, 2023); further details can be found in those reports. The incident water depths reported here are obtained from the RD6 capacitance wire probe except where the water depth is too low to obtain a reliable measurement. In those cases the RD6 measurements are used with data from other probes to provide upper and lower bounds on the measurement.

Table A.1: Measurements for catch basin inlet #1 (OPSD 400.070) - single round herringbone with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.018	0.0008	0.001	5.3E-06	0.016	0.0008	0.001	5.2E-06	0.017	0.0009	0.001	5.8E-06	0.0131	0.0009	0.0017	5.6E-06	0.013	0.0009	0.002	5.6E-06	0.009	0.0007	0.001	4.4E-06
	0.023	0.0018	0.001	1.1E-05	0.021	0.0021	0.001	1.3E-05	0.020	0.0021	0.001	1.3E-05	0.017	0.0025	0.001	1.6E-05	0.017	0.0025	0.001	1.6E-05	0.017	0.0024	0.001	1.5E-05
	0.027	0.0038	0.001	2.4E-05	0.024	0.0037	0.001	2.3E-05	0.023	0.0050	0.001	3.1E-05	0.019	0.0057	0.001	3.6E-05	0.019	0.0057	0.001	3.6E-05	0.019	0.0048	0.001	3.0E-05
	0.039	0.012	0.001	0.003	0.032	0.012	0.001	0.003	0.028	0.012	0.001	0.003	0.026	0.014	0.001	0.003	0.026	0.014	0.001	0.003	0.026	0.012	0.001	0.003
	0.049	0.017	0.001	0.004	0.037	0.019	0.001	0.004	0.034	0.019	0.001	0.004	0.032	0.018	0.001	0.004	0.032	0.018	0.001	0.004	0.032	0.018	0.002	0.004
	0.063	0.027	0.002	0.005	0.049	0.028	0.001	0.005	0.048	0.031	0.002	0.005	0.042	0.028	0.002	0.004	0.042	0.028	0.002	0.004	0.038	0.025	0.002	0.004
	0.073	0.034	0.004	0.005	0.061	0.036	0.003	0.005	0.058	0.038	0.003	0.005	0.050	0.033	0.003	0.005	0.050	0.033	0.003	0.005	0.045	0.029	0.004	0.004
	0.079	0.043	0.005	0.006	0.069	0.042	0.004	0.006	0.064	0.044	0.004	0.006	0.051	0.034	0.003	0.005	0.051	0.034	0.003	0.005	0.050	0.032	0.004	0.005
	0.082	0.047	0.006	0.006	0.074	0.046	0.005	0.006	0.068	0.047	0.005	0.006	0.055	0.037	0.004	0.005	0.055	0.037	0.004	0.005	0.053	0.034	0.005	0.005
	0.092	0.056	0.008	0.007	0.086	0.054	0.007	0.007	0.076	0.053	0.006	0.007	0.059	0.040	0.004	0.005	0.059	0.040	0.004	0.005	0.061	0.037	0.005	0.005
	0.102	0.064	0.008	0.008	0.096	0.060	0.008	0.007	0.086	0.059	0.006	0.007	0.068	0.045	0.006	0.006	0.068	0.045	0.006	0.006	0.067	0.040	0.006	0.005
	0.116	0.074	0.010	0.009	0.109	0.069	0.009	0.008	0.095	0.065	0.007	0.008	0.076	0.049	0.006	0.006	0.076	0.049	0.006	0.006	0.075	0.043	0.006	0.006
	0.123	0.080	0.011	0.010	0.116	0.075	0.010	0.009	0.103	0.069	0.008	0.008	0.084	0.056	0.007	0.007	0.084	0.056	0.007	0.007	0.079	0.045	0.007	0.006
													0.091	0.059	0.008	0.007	0.091	0.059	0.008	0.007				

Table A.2: Measurements for catch basin inlet #1 (OPSD 400.070) - single round herringbone with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.022	0.0009	0.001	5.3E-06	0.018	0.0009	0.001	5.5E-06	0.016	0.0008	0.001	4.9E-06	0.016	0.0008	0.001	4.9E-06	0.015	0.0008	0.001	5.2E-06	0.015	0.0008	0.002	4.7E-06
	0.029	0.0023	0.001	1.4E-05	0.023	0.0022	0.001	1.4E-05	0.020	0.0021	0.001	1.3E-05	0.019	0.0017	0.001	1.0E-05	0.019	0.0022	0.001	1.4E-05	0.019	0.0021	0.001	1.3E-05
	0.034	0.0045	0.001	2.8E-05	0.027	0.0043	0.001	2.7E-05	0.027	0.0048	0.001	3.0E-05	0.025	0.0045	0.001	2.8E-05	0.021	0.0043	0.001	2.7E-05	0.024	0.0044	0.001	2.7E-05
	0.050	0.013	0.002	0.003	0.041	0.014	0.001	0.003	0.036	0.014	0.001	0.003	0.032	0.013	0.001	0.003	0.033	0.012	0.001	0.003	0.033	0.011	0.001	0.003
	0.064	0.021	0.002	0.004	0.050	0.022	0.001	0.004	0.042	0.022	0.001	0.004	0.042	0.020	0.002	0.004	0.042	0.020	0.002	0.004	0.041	0.018	0.002	0.004
	0.078	0.033	0.003	0.005	0.063	0.034	0.002	0.005	0.055	0.032	0.002	0.005	0.062	0.032	0.002	0.005	0.058	0.030	0.002	0.005	0.055	0.028	0.003	0.004
	0.096	0.042	0.004	0.006	0.078	0.042	0.003	0.006	0.078	0.042	0.002	0.006	0.078	0.041	0.003	0.005	0.069	0.038	0.004	0.005	0.065	0.033	0.004	0.005
	0.103	0.049	0.005	0.007	0.091	0.047	0.004	0.006	0.090	0.050	0.004	0.006	0.084	0.049	0.004	0.006	0.075	0.043	0.004	0.006	0.070	0.038	0.004	0.005
	0.108	0.053	0.006	0.008	0.100	0.052	0.005	0.007	0.096	0.056	0.005	0.007	0.088	0.052	0.005	0.006	0.079	0.046	0.005	0.006	0.074	0.041	0.005	0.005
	0.120	0.061	0.007	0.009	0.114	0.061	0.007	0.008	0.105	0.064	0.006	0.008	0.096	0.058	0.006	0.007	0.088	0.051	0.006	0.006	0.083	0.046	0.006	0.006
	0.130	0.069	0.008	0.010	0.125	0.067	0.007	0.009	0.113	0.069	0.007	0.009	0.104	0.062	0.007	0.008	0.097	0.055	0.007	0.007	0.092	0.049	0.006	0.006
	0.145	0.077	0.008	0.011	0.135	0.075	0.008	0.010	0.123	0.075	0.007	0.009	0.113	0.067	0.007	0.008	0.105	0.059	0.007	0.007	0.100	0.053	0.007	0.006
	0.152	0.082	0.009	0.012	0.144	0.079	0.009	0.010	0.129	0.078	0.008	0.010	0.119	0.070	0.008	0.008	0.112	0.063	0.008	0.008	0.105	0.055	0.007	0.007

Table A.3: Measurements for catch basin inlet #2 (OPSD 400.070) - double round herringbone with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.017	0.0008	0.002	5.1E-06	0.015	0.0009	0.001	5.9E-06	0.012	0.0009	0.003	5.9E-06	0.011	0.0008	0.001	4.9E-06	0.011	0.0008	0.001	5.3E-06	0.010	0.0008	0.001	4.9E-06
	0.024	0.0023	0.001	1.4E-05	0.018	0.0023	0.001	1.4E-05	0.017	0.0025	0.001	1.5E-05	0.018	0.0025	0.001	1.6E-05	0.017	0.0025	0.001	1.6E-05	0.017	0.0026	0.002	1.6E-05
	0.028	0.0052	0.001	3.2E-05	0.021	0.0047	0.001	2.9E-05	0.020	0.0047	0.001	2.9E-05	0.020	0.0049	0.001	3.0E-05	0.020	0.0050	0.001	3.1E-05	0.020	0.0051	0.001	3.2E-05
	0.039	0.011	0.001	0.003	0.031	0.012	0.001	0.003	0.028	0.011	0.001	0.003	0.027	0.013	0.001	0.003	0.025	0.011	0.001	0.003	0.025	0.013	0.001	0.003
	0.050	0.019	0.001	0.004	0.035	0.020	0.001	0.004	0.035	0.018	0.001	0.004	0.033	0.021	0.001	0.004	0.032	0.019	0.002	0.004	0.031	0.021	0.002	0.004
	0.063	0.031	0.002	0.005	0.046	0.032	0.001	0.005	0.046	0.032	0.001	0.005	0.042	0.035	0.002	0.005	0.032	0.021	0.002	0.004	0.038	0.033	0.003	0.005
	0.074	0.043	0.004	0.006	0.058	0.044	0.003	0.006	0.055	0.046	0.003	0.006	0.049	0.048	0.003	0.006	0.039	0.032	0.003	0.005	0.043	0.044	0.004	0.006
	0.081	0.055	0.005	0.007	0.067	0.059	0.004	0.008	0.062	0.058	0.004	0.008	0.054	0.058	0.004	0.007	0.045	0.041	0.003	0.006	0.048	0.053	0.004	0.007
	0.085	0.064	0.006	0.009	0.073	0.068	0.005	0.009	0.067	0.066	0.004	0.009	0.058	0.065	0.004	0.008	0.046	0.044	0.003	0.006	0.052	0.060	0.004	0.007
	0.094	0.085	0.007	0.012	0.086	0.084	0.006	0.011	0.075	0.078	0.006	0.011	0.067	0.080	0.006	0.010	0.049	0.051	0.004	0.007	0.060	0.073	0.005	0.009
	0.102	0.100	0.008	0.015	0.095	0.097	0.007	0.013	0.085	0.090	0.007	0.012	0.075	0.095	0.007	0.012	0.053	0.056	0.004	0.007	0.066	0.081	0.006	0.010
	0.117	0.118	0.009	0.018	0.110	0.113	0.009	0.015	0.095	0.098	0.007	0.013	0.083	0.105	0.007	0.013	0.054	0.060	0.004	0.007	0.074	0.091	0.006	0.011
	0.125	0.127	0.011	0.019	0.117	0.121	0.010	0.017	0.102	0.112	0.008	0.015	0.089	0.114	0.008	0.014	0.061	0.075	0.005	0.009	0.078	0.096	0.006	0.012
																	0.067	0.085	0.006	0.011				
																	0.076	0.092	0.006	0.012				
																	0.081	0.098	0.007	0.012				

Table A.4: Measurements for catch basin inlet #2 (OPSD 400.070) - double round herringbone with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)	depth	Catchme	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.021	0.0009	0.001	5.7E-06	0.018	0.0008	0.001	5.2E-06	0.016	0.0008	0.001	5.0E-06	0.017	0.0009	0.001	5.7E-06	0.017	0.0010	0.001	6.1E-06	0.010	0.0008	0.002	4.9E-06
	0.029	0.0026	0.001	1.6E-05	0.022	0.0026	0.001	1.6E-05	0.026	0.0024	0.002	1.5E-05	0.020	0.0026	0.001	1.6E-05	0.020	0.0023	0.001	1.4E-05	0.015	0.0026	0.001	1.6E-05
	0.036	0.0048	0.001	3.0E-05	0.026	0.0049	0.001	3.0E-05	0.031	0.0052	0.002	3.3E-05	0.025	0.0056	0.001	3.4E-05	0.024	0.0052	0.001	3.2E-05	0.019	0.0053	0.001	3.3E-05
	0.048	0.013	0.001	0.003	0.040	0.013	0.001	0.003	0.037	0.016	0.001	0.004	0.033	0.014	0.001	0.003	0.034	0.015	0.001	0.003	0.028	0.013	0.001	0.003
	0.063	0.028	0.002	0.005	0.047	0.024	0.001	0.004	0.043	0.028	0.001	0.004	0.041	0.024	0.001	0.004	0.042	0.025	0.002	0.004	0.036	0.023	0.002	0.004
	0.076	0.044	0.002	0.006	0.061	0.042	0.001	0.006	0.056	0.043	0.002	0.006	0.042	0.025	0.002	0.004	0.058	0.043	0.002	0.006	0.048	0.040	0.003	0.006
	0.094	0.062	0.003	0.008	0.075	0.061	0.002	0.008	0.079	0.065	0.002	0.008	0.056	0.037	0.002	0.005	0.068	0.063	0.004	0.007	0.061	0.070	0.004	0.009
	0.104	0.079	0.004	0.010	0.089	0.076	0.003	0.010	0.091	0.083	0.003	0.011	0.059	0.040	0.002	0.005	0.075	0.077	0.004	0.009	0.064	0.057	0.004	0.007
	0.108	0.090	0.006	0.012	0.099	0.087	0.005	0.012	0.097	0.094	0.005	0.012	0.076	0.063	0.003	0.008	0.079	0.084	0.005	0.010	0.064	0.076	0.005	0.010
	0.120	0.107	0.007	0.014	0.113	0.110	0.006	0.015	0.106	0.109	0.006	0.014	0.076	0.064	0.003	0.009	0.087	0.095	0.006	0.012	0.072	0.087	0.006	0.011
	0.131	0.121	0.008	0.017	0.124	0.130	0.007	0.019	0.114	0.119	0.007	0.016	0.084	0.083	0.004	0.011	0.095	0.106	0.006	0.014	0.079	0.094	0.006	0.012
	0.144	0.139	0.008	0.020	0.134	0.153	0.008	0.023	0.124	0.129	0.007	0.018	0.087	0.092	0.005	0.012	0.103	0.121	0.007	0.017	0.086	0.104	0.006	0.014
	0.153	0.148	0.009	0.022	0.143	0.168	0.009	0.026	0.131	0.138	0.009	0.019	0.092	0.100	0.005	0.014	0.110	0.132	0.008	0.019	0.091	0.111	0.007	0.014
													0.096	0.105	0.006	0.015								
													0.097	0.106	0.006	0.014								
													0.103	0.112	0.006	0.015								
													0.105	0.121	0.007	0.017								
													0.106	0.117	0.007	0.016								
													0.114	0.134	0.007	0.019								
													0.119	0.140	0.008	0.020								

Table A.5: Measurements for catch basin inlet #3 (OPSD 400.020) - single square herringbone with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.021	0.0009	0.001	0.0002	0.016	0.0009	0.002	0.0002	0.013	0.0009	0.005	0.0002	0.010	0.0008	0.002	0.0002	0.009	0.0007	0.003	0.0002	0.008	0.0010	0.002	0.0002
	0.027	0.0026	0.001	0.0002	0.020	0.0028	0.002	0.0002	0.016	0.0028	0.004	0.0002	0.016	0.0028	0.001	0.0002	0.015	0.0029	0.002	0.0002	0.013	0.0024	0.002	0.0002
	0.033	0.004	0.001	0.002	0.026	0.0051	0.001	0.0002	0.022	0.0054	0.001	0.0002	0.020	0.0053	0.001	0.0002	0.021	0.0051	0.001	0.0002	0.020	0.0041	0.002	0.0002
	0.041	0.010	0.001	0.003	0.033	0.009	0.001	0.003	0.025	0.010	0.001	0.003	0.023	0.010	0.001	0.003	0.024	0.010	0.001	0.003	0.024	0.009	0.001	0.003
	0.050	0.017	0.001	0.004	0.034	0.008	0.001	0.003	0.032	0.017	0.001	0.004	0.029	0.016	0.001	0.003	0.030	0.017	0.002	0.004	0.030	0.016	0.002	0.003
	0.062	0.026	0.002	0.004	0.042	0.016	0.001	0.004	0.043	0.028	0.001	0.005	0.038	0.026	0.002	0.004	0.038	0.026	0.002	0.004	0.037	0.025	0.003	0.004
	0.070	0.033	0.003	0.005	0.047	0.024	0.002	0.004	0.055	0.038	0.002	0.005	0.047	0.037	0.002	0.005	0.044	0.033	0.003	0.005	0.042	0.031	0.003	0.005
	0.083	0.045	0.005	0.007	0.056	0.031	0.002	0.005	0.060	0.045	0.003	0.007	0.048	0.036	0.001	0.005	0.044	0.032	0.003	0.005	0.048	0.037	0.004	0.005
	0.087	0.051	0.006	0.008	0.068	0.043	0.003	0.006	0.065	0.048	0.004	0.007	0.053	0.042	0.003	0.006	0.049	0.038	0.004	0.006	0.052	0.041	0.004	0.006
	0.097	0.060	0.007	0.009	0.074	0.048	0.005	0.007	0.074	0.055	0.005	0.008	0.057	0.046	0.004	0.006	0.049	0.038	0.004	0.005	0.060	0.047	0.005	0.007
	0.104	0.064	0.008	0.009	0.086	0.056	0.006	0.009	0.083	0.060	0.006	0.009	0.066	0.052	0.006	0.007	0.052	0.041	0.004	0.006	0.067	0.051	0.006	0.007
	0.116	0.074	0.009	0.011	0.095	0.061	0.007	0.009	0.092	0.066	0.006	0.010	0.075	0.058	0.006	0.008	0.060	0.047	0.005	0.007	0.074	0.056	0.007	0.008
	0.122	0.079	0.010	0.011	0.105	0.069	0.008	0.011	0.098	0.070	0.007	0.010	0.077	0.057	0.006	0.008	0.067	0.051	0.006	0.007	0.078	0.059	0.007	0.008
					0.112	0.074	0.008	0.011					0.081	0.062	0.006	0.008	0.067	0.053	0.006	0.007				
													0.086	0.062	0.007	0.009	0.075	0.056	0.006	0.008				
													0.088	0.067	0.007	0.009	0.080	0.059	0.007	0.009				
													0.092	0.066	0.007	0.009								

Table A.6: Measurements for catch basin inlet #3 (OPSD 400.020) - single square herringbone with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.022	0.0010	0.001	0.0002	0.016	0.0009	0.002	0.0002	0.012	0.0008	0.004	0.0002	0.011	0.0010	0.004	0.0002	0.010	0.0008	0.004	0.0002	0.011	0.0010	0.004	0.0002
	0.029	0.0026	0.001	0.0002	0.023	0.0027	0.001	0.0002	0.018	0.0021	0.001	0.0002	0.020	0.0035	0.001	0.0002	0.021	0.0028	0.001	0.0002	0.016	0.0025	0.006	0.0002
	0.035	0.0052	0.002	0.0002	0.026	0.0041	0.001	0.0002	0.023	0.0041	0.001	0.0002	0.023	0.0058	0.001	0.0002	0.022	0.0044	0.001	0.0002	0.025	0.0053	0.001	0.0002
	0.048	0.0132	0.002	0.0002	0.037	0.012	0.001	0.003	0.030	0.010	0.001	0.003	0.030	0.0133	0.001	0.0002	0.029	0.009	0.001	0.003	0.032	0.010	0.002	0.003
	0.058	0.021	0.002	0.004	0.048	0.020	0.001	0.004	0.038	0.020	0.001	0.004	0.039	0.020	0.002	0.004	0.039	0.017	0.002	0.004	0.032	0.011	0.002	0.003
	0.073	0.032	0.002	0.005	0.059	0.032	0.001	0.005	0.043	0.028	0.001	0.005	0.055	0.034	0.002	0.005	0.051	0.029	0.002	0.005	0.039	0.019	0.002	0.004
	0.089	0.044	0.003	0.007	0.069	0.042	0.002	0.006	0.047	0.031	0.001	0.005	0.071	0.047	0.003	0.007	0.055	0.033	0.002	0.005	0.041	0.019	0.002	0.004
	0.101	0.052	0.004	0.008	0.085	0.051	0.003	0.008	0.067	0.041	0.002	0.006	0.078	0.054	0.004	0.009	0.063	0.042	0.003	0.006	0.052	0.032	0.003	0.005
	0.105	0.057	0.005	0.009	0.096	0.056	0.004	0.009	0.083	0.053	0.003	0.008	0.082	0.058	0.004	0.009	0.066	0.043	0.003	0.006	0.063	0.041	0.004	0.006
	0.117	0.065	0.007	0.010	0.110	0.065	0.006	0.011	0.090	0.059	0.004	0.009	0.091	0.064	0.006	0.010	0.071	0.048	0.004	0.007	0.068	0.047	0.004	0.006
	0.129	0.072	0.007	0.011	0.122	0.072	0.007	0.011	0.100	0.067	0.005	0.011	0.099	0.068	0.006	0.010	0.072	0.048	0.004	0.007	0.072	0.051	0.005	0.007
	0.142	0.081	0.008	0.013	0.131	0.080	0.008	0.013	0.108	0.073	0.006	0.011	0.108	0.073	0.007	0.011	0.076	0.052	0.004	0.007	0.081	0.057	0.006	0.008
	0.148	0.086	0.008	0.013	0.140	0.084	0.008	0.013	0.117	0.078	0.006	0.012	0.113	0.076	0.007	0.011	0.076	0.052	0.005	0.007	0.088	0.061	0.006	0.008
									0.123	0.082	0.007	0.012					0.085	0.059	0.006	0.009	0.096	0.066	0.007	0.009
																	0.085	0.058	0.006	0.008	0.100	0.069	0.007	0.009
																	0.092	0.063	0.006	0.009				
																	0.094	0.063	0.006	0.009				
																	0.101	0.068	0.006	0.010				
																	0.101	0.068	0.007	0.011				
																	0.107	0.071	0.008	0.011				
																	0.107	0.070	0.007	0.010				

Table A.7: Measurements for catch basin inlet #4 (OPSD 400.020) - double square herringbone with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.015	0.0007	0.001	0.0002	0.012	0.0008	0.001	0.0002	0.010	0.0007	0.001	0.0002	0.010	0.0006	0.001	0.0002	0.009	0.0007	0.001	0.0002	0.009	0.0011	0.001	0.0002
	0.022	0.0029	0.001	0.0002	0.016	0.0024	0.001	0.0002	0.016	0.0027	0.001	0.0002	0.016	0.0026	0.001	0.0002	0.014	0.0023	0.001	0.0002	0.013	0.0029	0.001	0.0002
	0.027	0.0059	0.001	0.0002	0.020	0.0053	0.001	0.0002	0.019	0.0053	0.001	0.0002	0.017	0.0060	0.001	0.0002	0.017	0.0055	0.001	0.0002	0.019	0.0051	0.001	0.0002
	0.038	0.0145	0.001	0.0002	0.027	0.011	0.001	0.003	0.025	0.0142	0.001	0.0002	0.024	0.013	0.001	0.003	0.022	0.011	0.001	0.003	0.021	0.010	0.001	0.003
	0.046	0.021	0.002	0.004	0.036	0.018	0.001	0.004	0.031	0.020	0.001	0.004	0.029	0.021	0.001	0.004	0.027	0.017	0.002	0.004	0.027	0.018	0.001	0.004
	0.058	0.031	0.002	0.005	0.043	0.029	0.001	0.005	0.041	0.034	0.001	0.005	0.036	0.034	0.002	0.005	0.035	0.031	0.002	0.005	0.033	0.028	0.002	0.005
	0.068	0.045	0.004	0.006	0.054	0.041	0.003	0.006	0.052	0.049	0.002	0.007	0.044	0.049	0.003	0.007	0.040	0.043	0.003	0.006	0.039	0.041	0.003	0.007
	0.078	0.058	0.005	0.008	0.065	0.056	0.004	0.008	0.058	0.063	0.003	0.009	0.050	0.060	0.004	0.009	0.046	0.057	0.004	0.008	0.045	0.053	0.004	0.009
	0.083	0.066	0.006	0.009	0.070	0.065	0.005	0.010	0.062	0.071	0.004	0.010	0.054	0.068	0.004	0.009	0.050	0.063	0.004	0.009	0.049	0.060	0.004	0.009
	0.094	0.087	0.008	0.012	0.083	0.083	0.007	0.012	0.071	0.085	0.006	0.011	0.062	0.080	0.006	0.011	0.058	0.075	0.005	0.010	0.056	0.072	0.006	0.011
	0.103	0.106	0.008	0.014	0.093	0.096	0.008	0.013	0.080	0.097	0.006	0.012	0.071	0.096	0.007	0.012	0.065	0.084	0.006	0.011	0.063	0.078	0.007	0.012
	0.116	0.129	0.010	0.017	0.105	0.113	0.009	0.015	0.090	0.108	0.007	0.014	0.079	0.110	0.007	0.015	0.073	0.095	0.007	0.013	0.070	0.089	0.007	0.015
	0.117	0.132	0.010	0.017	0.112	0.121	0.010	0.017	0.096	0.116	0.008	0.014	0.086	0.119	0.008	0.016	0.078	0.101	0.007	0.014	0.074	0.093	0.008	0.016
	0.123	0.149	0.011	0.021																				

Table A.8: Measurements for catch basin inlet #4 (OPSD 400.020) - double square herringbone with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.018	0.0008	0.002	0.0002	0.017	0.0010	0.001	0.0002	0.016	0.0010	0.002	0.0002	0.013	0.0010	0.003	0.0002	0.013	0.0007	0.001	0.0002	0.012	0.0009	0.002	0.0002
	0.028	0.0032	0.001	0.0002	0.021	0.0027	0.001	0.0002	0.020	0.0029	0.001	0.0002	0.017	0.0031	0.001	0.0002	0.018	0.0026	0.001	0.0002	0.019	0.0024	0.001	0.0002
	0.035	0.0074	0.001	0.0002	0.029	0.0069	0.001	0.0002	0.025	0.0066	0.001	0.0002	0.022	0.0067	0.001	0.0002	0.022	0.0056	0.001	0.0002	0.021	0.0046	0.001	0.0002
	0.052	0.017	0.002	0.004	0.042	0.014	0.001	0.003	0.033	0.014	0.001	0.003	0.031	0.014	0.001	0.003	0.030	0.012	0.002	0.003	0.031	0.0135	0.002	0.0002
	0.061	0.028	0.002	0.005	0.049	0.025	0.001	0.004	0.039	0.026	0.001	0.004	0.040	0.025	0.002	0.004	0.039	0.024	0.002	0.004	0.038	0.021	0.002	0.004
	0.079	0.049	0.003	0.007	0.060	0.045	0.002	0.006	0.053	0.044	0.001	0.006	0.055	0.044	0.002	0.007	0.052	0.044	0.003	0.006	0.038	0.021	0.002	0.004
	0.094	0.068	0.004	0.010	0.076	0.064	0.003	0.009	0.075	0.068	0.003	0.009	0.068	0.069	0.003	0.010	0.063	0.064	0.004	0.010	0.050	0.040	0.003	0.006
	0.099	0.082	0.005	0.011	0.080	0.068	0.003	0.010	0.086	0.087	0.004	0.012	0.070	0.071	0.003	0.010	0.070	0.081	0.004	0.012	0.058	0.056	0.004	0.008
	0.104	0.093	0.006	0.013	0.091	0.082	0.004	0.011	0.091	0.098	0.005	0.013	0.075	0.088	0.004	0.011	0.073	0.089	0.005	0.013	0.063	0.069	0.004	0.010
	0.117	0.115	0.007	0.015	0.100	0.094	0.005	0.012	0.099	0.117	0.006	0.016	0.079	0.101	0.005	0.014	0.082	0.102	0.006	0.015	0.068	0.077	0.005	0.012
	0.127	0.133	0.008	0.018	0.112	0.118	0.007	0.017	0.108	0.127	0.006	0.019	0.089	0.121	0.006	0.016	0.090	0.110	0.007	0.017	0.077	0.091	0.006	0.014
	0.140	0.156	0.008	0.022	0.122	0.136	0.007	0.019	0.118	0.142	0.007	0.021	0.098	0.138	0.007	0.020	0.097	0.121	0.007	0.019	0.085	0.100	0.007	0.015
	0.144	0.166	0.009	0.024	0.122	0.137	0.007	0.019	0.125	0.149	0.008	0.022	0.106	0.146	0.007	0.022	0.105	0.129	0.008	0.020	0.093	0.110	0.007	0.017
					0.133	0.160	0.008	0.023					0.112	0.157	0.008	0.025					0.098	0.114	0.008	0.017
					0.141	0.164	0.009	0.024																

Table A.9: Measurements for catch basin inlet #5 (MT-310) - single square with square bars and a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.020	0.0009	0.007	0.0002	0.017	0.0009	0.002	0.0002	0.014	0.0011	0.002	0.0002	0.011	0.0008	0.004	0.0002	0.015	0.0007	0.002	0.0002	0.013	0.0007	0.001	0.0002
	0.024	0.0021	0.001	0.0002	0.022	0.0030	0.001	0.0002	0.017	0.0026	0.003	0.0002	0.016	0.0027	0.001	0.0002	0.017	0.0028	0.001	0.0002	0.016	0.0018	0.001	0.0002
	0.029	0.0040	0.001	0.0002	0.026	0.0056	0.001	0.0002	0.020	0.0045	0.001	0.0002	0.018	0.004	0.001	0.002	0.018	0.004	0.001	0.002	0.017	0.0043	0.001	0.0002
	0.031	0.0049	0.001	0.0002	0.034	0.011	0.001	0.003	0.025	0.0130	0.001	0.0002	0.021	0.007	0.001	0.003	0.022	0.007	0.001	0.003	0.021	0.0073	0.001	0.0002
	0.033	0.0061	0.001	0.0002	0.039	0.016	0.001	0.004	0.031	0.018	0.001	0.004	0.033	0.019	0.001	0.004	0.034	0.020	0.002	0.004	0.034	0.018	0.002	0.004
	0.033	0.0064	0.001	0.0002	0.052	0.030	0.002	0.005	0.043	0.030	0.001	0.005	0.038	0.027	0.001	0.005	0.040	0.026	0.002	0.005	0.044	0.029	0.003	0.005
	0.040	0.006	0.001	0.003	0.062	0.040	0.003	0.006	0.056	0.040	0.003	0.006	0.048	0.036	0.003	0.005	0.045	0.032	0.003	0.005	0.049	0.036	0.004	0.006
	0.050	0.013	0.001	0.003	0.072	0.047	0.004	0.007	0.062	0.048	0.004	0.007	0.060	0.046	0.004	0.006	0.052	0.038	0.004	0.006	0.050	0.037	0.004	0.007
	0.062	0.021	0.002	0.004	0.077	0.051	0.005	0.008	0.067	0.052	0.004	0.008	0.070	0.052	0.006	0.007	0.056	0.040	0.004	0.006	0.055	0.040	0.005	0.007
	0.068	0.027	0.003	0.005	0.088	0.059	0.007	0.009	0.076	0.058	0.005	0.008	0.076	0.055	0.006	0.008	0.064	0.046	0.005	0.007	0.062	0.045	0.006	0.010
	0.082	0.040	0.005	0.006	0.095	0.063	0.007	0.009	0.082	0.061	0.006	0.009	0.084	0.060	0.006	0.008	0.069	0.050	0.006	0.007	0.067	0.048	0.006	0.013
	0.087	0.045	0.006	0.008	0.106	0.071	0.008	0.011	0.091	0.067	0.006	0.009	0.091	0.063	0.007	0.008	0.077	0.054	0.006	0.008	0.074	0.052	0.006	0.018
	0.097	0.052	0.007	0.009	0.112	0.076	0.009	0.011	0.099	0.070	0.007	0.010					0.083	0.057	0.007	0.008	0.079	0.054	0.007	0.021
	0.103	0.057	0.008	0.009																				
	0.117	0.066	0.009	0.011																				
	0.123	0.072	0.010	0.011																				

Table A.10: Measurements for catch basin inlet #5 (MT-310) - single square with square bars and a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0		4.0		4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5		2.5		5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.012	0.00013	0.001	2.7E-06	0.014	0.0001	0.002	0.0002	0.018	0.0009	0.004	0.0002	0.015	0.0010	0.004	0.0002	0.014	0.0010	0.004	0.0002	0.016	0.0010	0.004	0.0002
	0.018	0.0004	0.002	8.0E-06	0.018	0.0005	0.002	0.0002	0.024	0.0032	0.001	0.0002	0.017	0.0030	0.002	0.0002	0.016	0.0011	0.005	0.0002	0.017	0.0010	0.004	0.0002
	0.023	0.001	0.001	1.6E-05	0.023	0.0014	0.001	0.0002	0.027	0.0066	0.001	0.0002	0.024	0.0063	0.001	0.0002	0.018	0.0037	0.004	0.0002	0.017	0.0024	0.003	0.0002
	0.026	0.001	0.001	2.8E-05	0.023	0.0013	0.001	7.8E-06	0.029	0.0109	0.001	0.0002	0.026	0.0069	0.001	0.0000	0.031	0.0068	0.001	0.0002	0.020	0.0030	0.001	0.0002
	0.027	0.002	0.001	3.6E-05	0.023	0.0013	0.001	7.8E-06	0.041	0.022	0.001	0.004	0.028	0.0102	0.001	0.0002	0.035	0.0131	0.002	0.0001	0.021	0.0044	0.001	0.0002
	0.028	0.002	0.001	3.0E-05	0.024	0.0014	0.001	0.0002	0.053	0.032	0.001	0.005	0.045	0.024	0.002	0.004	0.050	0.026	0.002	0.005	0.025	0.0060	0.001	0.0002
	0.037	0.009	0.001	0.004	0.032	0.0044	0.001	0.0002	0.074	0.040	0.002	0.006	0.058	0.032	0.002	0.005	0.059	0.033	0.002	0.005	0.027	0.0081	0.001	0.0002
	0.038	0.005	0.001	1.0E-04	0.037	0.0082	0.001	0.0002	0.087	0.049	0.003	0.007	0.069	0.041	0.003	0.006	0.068	0.041	0.004	0.006	0.029	0.0100	0.001	0.0002
	0.044	0.007	0.001	1.4E-04	0.058	0.021	0.001	0.004	0.092	0.054	0.004	0.008	0.080	0.049	0.004	0.008	0.078	0.047	0.004	0.007	0.040	0.0176	0.002	0.0001
	0.053	0.013	0.002	2.6E-04	0.068	0.034	0.002	0.006	0.101	0.062	0.005	0.009	0.084	0.053	0.004	0.008	0.080	0.050	0.005	0.008	0.046	0.022	0.002	0.004
	0.054	0.015	0.002	2.9E-04	0.069	0.034	0.002	0.006	0.107	0.066	0.006	0.010	0.093	0.059	0.006	0.009	0.089	0.055	0.006	0.008	0.052	0.028	0.003	0.005
	0.058	0.018	0.002	0.005	0.071	0.039	0.002	0.006	0.117	0.072	0.006	0.010	0.098	0.062	0.006	0.009	0.094	0.058	0.006	0.009	0.053	0.029	0.003	0.005
	0.060	0.022	0.002	2.0E-04	0.087	0.046	0.004	0.007	0.124	0.075	0.007	0.012	0.109	0.067	0.007	0.010	0.102	0.063	0.006	0.009	0.060	0.036	0.004	0.006
	0.063	0.018	0.002	3.7E-04	0.099	0.053	0.005	0.008					0.114	0.070	0.007	0.010	0.105	0.063	0.007	0.009	0.064	0.037	0.004	0.006
	0.065	0.024	0.002	4.7E-04	0.113	0.063	0.006	0.009									0.109	0.065	0.007	0.010	0.068	0.042	0.004	0.007
	0.066	0.028	0.002	0.005	0.123	0.069	0.007	0.010													0.072	0.045	0.005	0.007
	0.070	0.024	0.002	4.8E-04	0.131	0.074	0.007	0.011													0.079	0.049	0.006	0.007
	0.073	0.032	0.002	0.005	0.140	0.078	0.008	0.012													0.080	0.050	0.006	0.008
	0.075	0.028	0.002	0.005																	0.083	0.051	0.006	0.008
	0.086	0.039	0.003	0.006																	0.086	0.053	0.006	0.008
	0.088	0.042	0.003	0.006																	0.089	0.053	0.006	0.008
	0.102	0.053	0.004	0.008																	0.090	0.054	0.006	0.009
	0.102	0.053	0.004	0.008																	0.094	0.057	0.007	0.009
	0.109	0.056	0.005	0.008																	0.096	0.057	0.007	0.009
	0.122	0.063	0.006	0.010																	0.100	0.060	0.007	0.009
	0.123	0.066	0.007	0.010																	0.102	0.060	0.007	0.009
	0.131	0.066	0.007	0.010																				
	0.133	0.070	0.007	0.011																				
	0.133	0.073	0.007	0.011																				
	0.144	0.076	0.008	0.011																				
	0.151	0.080	0.008	0.012																				
	0.154	0.083	0.008	0.012																				

Table A.11: Measurements for catch basin inlet #6 (Stepcon 5103) - high capacity inlet with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.016	0.0008	0.001	0.0002	0.016	0.0010	0.001	0.0002	0.015	0.0011	0.001	0.0002	0.011	0.0008	0.001	0.0002	0.011	0.0015	0.001	0.0002	0.007	0.0009	0.001	0.0002
	0.022	0.0025	0.001	0.0002	0.018	0.0027	0.001	0.0002	0.017	0.0028	0.001	0.0002	0.017	0.0033	0.001	0.0002	0.016	0.0026	0.001	0.0002	0.013	0.0028	0.002	0.0002
	0.027	0.0050	0.001	0.0002	0.023	0.0061	0.001	0.0002	0.021	0.0062	0.001	0.0002	0.021	0.0062	0.001	0.0002	0.020	0.0055	0.001	0.0002	0.020	0.0055	0.001	0.0002
	0.038	0.0145	0.001	0.0002	0.033	0.0153	0.001	0.0002	0.027	0.013	0.001	0.003	0.025	0.013	0.001	0.003	0.024	0.0136	0.001	0.0002	0.024	0.012	0.001	0.003
	0.048	0.019	0.001	0.004	0.037	0.022	0.001	0.004	0.033	0.023	0.001	0.004	0.032	0.025	0.001	0.005	0.031	0.022	0.002	0.004	0.030	0.021	0.002	0.004
	0.060	0.033	0.002	0.006	0.049	0.039	0.002	0.006	0.045	0.041	0.001	0.007	0.041	0.044	0.002	0.007	0.038	0.038	0.002	0.005	0.037	0.039	0.003	0.006
	0.071	0.049	0.004	0.008	0.060	0.056	0.003	0.009	0.057	0.064	0.003	0.010	0.050	0.067	0.003	0.011	0.045	0.059	0.003	0.009	0.041	0.054	0.003	0.008
	0.077	0.065	0.004	0.010	0.069	0.072	0.004	0.011	0.062	0.082	0.004	0.012	0.055	0.085	0.004	0.012	0.050	0.078	0.004	0.012	0.048	0.077	0.004	0.010
	0.080	0.082	0.006	0.014	0.074	0.085	0.005	0.013	0.066	0.096	0.005	0.014	0.059	0.100	0.005	0.015	0.054	0.093	0.004	0.013	0.052	0.092	0.005	0.012
	0.092	0.107	0.007	0.015	0.086	0.113	0.007	0.016	0.075	0.124	0.006	0.017	0.068	0.129	0.006	0.019	0.062	0.121	0.005	0.016	0.060	0.116	0.005	0.016
	0.103	0.133	0.008	0.021	0.096	0.138	0.008	0.020	0.084	0.145	0.006	0.022	0.076	0.155	0.006	0.024	0.069	0.150	0.006	0.020	0.067	0.145	0.006	0.021
	0.117	0.173	0.009	0.026	0.107	0.177	0.008	0.027	0.094	0.184	0.007	0.026	0.085	0.178	0.007	0.029	0.077	0.172	0.007	0.024	0.075	0.178	0.006	0.027
	0.122	0.195	0.010	0.031	0.113	0.198	0.009	0.029	0.101	0.204	0.008	0.032	0.090	0.206	0.008	0.033	0.084	0.199	0.007	0.032	0.081	0.195	0.007	0.031

Table A.12: Measurements for catch basin inlet #6 (Stepcon 5103) - high capacity inlet with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.021	0.0009	0.003	0.0002	0.018	0.0010	0.003	0.0002	0.016	0.0010	0.001	0.0002	0.016	0.0009	0.001	0.0002	0.013	0.0008	0.001	0.0002	0.015	0.0010	0.001	0.0002
	0.029	0.0028	0.001	0.0002	0.023	0.0026	0.001	0.0002	0.020	0.0029	0.001	0.0002	0.019	0.0029	0.001	0.0002	0.020	0.0030	0.001	0.0002	0.019	0.0027	0.001	0.0002
	0.034	0.0057	0.001	0.0002	0.027	0.0059	0.001	0.0002	0.026	0.0066	0.001	0.0002	0.022	0.0055	0.001	0.0002	0.023	0.0061	0.001	0.0002	0.023	0.0055	0.001	0.0002
	0.052	0.0160	0.001	0.0002	0.040	0.0161	0.001	0.0002	0.034	0.0154	0.001	0.0002	0.031	0.0155	0.001	0.0002	0.032	0.0150	0.001	0.0002	0.033	0.0145	0.002	0.0002
	0.063	0.0291	0.002	0.0002	0.050	0.029	0.001	0.005	0.041	0.027	0.001	0.004	0.040	0.027	0.001	0.004	0.041	0.027	0.002	0.004	0.034	0.016	0.002	0.003
	0.079	0.051	0.002	0.007	0.054	0.050	0.001	0.007	0.048	0.043	0.001	0.006	0.057	0.050	0.002	0.006	0.054	0.051	0.002	0.007	0.040	0.023	0.002	0.004
	0.095	0.074	0.003	0.010	0.076	0.074	0.002	0.010	0.054	0.050	0.001	0.006	0.072	0.087	0.003	0.012	0.066	0.088	0.003	0.011	0.041	0.028	0.002	0.004
	0.103	0.097	0.005	0.013	0.090	0.096	0.004	0.012	0.075	0.077	0.003	0.010	0.080	0.123	0.004	0.017	0.073	0.120	0.004	0.016	0.052	0.044	0.003	0.007
	0.103	0.095	0.005	0.013	0.100	0.111	0.005	0.014	0.088	0.110	0.004	0.014	0.084	0.146	0.005	0.022	0.078	0.142	0.005	0.019	0.053	0.051	0.003	0.006
	0.108	0.110	0.005	0.015	0.113	0.145	0.006	0.020	0.095	0.133	0.004	0.018	0.093	0.187	0.006	0.028	0.087	0.179	0.006	0.026	0.068	0.111	0.004	0.014
	0.119	0.138	0.007	0.020	0.125	0.180	0.007	0.027	0.104	0.173	0.006	0.026	0.101	0.215	0.007	0.029	0.096	0.207	0.006	0.032	0.072	0.133	0.005	0.018
	0.130	0.168	0.008	0.025	0.135	0.218	0.008	0.030	0.112	0.212	0.006	0.033	0.111	0.241	0.007	0.034	0.104	0.243	0.007	0.034	0.082	0.170	0.006	0.025
	0.145	0.207	0.009	0.033	0.144	0.235	0.009	0.031	0.122	0.235	0.007	0.031	0.116	0.256	0.008	0.037	0.111	0.260	0.008	0.038	0.090	0.204	0.006	0.033
	0.151	0.222	0.009	0.031					0.129	0.246	0.008	0.034									0.098	0.234	0.006	0.035
																					0.104	0.260	0.007	0.041

Table A.13: Measurements for catch basin inlet #7 (OPSD 401.010) – circular open cover (type B) with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				1.0				2.5				5.0				7.5				10.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.016	0.001	0.002	0.0002	0.017	0.001	0.001	0.0002	0.014	0.001	0.001	0.0002	0.014	0.001	0.001	0.00001	0.012	0.001	0.001	0.0002	0.010	0.001	0.001	0.000
	0.025	0.003	0.001	0.0002	0.021	0.002	0.001	0.0002	0.016	0.001	0.001	0.0002	0.017	0.002	0.001	0.00002	0.017	0.003	0.001	0.0002	0.013	0.002	0.001	0.000
	0.029	0.005	0.001	0.0002	0.024	0.005	0.001	0.0002	0.016	0.002	0.001	0.0002	0.019	0.005	0.001	0.00003	0.020	0.006	0.001	0.0002	0.014	0.002	0.002	0.000
	0.040	0.012	0.001	0.003	0.032	0.011	0.001	0.003	0.020	0.003	0.001	0.0002	0.026	0.013	0.001	0.003	0.026	0.010	0.001	0.003	0.021	0.006	0.001	0.000
	0.050	0.017	0.001	0.004	0.037	0.016	0.001	0.004	0.021	0.005	0.001	0.0002	0.032	0.015	0.001	0.003	0.031	0.014	0.001	0.003	0.025	0.009	0.001	0.003
	0.064	0.023	0.002	0.004	0.049	0.021	0.002	0.004	0.023	0.006	0.001	0.0002	0.032	0.016	0.001	0.004	0.031	0.014	0.001	0.003	0.030	0.013	0.002	0.003
	0.073	0.025	0.004	0.004	0.061	0.025	0.003	0.004	0.026	0.011	0.001	0.003	0.041	0.019	0.002	0.004	0.040	0.018	0.002	0.004	0.038	0.016	0.003	0.004
	0.075	0.025	0.004	0.004	0.069	0.028	0.004	0.005	0.027	0.011	0.001	0.003	0.049	0.022	0.003	0.004	0.046	0.020	0.004	0.004	0.043	0.018	0.004	0.004
	0.079	0.029	0.005	0.005	0.075	0.029	0.005	0.005	0.034	0.015	0.001	0.003	0.050	0.023	0.003	0.004	0.051	0.023	0.004	0.004	0.049	0.021	0.004	0.004
	0.082	0.031	0.006	0.005	0.086	0.033	0.007	0.005	0.034	0.016	0.001	0.003	0.055	0.024	0.004	0.004	0.055	0.024	0.004	0.004	0.053	0.022	0.005	0.004
	0.093	0.036	0.007	0.006	0.097	0.036	0.008	0.005	0.048	0.022	0.002	0.004	0.059	0.026	0.005	0.004	0.062	0.027	0.005	0.004	0.061	0.024	0.005	0.004
	0.104	0.038	0.008	0.006	0.109	0.040	0.009	0.006	0.048	0.021	0.002	0.004	0.069	0.028	0.006	0.004	0.069	0.028	0.006	0.004	0.068	0.026	0.006	0.004
	0.117	0.043	0.010	0.006	0.116	0.041	0.009	0.006	0.056	0.024	0.003	0.004	0.077	0.029	0.006	0.004	0.069	0.028	0.006	0.004	0.076	0.028	0.007	0.004
	0.124	0.044	0.011	0.006					0.058	0.025	0.002	0.004	0.085	0.032	0.007	0.005	0.077	0.030	0.006	0.005	0.081	0.029	0.007	0.004
									0.063	0.027	0.004	0.005	0.091	0.033	0.008	0.005	0.084	0.031	0.007	0.005				
									0.064	0.028	0.003	0.005												
									0.067	0.028	0.005	0.005												
									0.068	0.030	0.004	0.005												
									0.075	0.031	0.006	0.005												
									0.077	0.033	0.006	0.005												
									0.084	0.033	0.007	0.005												
									0.086	0.034	0.007	0.005												
									0.094	0.036	0.007	0.005												
									0.096	0.037	0.007	0.005												
									0.102	0.037	0.008	0.005												
									0.104	0.039	0.008	0.006												

Table A.14: Measurements for catch basin inlet #8 (OPSD 401.010) – circular closed cover (type A) with a cross-slope of 2.0%

cross-slope (%)	2.0				2.0			
Grade (%)	0.5				2.5			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.019	0.00053	0.001	0.00001	0.015	0.00038	0.001	0.00001
	0.025	0.00086	0.001	0.00001	0.018	0.00046	0.001	0.00001
	0.028	0.00105	0.001	0.00001	0.023	0.00055	0.001	0.00001
	0.025	0.00086	0.001	0.00001	0.027	0.00072	0.001	0.00001
	0.028	0.00105	0.001	0.00001	0.034	0.00084	0.001	0.00001
	0.039	0.00114	0.001	0.00001	0.049	0.00108	0.002	0.00001
	0.049	0.00127	0.001	0.00001	0.060	0.00113	0.002	0.00001
	0.063	0.00150	0.002	0.00001	0.064	0.00115	0.004	0.00001
	0.074	0.00164	0.004	0.00001	0.069	0.00113	0.005	0.00001
	0.079	0.00178	0.005	0.00001	0.064	0.00115	0.004	0.00001
	0.083	0.00183	0.006	0.00001	0.069	0.00113	0.005	0.00001
	0.093	0.00197	0.008	0.00001	0.077	0.00119	0.006	0.00001
	0.103	0.00211	0.008	0.00001	0.086	0.00127	0.007	0.00001

Table A.15: Measurements for catch basin inlet #9 (S19) – “FISH” single round catch basin cover with a cross-slope of 0.0% or 2.0%

cross-slope (%)	0.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.012	0.0010	0.001	2.0E-05	0.016	0.0001	0.001	2.3E-06	0.010	0.0004	0.005	8.8E-06	0.014	0.0004	0.0010	8.1E-06	0.013	0.0012	0.001	2.4E-05
	0.031	0.025	0.002	0.005	0.019	0.0007	0.001	1.5E-05	0.016	0.0008	0.001	1.6E-05	0.017	0.0009	0.0011	1.8E-05	0.015	0.0028	0.001	5.5E-05
	0.041	0.033	0.002	0.005	0.024	0.0013	0.001	2.7E-05	0.021	0.0015	0.001	3.0E-05	0.022	0.0017	0.0011	3.4E-05	0.018	0.0050	0.001	9.9E-05
	0.063	0.052	0.005	0.008	0.036	0.014	0.001	0.004	0.028	0.014	0.001	0.003	0.026	0.014	0.001	0.004	0.022	0.0079	0.001	1.6E-04
	0.065	0.054	0.005	0.008	0.046	0.021	0.001	0.004	0.035	0.021	0.001	0.005	0.034	0.021	0.001	0.004	0.022	0.010	0.001	0.003
	0.080	0.069	0.005	0.010	0.061	0.031	0.003	0.005	0.048	0.031	0.002	0.005	0.047	0.032	0.001	0.005	0.024	0.013	0.001	0.003
	0.093	0.081	0.007	0.012	0.070	0.038	0.004	0.005	0.060	0.038	0.003	0.005	0.057	0.036	0.002	0.006	0.032	0.021	0.001	0.004
	0.095	0.084	0.007	0.013	0.081	0.044	0.005	0.007	0.069	0.044	0.004	0.006	0.064	0.042	0.003	0.007	0.041	0.028	0.001	0.004
	0.105	0.091	0.007	0.013	0.085	0.047	0.006	0.007	0.074	0.047	0.005	0.006	0.070	0.045	0.004	0.007	0.046	0.033	0.002	0.005
	0.124	0.107	0.008	0.016	0.093	0.054	0.007	0.007	0.084	0.053	0.006	0.006	0.076	0.049	0.005	0.007	0.053	0.038	0.003	0.005
	0.144	0.123	0.007	0.018	0.102	0.059	0.008	0.008	0.093	0.058	0.007	0.007	0.084	0.053	0.006	0.007	0.057	0.041	0.003	0.006
	0.166	0.131	0.006	0.017	0.103	0.060	0.008	0.008	0.101	0.063	0.008	0.008	0.092	0.056	0.006	0.008	0.064	0.043	0.005	0.005
	0.204	0.144	0.006	0.020	0.111	0.065	0.009	0.009	0.114	0.069	0.009	0.009	0.101	0.060	0.007	0.009	0.072	0.048	0.005	0.006
	0.251	0.163	0.005	0.023	0.124	0.072	0.010	0.010									0.079	0.051	0.006	0.006
	0.311	0.18	0.005	0.03	0.124	0.073	0.010	0.010									0.086	0.056	0.007	0.007
	0.315	0.18	0.005	0.03																
	0.345	0.19	0.005	0.03																

Table A.16: Measurements for catch basin inlet #9 (S19) – “FISH” single round catch basin cover with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.023	0.0013	0.002	2.7E-05	0.020	0.0013	0.001	2.5E-05	0.021	0.0011	0.001	2.2E-05	0.018	0.0010	0.004	2.0E-05
	0.028	0.0030	0.001	6.1E-05	0.024	0.0029	0.001	5.7E-05	0.024	0.0024	0.001	4.7E-05	0.021	0.0023	0.001	4.6E-05
	0.035	0.0056	0.001	1.1E-04	0.029	0.0058	0.001	1.2E-04	0.027	0.0046	0.001	9.3E-05	0.025	0.0041	0.001	8.3E-05
	0.046	0.018	0.001	0.004	0.041	0.018	0.001	0.004	0.034	0.015	0.001	0.004	0.030	0.014	0.001	0.003
	0.061	0.028	0.002	0.005	0.053	0.027	0.001	0.005	0.043	0.024	0.001	0.004	0.037	0.022	0.001	0.004
	0.081	0.039	0.002	0.006	0.067	0.040	0.002	0.006	0.052	0.032	0.001	0.005	0.055	0.030	0.002	0.005
	0.095	0.049	0.004	0.006	0.079	0.048	0.002	0.006	0.075	0.039	0.002	0.006	0.072	0.041	0.002	0.006
	0.107	0.053	0.004	0.007	0.093	0.052	0.003	0.008	0.089	0.049	0.003	0.007	0.083	0.046	0.003	0.007
	0.112	0.056	0.005	0.008	0.100	0.056	0.004	0.008	0.095	0.053	0.003	0.008	0.087	0.052	0.004	0.007
	0.122	0.064	0.006	0.008	0.114	0.064	0.006	0.008	0.105	0.058	0.005	0.009	0.093	0.057	0.005	0.007
	0.133	0.071	0.007	0.009	0.123	0.069	0.006	0.009	0.115	0.063	0.005	0.009	0.101	0.061	0.005	0.008
	0.146	0.076	0.007	0.010	0.132	0.073	0.006	0.010	0.121	0.067	0.006	0.010	0.108	0.063	0.006	0.009
	0.162	0.082	0.007	0.010	0.145	0.078	0.007	0.010	0.129	0.072	0.007	0.011	0.113	0.068	0.007	0.009

Table A.17: Measurements for catch basin inlet #10 (S22) – single curb inlet frame with a cross-slope of 0.0% or 2.0%

cross-slope (%)	0.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.012	0.0018	0.001	3.5E-05	0.017	0.0008	0.001	1.6E-05	0.017	0.0006	0.001	1.2E-05	0.013	0.0006	0.001	1.2E-05	0.007	0.0006	0.002	1.2E-05
	0.024	0.012	0.001	0.004	0.019	0.0015	0.001	3.0E-05	0.020	0.0011	0.001	2.2E-05	0.016	0.0010	0.001	2.0E-05	0.016	0.0007	0.001	1.5E-05
	0.048	0.024	0.002	0.005	0.022	0.0022	0.002	4.5E-05	0.023	0.0017	0.001	3.5E-05	0.020	0.0015	0.001	3.0E-05	0.019	0.0012	0.001	2.4E-05
	0.078	0.040	0.004	0.007	0.035	0.005	0.001	0.003	0.034	0.003	0.001	0.002	0.026	0.003	0.001	0.002	0.025	0.003	0.001	0.003
	0.102	0.054	0.006	0.007	0.045	0.007	0.002	0.003	0.046	0.005	0.002	0.002	0.034	0.004	0.001	0.002	0.034	0.004	0.001	0.003
	0.142	0.087	0.006	0.012	0.063	0.012	0.003	0.003	0.060	0.008	0.002	0.003	0.048	0.007	0.002	0.003	0.045	0.006	0.002	0.003
	0.149	0.091	0.005	0.012	0.079	0.015	0.004	0.004	0.075	0.012	0.003	0.003	0.059	0.010	0.002	0.003	0.055	0.007	0.003	0.003
	0.174	0.115	0.005	0.017	0.084	0.015	0.004	0.004	0.085	0.015	0.004	0.004	0.068	0.010	0.004	0.003	0.062	0.010	0.003	0.003
	0.189	0.128	0.005	0.019	0.095	0.019	0.004	0.004	0.094	0.018	0.005	0.004	0.073	0.014	0.004	0.003	0.067	0.011	0.004	0.003
	0.209	0.137	0.004	0.023	0.107	0.021	0.005	0.004	0.114	0.022	0.006	0.004	0.082	0.016	0.006	0.004	0.079	0.014	0.005	0.004
	0.226	0.16	0.008	0.03	0.129	0.027	0.006	0.005	0.135	0.027	0.008	0.005	0.096	0.019	0.007	0.004	0.095	0.017	0.007	0.004
	0.230	0.16	0.009	0.03	0.150	0.034	0.008	0.005	0.147	0.033	0.008	0.005	0.113	0.021	0.007	0.004	0.107	0.020	0.008	0.004
	0.237	0.16	0.009	0.03	0.151	0.035	0.008	0.005	0.148	0.033	0.008	0.005	0.126	0.024	0.008	0.004	0.116	0.023	0.008	0.005
	0.254	0.15	0.004	0.03	0.171	0.048	0.009	0.006	0.168	0.037	0.010	0.006								
	0.267	0.15	0.004	0.03	0.171	0.039	0.008	0.005												
	0.303	0.17	0.004	0.04	0.171	0.040	0.008	0.006												
	0.348	0.18	0.004	0.05	0.172	0.048	0.009	0.006												
	0.348	0.17	0.004	0.04																

Table A.18: Measurements for catch basin inlet #10 (S22) – single curb inlet frame with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.019	0.0011	0.001	2.2E-05	0.018	0.0011	0.001	2.2E-05	0.018	0.0008	0.001	1.6E-05	0.018	0.0008	0.001	1.5E-05
	0.022	0.0021	0.001	4.1E-05	0.022	0.0017	0.001	3.3E-05	0.019	0.0012	0.001	2.3E-05	0.020	0.0010	0.001	2.1E-05
	0.025	0.0029	0.001	5.8E-05	0.026	0.0021	0.001	4.2E-05	0.023	0.0017	0.001	3.4E-05	0.025	0.0015	0.001	3.0E-05
	0.028	0.0036	0.002	7.1E-05	0.026	0.0025	0.001	5.0E-05	0.035	0.005	0.001	0.002	0.034	0.003	0.001	0.002
	0.040	0.009	0.001	0.003	0.042	0.006	0.001	0.003	0.043	0.008	0.001	0.003	0.044	0.005	0.001	0.002
	0.042	0.009	0.001	0.003	0.042	0.006	0.001	0.003	0.058	0.010	0.001	0.003	0.061	0.009	0.002	0.003
	0.055	0.013	0.002	0.004	0.053	0.009	0.001	0.003	0.073	0.014	0.002	0.004	0.068	0.011	0.002	0.003
	0.073	0.018	0.002	0.004	0.074	0.014	0.001	0.003	0.083	0.017	0.003	0.004	0.079	0.014	0.003	0.003
	0.095	0.021	0.004	0.005	0.091	0.018	0.002	0.004	0.088	0.018	0.004	0.004	0.084	0.015	0.004	0.003
	0.095	0.022	0.004	0.005	0.105	0.021	0.004	0.004	0.099	0.021	0.006	0.004	0.093	0.017	0.005	0.003
	0.107	0.027	0.004	0.004	0.111	0.024	0.005	0.004	0.112	0.024	0.007	0.004	0.105	0.021	0.006	0.004
	0.122	0.028	0.005	0.005	0.126	0.029	0.005	0.005	0.124	0.027	0.007	0.004	0.119	0.024	0.007	0.004
	0.123	0.027	0.006	0.005	0.144	0.033	0.007	0.005	0.137	0.031	0.008	0.005	0.128	0.027	0.008	0.004
	0.148	0.036	0.007	0.005	0.157	0.037	0.008	0.005								
	0.162	0.043	0.008	0.006	0.175	0.042	0.008	0.006								
	0.186	0.046	0.007	0.006												
	0.187	0.046	0.007	0.006												
	0.190	0.057	0.008	0.007												

Table A.19: Measurements for catch basin inlet #11 (S22x2) – double curb inlet frame with a cross-slope of 0.0% or 2.0%

cross-slope (%)	2.0				2.0				2.0				2.0				2.0			
Grade (%)	0.0				0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.026	0.0033	0.001	6.6E-05	0.019	0.0011	0.001	2.0E-04	0.026	0.0015	0.005	3.0E-05	0.026	0.0008	0.005	1.6E-05	0.029	0.0011	0.003	2.3E-05
	0.032	0.025	0.001	0.004	0.022	0.0027	0.001	2.0E-04	0.030	0.0032	0.005	6.3E-05	0.029	0.0022	0.005	4.4E-05	0.031	0.0014	0.003	2.9E-05
	0.041	0.040	0.001	0.005	0.026	0.005	0.001	0.002	0.037	0.006	0.001	0.002	0.032	0.005	0.001	0.002	0.031	0.0023	0.001	4.7E-05
	0.051	0.046	0.002	0.006	0.033	0.008	0.001	0.003	0.046	0.011	0.001	0.003	0.039	0.007	0.001	0.003	0.035	0.0036	0.001	7.2E-05
	0.066	0.064	0.004	0.008	0.042	0.011	0.002	0.003	0.057	0.015	0.002	0.003	0.046	0.010	0.001	0.003	0.036	0.005	0.001	0.002
	0.106	0.107	0.006	0.014	0.060	0.017	0.003	0.003	0.073	0.021	0.003	0.004	0.059	0.015	0.002	0.003	0.041	0.008	0.001	0.003
	0.129	0.140	0.007	0.019	0.079	0.022	0.005	0.004	0.086	0.028	0.004	0.004	0.072	0.020	0.003	0.003	0.049	0.011	0.001	0.003
	0.150	0.17	0.008	0.02	0.080	0.022	0.005	0.004	0.098	0.033	0.005	0.005	0.080	0.023	0.004	0.004	0.055	0.013	0.002	0.003
	0.167	0.20	0.009	0.03	0.092	0.027	0.006	0.004	0.106	0.037	0.006	0.005	0.086	0.027	0.005	0.004	0.061	0.016	0.002	0.003
	0.181	0.22	0.009	0.03	0.101	0.030	0.007	0.005	0.126	0.047	0.007	0.006	0.095	0.032	0.006	0.004	0.066	0.017	0.003	0.003
	0.181	0.22	0.010	0.03	0.116	0.040	0.008	0.005	0.146	0.058	0.008	0.007	0.110	0.037	0.007	0.005	0.074	0.021	0.004	0.003
	0.195	0.23	0.010	0.03	0.133	0.052	0.008	0.007	0.155	0.068	0.008	0.008	0.125	0.041	0.008	0.005	0.080	0.022	0.004	0.004
	0.217	0.26	0.009	0.04	0.157	0.065	0.010	0.008	0.181	0.081	0.010	0.010	0.137	0.048	0.008	0.006	0.092	0.025	0.006	0.004
	0.246	0.29	0.010	0.04	0.165	0.083	0.009	0.010									0.093	0.025	0.006	0.004
	0.281	0.33	0.017	0.05													0.108	0.030	0.007	0.004
	0.343	0.41	0.019	0.07													0.108	0.030	0.007	0.004
																	0.119	0.035	0.008	0.005
																	0.130	0.042	0.008	0.005

Table A.20: Measurements for catch basin inlet #11 (S22x2) – double curb inlet frame with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.032	0.0013	0.001	2.5E-05	0.033	0.0013	0.001	2.6E-05	0.031	0.0013	0.001	2.6E-05	0.031	0.0012	0.001	2.4E-05
	0.036	0.0026	0.001	5.1E-05	0.038	0.0027	0.001	5.4E-05	0.035	0.0027	0.001	5.4E-05	0.035	0.0024	0.001	4.8E-05
	0.042	0.007	0.001	0.003	0.042	0.006	0.001	0.002	0.040	0.006	0.001	0.002	0.038	0.0035	0.001	7.1E-05
	0.055	0.016	0.001	0.003	0.055	0.013	0.001	0.003	0.048	0.011	0.001	0.003	0.046	0.006	0.001	0.002
	0.070	0.024	0.002	0.004	0.070	0.019	0.001	0.003	0.055	0.016	0.001	0.003	0.056	0.009	0.001	0.003
	0.088	0.033	0.002	0.005	0.087	0.027	0.001	0.004	0.071	0.021	0.002	0.004	0.073	0.016	0.002	0.003
	0.109	0.042	0.004	0.005	0.106	0.035	0.003	0.005	0.086	0.028	0.002	0.004	0.081	0.019	0.003	0.003
	0.123	0.049	0.005	0.006	0.116	0.041	0.004	0.005	0.095	0.033	0.003	0.004	0.090	0.022	0.003	0.004
	0.130	0.054	0.005	0.006	0.124	0.045	0.005	0.005	0.101	0.036	0.004	0.005	0.094	0.024	0.004	0.004
	0.156	0.067	0.007	0.008	0.141	0.058	0.006	0.007	0.107	0.041	0.006	0.005	0.104	0.027	0.005	0.004
	0.171	0.081	0.008	0.009	0.160	0.069	0.008	0.008	0.121	0.047	0.007	0.005	0.119	0.032	0.006	0.004
	0.185	0.095	0.007	0.011	0.171	0.078	0.008	0.009	0.133	0.051	0.007	0.006	0.132	0.036	0.007	0.005
	0.196	0.112	0.009	0.013	0.190	0.092	0.009	0.010	0.147	0.059	0.008	0.007	0.142	0.042	0.008	0.005

Table A.21: Measurements for catch basin inlet #12 (S28) – single curb inlet frame for CBMH with a cross-slope of 0.0% or 2.0%

cross-slope (%)	0.0				2.0				2.0				2.0				2.0			
Grade (%)	0.5				0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.012	0.0034	0.001	6.8E-05	0.016	0.0015	0.002	3.0E-05	0.015	0.0014	0.005	2.8E-05	0.014	0.0007	0.001	1.4E-05	0.014	0.0006	0.004	1.2E-05
	0.021	0.013	0.002	0.003	0.018	0.0028	0.002	5.6E-05	0.019	0.0022	0.003	4.4E-05	0.017	0.0015	0.001	3.0E-05	0.017	0.0013	0.001	2.5E-05
	0.046	0.026	0.002	0.004	0.024	0.0041	0.001	8.2E-05	0.024	0.0032	0.001	6.4E-05	0.021	0.0023	0.001	4.6E-05	0.018	0.0020	0.001	3.9E-05
	0.083	0.049	0.006	0.009	0.034	0.008	0.001	0.003	0.034	0.0051	0.001	1.0E-04	0.027	0.0041	0.001	8.2E-05	0.023	0.0037	0.001	7.3E-05
	0.109	0.060	0.005	0.011	0.043	0.010	0.002	0.003	0.034	0.007	0.001	0.003	0.034	0.008	0.001	0.003	0.031	0.008	0.001	0.003
	0.135	0.081	0.005	0.017	0.063	0.015	0.003	0.003	0.046	0.009	0.002	0.003	0.047	0.011	0.002	0.003	0.042	0.011	0.002	0.003
	0.153	0.093	0.005	0.019	0.086	0.018	0.004	0.004	0.064	0.012	0.003	0.003	0.061	0.014	0.003	0.003	0.052	0.013	0.002	0.003
	0.164	0.099	0.005	0.020	0.086	0.018	0.004	0.004	0.078	0.015	0.004	0.003	0.062	0.015	0.003	0.003	0.058	0.016	0.004	0.003
	0.204	0.13	0.004	0.03	0.096	0.021	0.005	0.004	0.089	0.019	0.005	0.004	0.069	0.017	0.004	0.004	0.063	0.018	0.004	0.004
	0.252	0.16	0.005	0.03	0.107	0.023	0.005	0.004	0.098	0.022	0.005	0.004	0.074	0.019	0.004	0.004	0.078	0.021	0.005	0.004
	0.292	0.20	0.005	0.04	0.132	0.028	0.007	0.005	0.116	0.027	0.006	0.004	0.083	0.022	0.006	0.004	0.093	0.025	0.007	0.004
	0.331	0.21	0.005	0.04	0.132	0.028	0.007	0.005	0.133	0.032	0.008	0.004	0.083	0.022	0.006	0.004	0.103	0.028	0.008	0.004
	0.352	0.22	0.004	0.03	0.141	0.035	0.007	0.006	0.141	0.038	0.007	0.005	0.097	0.026	0.007	0.004	0.112	0.031	0.009	0.005
					0.141	0.035	0.007	0.006	0.167	0.044	0.009	0.005	0.098	0.025	0.007	0.004				
					0.142	0.036	0.007	0.006					0.098	0.025	0.007	0.004				
					0.154	0.042	0.008	0.007					0.099	0.026	0.006	0.004				
					0.194	0.046	0.010	0.007					0.113	0.028	0.007	0.005				
					0.195	0.048	0.009	0.008					0.125	0.032	0.008	0.005				
					0.195	0.048	0.009	0.008					0.126	0.031	0.008	0.005				
													0.126	0.030	0.008	0.005				
													0.127	0.030	0.008	0.005				

Table A.22: Measurements for catch basin inlet #12 (S28) – single curb inlet frame for CBMH with a cross-slope of 4.0%

cross-slope (%)	4.0				4.0				4.0				4.0			
Grade (%)	0.5				1.0				2.5				5.0			
	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)	depth	Catchment	Δ(depth)	Δ(flow)
	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
	0.020	0.0013	0.001	2.6E-05	0.019	0.0012	0.001	2.4E-05	0.017	0.0009	0.001	1.8E-05	0.018	0.0008	0.001	1.6E-05
	0.024	0.0028	0.001	5.5E-05	0.023	0.0025	0.001	5.0E-05	0.019	0.0017	0.001	3.5E-05	0.020	0.0015	0.001	3.1E-05
	0.029	0.0048	0.001	9.6E-05	0.027	0.0037	0.001	7.4E-05	0.023	0.0028	0.001	5.6E-05	0.023	0.0024	0.001	4.8E-05
	0.029	0.006	0.001	0.003	0.041	0.008	0.001	0.003	0.035	0.007	0.001	0.002	0.032	0.0044	0.001	8.7E-05
	0.043	0.010	0.001	0.003	0.057	0.011	0.001	0.003	0.043	0.009	0.001	0.003	0.041	0.009	0.001	0.003
	0.056	0.014	0.001	0.003	0.074	0.016	0.002	0.003	0.056	0.013	0.001	0.003	0.057	0.013	0.002	0.003
	0.075	0.020	0.002	0.004	0.093	0.020	0.003	0.004	0.067	0.016	0.002	0.003	0.065	0.015	0.002	0.003
	0.098	0.024	0.004	0.004	0.104	0.024	0.004	0.004	0.079	0.019	0.003	0.004	0.075	0.018	0.003	0.004
	0.112	0.027	0.005	0.004	0.110	0.026	0.005	0.004	0.085	0.021	0.003	0.004	0.081	0.020	0.004	0.004
	0.117	0.029	0.005	0.004	0.127	0.032	0.006	0.005	0.094	0.025	0.006	0.004	0.089	0.023	0.005	0.004
	0.145	0.035	0.006	0.005	0.147	0.039	0.007	0.005	0.107	0.029	0.007	0.004	0.100	0.028	0.006	0.004
	0.157	0.043	0.007	0.006	0.155	0.045	0.007	0.005	0.120	0.033	0.008	0.005	0.114	0.032	0.007	0.005
	0.171	0.050	0.007	0.007	0.176	0.051	0.008	0.006	0.133	0.037	0.008	0.005	0.124	0.036	0.007	0.005
	0.183	0.057	0.009	0.008												

B. Appendix – Calculated catch basin rating curve data tables

This appendix includes all of the calculated catch basin rating curve data. The data has been calculated using the parameters that were obtained in Table 4 and Section 5. We assume zero inflow at a zero incident water depth. This is a reasonable assumption but may not be perfect due to surface roughness of the roadway and the height at which the inlet is installed.

The calculated best fit catchment flow values for inlet #1, single round herringbone are included in Table B.1. They were obtained using the function parameters from Table 4. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 4.

Table B.1: Catch Basin inlet #1 (OPSD 400.070) – Single round herringbone

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010						0.0008						
0.015				0.0014	0.0018	0.0019						0.0007
0.020	0.0009	0.0017	0.0024	0.0052	0.0035	0.0056		0.0015	0.0020	0.0021	0.0029	0.0024
0.025	0.0025	0.0046	0.0066	0.012	0.0060	0.011	0.0013	0.0033	0.0041	0.0047	0.0069	0.0053
0.030	0.0055	0.0093	0.013	0.017	0.0093	0.016	0.0027	0.0057	0.0071	0.0083	0.011	0.0093
0.035	0.0086	0.016	0.019	0.021	0.013	0.021	0.0046	0.0087	0.011	0.013	0.015	0.013
0.040	0.012	0.020	0.024	0.025	0.018	0.025	0.0070	0.012	0.015	0.018	0.018	0.017
0.045	0.015	0.024	0.028	0.029	0.023	0.029	0.010	0.016	0.021	0.021	0.022	0.021
0.050	0.019	0.027	0.032	0.033	0.029	0.032	0.013	0.021	0.027	0.025	0.026	0.024
0.055	0.022	0.031	0.037	0.037	0.035	0.035	0.017	0.026	0.030	0.028	0.029	0.027
0.060	0.026	0.035	0.041	0.040	0.038	0.038	0.020	0.030	0.033	0.031	0.033	0.031
0.065	0.030	0.038	0.045	0.044	0.041	0.040	0.023	0.033	0.036	0.035	0.036	0.034
0.070	0.034	0.042	0.048	0.047	0.043	0.042	0.027	0.036	0.039	0.038	0.039	0.037
0.075	0.038	0.046	0.052	0.050	0.045	0.043	0.030	0.038	0.043	0.042	0.042	0.040
0.080	0.042	0.049	0.055	0.053	0.047		0.033	0.041	0.046	0.045	0.045	0.043
0.085	0.046	0.053	0.059	0.055			0.037	0.044	0.049	0.048	0.048	0.045
0.090	0.050	0.057	0.062	0.058			0.040	0.047	0.052	0.052	0.051	0.048
0.095	0.055	0.061	0.065				0.043	0.050	0.055	0.055	0.054	0.051
0.100	0.060	0.064	0.068				0.047	0.053	0.058	0.058	0.057	0.053
0.105	0.064	0.068					0.050	0.056	0.062	0.062	0.059	
0.110	0.069	0.072					0.053	0.059	0.065	0.065	0.062	
0.115	0.074	0.075					0.057	0.062	0.068	0.069		
0.120	0.079						0.060	0.065	0.071			
0.125							0.063	0.068	0.074			
0.130							0.067	0.071				
0.135							0.070	0.074				
0.140							0.073	0.077				
0.145							0.077					
0.150							0.080					
intercept	0.0024	0.016	0.016	0.013	0.0339	0.0026	0.010	0.027	0.027	0.017	0.0026	0.0041
min	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007
max	0.083	0.076	0.069	0.058	0.047	0.044	0.081	0.079	0.077	0.071	0.063	0.055

The calculated best fit catchment flow values for inlet #2, double round herringbone are included in Table B.2. They were obtained using the function parameters from Table 5. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 5.

Table B.2: Catch Basin inlet #2 (OPSD 400.070) – Double round herringbone

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010						0.0008						
0.015		0.0010	0.0016	0.0013	0.0020	0.0015						0.0026
0.020	0.0014	0.0033	0.0045	0.0041	0.0050	0.0047		0.0016	0.0007	0.0025	0.0025	0.0057
0.025	0.0029	0.0072	0.0081	0.0091	0.0095	0.010	0.0015	0.0042	0.0021	0.0062	0.0062	0.010
0.030	0.0050	0.013	0.012	0.017	0.016	0.018	0.0027	0.0073	0.0066	0.010	0.011	0.015
0.035	0.0077	0.019	0.018	0.025	0.023	0.028	0.0045	0.011	0.013	0.015	0.016	0.022
0.040	0.011	0.025	0.023	0.034	0.033	0.038	0.0070	0.015	0.020	0.019	0.021	0.029
0.045	0.014	0.031	0.030	0.042	0.043	0.047	0.010	0.020	0.026	0.025	0.028	0.037
0.050	0.019	0.038	0.037	0.051	0.052	0.056	0.014	0.026	0.033	0.030	0.035	0.045
0.055	0.023	0.044	0.046	0.059	0.061	0.064	0.018	0.032	0.039	0.036	0.043	0.053
0.060	0.029	0.050	0.054	0.068	0.069	0.072	0.023	0.039	0.046	0.043	0.051	0.061
0.065	0.034	0.056	0.063	0.076	0.076	0.079	0.029	0.046	0.052	0.051	0.059	0.069
0.070	0.041	0.062	0.070	0.084	0.084	0.086	0.036	0.052	0.059	0.059	0.067	0.077
0.075	0.047	0.069	0.078	0.093	0.090	0.092	0.043	0.058	0.065	0.067	0.075	0.084
0.080	0.055	0.075	0.084	0.101	0.096		0.049	0.064	0.072	0.076	0.083	0.092
0.085	0.065	0.081	0.091	0.110			0.056	0.070	0.078	0.084	0.091	0.100
0.090	0.076	0.087	0.096				0.063	0.077	0.085	0.092	0.099	0.108
0.095	0.086	0.094	0.102				0.069	0.084	0.091	0.101	0.107	
0.100	0.095	0.100	0.106				0.076	0.092	0.098	0.109	0.115	
0.105	0.103	0.106					0.083	0.099	0.104	0.117	0.122	
0.110	0.110	0.112					0.089	0.107	0.111	0.126		
0.115	0.117	0.119					0.096	0.115	0.117	0.134		
0.120	0.122						0.103	0.124	0.124			
0.125							0.109	0.133	0.130			
0.130							0.116	0.142	0.137			
0.135							0.123	0.151				
0.140							0.129	0.161				
0.145							0.136					
0.150							0.143					
intercept	0.058	0.013	0.050	0.017	0.032	0.023	0.024	0.048	0.0034	0.044	0.038	0.020
min	0.0006	0.0009	0.0003	0.0008	0.0008	0.0008	0.0010	0.0008	0.0008	0.0007	0.0009	0.0007
max	0.127	0.121	0.108	0.116	0.098	0.095	0.146	0.166	0.138	0.141	0.130	0.110

The calculated best fit catchment flow values for inlet #3, single square herringbone are included in Table B.3. They were obtained using the function parameters from Table 6. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 6.

Table B.3: Catch Basin inlet #3 (OPSD 400.020) – Single square herringbone

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010					0.0012	0.0016					0.0007	
0.015			0.0019	0.0020	0.0031	0.0030			0.0011	0.0013	0.0012	0.0017
0.020		0.0025	0.0048	0.0059	0.0049	0.0045		0.0018	0.0026	0.0033	0.0028	0.0031
0.025	0.0019	0.0047	0.0093	0.012	0.011	0.010	0.0015	0.0037	0.0056	0.0076	0.0053	0.0055
0.030	0.0038	0.0073	0.015	0.018	0.017	0.017	0.0030	0.0063	0.010	0.013	0.0088	0.0089
0.035	0.0063	0.010	0.020	0.023	0.023	0.023	0.0050	0.010	0.016	0.017	0.013	0.013
0.040	0.0094	0.016	0.025	0.029	0.029	0.029	0.0076	0.014	0.023	0.022	0.019	0.018
0.045	0.013	0.021	0.030	0.034	0.034	0.034	0.011	0.019	0.027	0.027	0.024	0.024
0.050	0.017	0.026	0.035	0.038	0.039	0.039	0.014	0.023	0.031	0.031	0.029	0.029
0.055	0.022	0.031	0.039	0.043	0.043	0.043	0.018	0.028	0.034	0.035	0.033	0.034
0.060	0.026	0.035	0.044	0.047	0.047	0.047	0.022	0.032	0.038	0.039	0.038	0.039
0.065	0.030	0.040	0.048	0.051	0.051	0.051	0.026	0.036	0.041	0.043	0.042	0.044
0.070	0.034	0.044	0.052	0.054	0.054	0.054	0.030	0.040	0.045	0.047	0.047	0.048
0.075	0.039	0.048	0.055	0.057	0.056	0.057	0.034	0.043	0.049	0.051	0.050	0.052
0.080	0.043	0.052	0.059	0.060	0.058		0.038	0.047	0.052	0.055	0.054	0.056
0.085	0.047	0.056	0.062	0.063			0.041	0.051	0.056	0.058	0.058	0.059
0.090	0.051	0.059	0.065	0.065			0.045	0.054	0.059	0.062	0.061	0.063
0.095	0.056	0.063	0.068				0.049	0.057	0.063	0.065	0.064	0.066
0.100	0.060	0.066					0.052	0.061	0.066	0.068	0.067	
0.105	0.064	0.069					0.056	0.064	0.070	0.071	0.070	
0.110	0.068	0.072					0.059	0.067	0.073	0.074		
0.115	0.073						0.063	0.070	0.077			
0.120	0.077						0.066	0.072	0.080			
0.125							0.070	0.075				
0.130							0.073	0.077				
0.135							0.077	0.080				
0.140							0.080	0.082				
0.145							0.083					
intercept	0.012	0.010	0.0068	0.0067	0.0052	0.0048	0.012	0.0086	0.024	0.0047	0.015	0.016
min	0.0009	0.0010	0.0011	0.0008	0.0008	0.0011	0.0010	0.0008	0.0008	0.0010	0.0008	0.0012
max	0.078	0.073	0.070	0.066	0.058	0.058	0.086	0.082	0.082	0.076	0.071	0.068

The calculated best fit catchment flow values for inlet #4, double square herringbone are included in Table B.4. They were obtained using the function parameters from Table 7. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 7.

Table B.4: Catch Basin inlet #4 (OPSD 400.020) – Double square herringbone

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.005												
0.010			0.0007	0.0007	0.0009	0.0014						
0.015		0.0020	0.0022	0.0041	0.0037	0.0036				0.0019	0.0014	0.0014
0.020	0.0022	0.0050	0.0066	0.0089	0.0082	0.0077	0.0010	0.0023	0.0030	0.0050	0.0042	0.0037
0.025	0.0046	0.0086	0.014	0.015	0.014	0.014	0.0025	0.0046	0.0065	0.0088	0.0079	0.0071
0.030	0.0077	0.013	0.021	0.022	0.022	0.023	0.0045	0.0076	0.011	0.013	0.013	0.012
0.035	0.012	0.018	0.028	0.031	0.031	0.034	0.0069	0.011	0.018	0.018	0.018	0.017
0.040	0.016	0.024	0.035	0.041	0.042	0.043	0.010	0.016	0.025	0.024	0.024	0.024
0.045	0.020	0.031	0.042	0.050	0.053	0.052	0.013	0.021	0.032	0.030	0.032	0.032
0.050	0.024	0.037	0.049	0.059	0.062	0.061	0.017	0.027	0.039	0.037	0.040	0.042
0.055	0.029	0.044	0.056	0.068	0.071	0.069	0.021	0.034	0.046	0.045	0.049	0.052
0.060	0.034	0.051	0.063	0.076	0.079	0.076	0.026	0.041	0.053	0.053	0.059	0.062
0.065	0.040	0.057	0.070	0.085	0.086	0.083	0.031	0.048	0.061	0.062	0.070	0.072
0.070	0.046	0.064	0.077	0.094	0.092	0.089	0.037	0.056	0.068	0.076	0.080	0.080
0.075	0.053	0.071	0.084	0.103	0.097		0.043	0.063	0.075	0.089	0.089	0.088
0.080	0.061	0.077	0.092	0.112			0.050	0.070	0.082	0.102	0.097	0.095
0.085	0.069	0.084	0.099	0.121			0.058	0.078	0.089	0.113	0.105	0.102
0.090	0.078	0.091	0.106				0.067	0.085	0.097	0.124	0.112	0.107
0.095	0.087	0.097	0.113				0.076	0.092	0.104	0.133	0.118	0.111
0.100	0.096	0.104					0.085	0.100	0.111	0.140	0.124	
0.105	0.107	0.111					0.093	0.107	0.118	0.147		
0.110	0.118	0.117					0.102	0.114	0.125	0.152		
0.115	0.129						0.111	0.122	0.132			
0.120	0.141						0.120	0.129	0.140			
0.125							0.129	0.136				
0.130							0.138	0.144				
0.135							0.146	0.151				
0.140							0.155	0.159				
intercept	0.015	0.028	0.014	0.041	0.038	0.017	0.053	0.028	0.019	0.065	0.075	0.051
min	0.0006	0.0008	0.0007	0.0006	0.0007	0.0011	0.0007	0.0011	0.0011	0.0007	0.0007	0.0007
max	0.149	0.120	0.115	0.122	0.100	0.093	0.163	0.160	0.146	0.154	0.129	0.114

The calculated best fit catchment flow values for inlet #5, single square grate with horizontal bars are included in Table B.5. They were obtained using the function parameters from Table 8. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions, where applicable, are also found in Table 8.

Table B.5: Catch Basin inlet #5 (MT-310) – Single square with horizontal bars

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010												
0.015			0.0013	0.0021	0.0005	0.0022	0.0002	0.0001		0.0013	0.0015	
0.020	0.0005	0.0022	0.0048	0.0053	0.0061	0.0064	0.0005	0.0007	0.0008	0.0043	0.0035	0.0035
0.025	0.0024	0.0047	0.012	0.010	0.011	0.011	0.0013	0.0019	0.0041	0.0072	0.0058	0.0069
0.030	0.0046	0.0080	0.017	0.016	0.017	0.015	0.0024	0.0039	0.011	0.011	0.0083	0.010
0.035	0.0069	0.012	0.023	0.023	0.022	0.019	0.0040	0.0067	0.014	0.015	0.012	0.014
0.040	0.0094	0.017	0.028	0.028	0.026	0.025	0.0061	0.011	0.018	0.020	0.017	0.017
0.045	0.012	0.022	0.033	0.033	0.031	0.031	0.0085	0.014	0.021	0.024	0.022	0.021
0.050	0.015	0.027	0.038	0.038	0.035	0.036	0.011	0.018	0.025	0.028	0.026	0.026
0.055	0.018	0.032	0.042	0.042	0.039	0.040	0.015	0.022	0.028	0.031	0.031	0.031
0.060	0.021	0.037	0.046	0.046	0.043	0.044	0.018	0.026	0.032	0.035	0.035	0.035
0.065	0.024	0.042	0.050	0.049	0.047	0.047	0.022	0.029	0.036	0.039	0.039	0.039
0.070	0.028	0.046	0.054	0.053	0.050	0.050	0.025	0.033	0.039	0.042	0.043	0.043
0.075	0.032	0.050	0.057	0.056	0.053	0.052	0.029	0.036	0.043	0.046	0.046	0.046
0.080	0.036	0.054	0.060	0.058	0.056		0.032	0.040	0.046	0.049	0.050	0.050
0.085	0.040	0.058	0.063	0.060			0.035	0.044	0.050	0.053	0.053	0.052
0.090	0.044	0.061	0.066	0.062			0.039	0.047	0.053	0.056	0.056	0.055
0.095	0.048	0.064	0.068				0.042	0.050	0.057	0.059	0.058	0.057
0.100	0.053	0.068					0.046	0.054	0.061	0.062	0.061	0.059
0.105	0.058	0.071					0.049	0.057	0.064	0.065	0.063	
0.110	0.063	0.073					0.053	0.061	0.068	0.068		
0.115	0.068						0.056	0.064	0.071			
0.120	0.073						0.060	0.067	0.075			
0.125							0.063	0.070				
0.130							0.066	0.074				
0.135							0.070	0.077				
0.140							0.073					
0.145							0.077					
0.150							0.080					
intercept		0.014	0.0094	0.023		0.018	0.012	0.0062	0.010	0.0080	0.010	0.019
min	0.0004	0.0008	0.0012	0.0007	0.0004	0.0007	0.00014	0.0001	0.00077	0.0012	0.0010	0.0010
max	0.076	0.074	0.070	0.063	0.058	0.053	0.083	0.080	0.078	0.070	0.065	0.060

The calculated best fit catchment flow values for inlet #6, high capacity inlet are included in Table B.6. They were obtained using the function parameters from Table 9. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions, where applicable, are also found in Table 9.

Table B.6: Catch Basin inlet #6 (Stepcon 5103) – High capacity inlet

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)											
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.005												
0.010						0.0015						
0.015				0.0024	0.0029	0.0036					0.001	
0.020	0.0021	0.0041	0.0057	0.0060	0.0069	0.0074		0.001	0.003	0.004	0.004	0.003
0.025	0.0046	0.0079	0.011	0.012	0.013	0.013	0.002	0.004	0.006	0.009	0.007	0.007
0.030	0.0077	0.013	0.017	0.019	0.022	0.020	0.0033	0.0077	0.011	0.014	0.012	0.011
0.035	0.011	0.018	0.025	0.029	0.033	0.032	0.0054	0.012	0.016	0.020	0.019	0.017
0.040	0.015	0.024	0.033	0.040	0.047	0.049	0.0082	0.017	0.022	0.027	0.026	0.024
0.045	0.020	0.031	0.042	0.054	0.063	0.067	0.011	0.022	0.029	0.034	0.035	0.033
0.050	0.025	0.038	0.052	0.070	0.080	0.084	0.015	0.028	0.036	0.043	0.046	0.042
0.055	0.031	0.047	0.063	0.086	0.098	0.102	0.020	0.034	0.044	0.052	0.057	0.058
0.060	0.038	0.056	0.075	0.102	0.115	0.119	0.025	0.041	0.054	0.062	0.072	0.079
0.065	0.045	0.065	0.088	0.119	0.133	0.137	0.031	0.049	0.064	0.072	0.090	0.100
0.070	0.052	0.076	0.102	0.135	0.150	0.154	0.037	0.057	0.074	0.084	0.109	0.120
0.075	0.060	0.087	0.117	0.152	0.168	0.172	0.044	0.066	0.086	0.100	0.128	0.141
0.080	0.074	0.099	0.133	0.168	0.185	0.190	0.052	0.076	0.098	0.121	0.147	0.161
0.085	0.088	0.112	0.149	0.185			0.060	0.086	0.112	0.141	0.165	0.182
0.090	0.101	0.125	0.167	0.201			0.069	0.097	0.126	0.161	0.184	0.202
0.095	0.115	0.139	0.185				0.078	0.108	0.140	0.182	0.203	0.223
0.100	0.129	0.154	0.205				0.088	0.120	0.156	0.202	0.222	0.244
0.105	0.143	0.169					0.099	0.132	0.172	0.222	0.240	
0.110	0.156	0.186					0.110	0.145	0.190	0.243	0.259	
0.115	0.170						0.122	0.159	0.208	0.263		
0.120	0.184						0.134	0.173	0.226			
0.125							0.147	0.188	0.246			
0.130							0.161	0.203				
0.135							0.175	0.219				
0.140							0.190	0.236				
0.145							0.206					
0.150							0.222					
intercept	0.060			0.069	0.065	0.025				0.090	0.067	0.047
min	0.0006	0.0013	0.0014	0.0008	0.0014	0.0010	0.0010	0.0002	0.0007	0.0008	0.0008	0.0009
max	0.191	0.196	0.209	0.202	0.200	0.192	0.227	0.249	0.261	0.269	0.262	0.262

The calculated best fit catchment flow values for inlet #7, circular open cover are included in Table B.7. They were obtained using the function parameters from Table 10. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 10.

Table B.7: Catch Basin inlet #7 (OPSD 401.010) – Circular open cover

cross-slope (%)	2.0	2.0	2.0	2.0	2.0	2.0
Grade (%)	0.5	1.0	2.5	5.0	7.5	10.0
depth (m)	Catchment (m3/s)					
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010						
0.015			0.0011	0.0018	0.0012	0.0031
0.020	0.0014	0.0024	0.0039	0.0058	0.0055	0.0055
0.025	0.0030	0.0057	0.0074	0.0099	0.0090	0.0086
0.030	0.0054	0.0090	0.012	0.014	0.012	0.012
0.035	0.0085	0.012	0.016	0.017	0.015	0.014
0.040	0.012	0.016	0.018	0.019	0.018	0.017
0.045	0.014	0.018	0.020	0.021	0.021	0.019
0.050	0.016	0.021	0.022	0.022	0.023	0.021
0.055	0.018	0.023	0.024	0.024	0.025	0.023
0.060	0.021	0.025	0.026	0.026	0.026	0.025
0.065	0.023	0.027	0.028	0.027	0.028	0.026
0.070	0.025	0.028	0.029	0.028	0.029	0.027
0.075	0.027	0.030	0.031	0.030	0.029	0.028
0.080	0.029	0.032	0.032	0.031	0.030	0.028
0.085	0.031	0.033	0.034	0.032		
0.090	0.033	0.035	0.035	0.033		
0.095	0.035	0.036	0.036			
0.100	0.036	0.037	0.037			
0.105	0.038	0.038				
0.110	0.040	0.039				
0.115	0.042	0.040				
0.120	0.043					
intercept	0.011	0.017	0.015	0.015	0.0047	0.0061
min	0.0007	0.0005	0.0009	0.0008	0.0007	0.0007
max	0.045	0.040	0.038	0.033	0.030	0.028

The calculated best fit catchment flow values for inlet #8, circular closed cover are included in Table B.8 were obtained using the function parameters from Table 11. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 11.

Table B.8: Catch Basin inlet #8 (OPSD 401.010) – Circular closed cover

cross-slope (%)	2.0	2.0
Grade (%)	0.5	2.5
depth (m)	Catchment (m3/s)	
0.000	0.000	0.000
0.015		
0.020	0.0006	0.0005
0.025	0.0009	0.0007
0.030	0.0010	0.0008
0.035	0.0011	0.0009
0.040	0.0012	0.0010
0.045	0.0012	0.0010
0.050	0.0013	0.0011
0.055	0.0014	0.0011
0.060	0.0015	0.0011
0.065	0.0015	0.0011
0.070	0.0016	0.0011
0.075	0.0017	0.0012
0.080	0.0018	0.0012
0.085	0.0018	0.0013
0.090	0.0019	0.0013
0.095	0.0020	0.0014
0.100	0.0020	0.0014
0.105	0.0021	
0.110	0.0022	
0.115	0.0023	
0.120	0.0023	
intercept	0.0009	0.0011
min	0.0005	0.0004
max	0.0024	0.0014

The calculated best fit catchment flow values for inlet #9, the S19 “FISH” round catch basin cover are included in Table B.9. They were obtained using the function parameters from Table 12. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions are also found in Table 12.

Table B.9: Catch Basin inlet #9 (DWG. No. S19) – “FISH” round catch basin cover

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
depth (m)	Catchment (m^3/s)								
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010			0.0004						
0.015	0.004		0.0005	0.0005	0.0028				
0.020	0.009	0.0009	0.003	0.003	0.007				0.002
0.025	0.014	0.003	0.007	0.010	0.012	0.002	0.003	0.003	0.005
0.030	0.019	0.007	0.013	0.017	0.017	0.004	0.006	0.008	0.012
0.035	0.024	0.012	0.021	0.022	0.022	0.006	0.011	0.017	0.018
0.040	0.029	0.017	0.025	0.025	0.026	0.010	0.016	0.021	0.021
0.045	0.034	0.020	0.028	0.029	0.031	0.014	0.021	0.024	0.025
0.050	0.039	0.024	0.032	0.033	0.034	0.018	0.025	0.027	0.028
0.055	0.044	0.027	0.035	0.036	0.038	0.022	0.029	0.030	0.031
0.060	0.049	0.030	0.038	0.039	0.041	0.026	0.033	0.033	0.034
0.065	0.054	0.034	0.042	0.043	0.044	0.029	0.037	0.035	0.037
0.070	0.059	0.037	0.045	0.045	0.047	0.033	0.040	0.038	0.041
0.075	0.064	0.041	0.048	0.048	0.049	0.036	0.044	0.041	0.044
0.080	0.069	0.044	0.051	0.051	0.051	0.040	0.047	0.044	0.047
0.085	0.074	0.047	0.054	0.053	0.053	0.043	0.050	0.047	0.050
0.090	0.078	0.051	0.057	0.056		0.046	0.053	0.050	0.053
0.095	0.083	0.054	0.059	0.058		0.049	0.056	0.053	0.057
0.100	0.088	0.058	0.062	0.060		0.052	0.059	0.056	0.060
0.105	0.093	0.061	0.065			0.055	0.061	0.059	0.063
0.110	0.098	0.064	0.067			0.058	0.063	0.061	0.066
0.115	0.103	0.068				0.060	0.066	0.064	
0.120	0.108	0.071				0.063	0.068	0.067	
0.125	0.113					0.065	0.070	0.070	
0.130	0.118					0.068	0.072		
0.135	0.120					0.070	0.074		
0.140	0.122					0.072	0.075		
0.145	0.124					0.074			
0.150	0.125					0.076			
0.160	0.129								
0.170	0.132								
0.180	0.136								
0.190	0.139								
0.200	0.142								
0.220	0.149								
0.240	0.156								
0.260	0.163								
0.280	0.17								
0.300	0.18								
0.320	0.18								
0.340	0.19								
intercept	0.119	0.016	0.020	0.016	0.005	0.010	0.021	0.019	0.017
min	0.0013	0.00013	0.0005	0.0004	0.00002	0.0014	0.0013	0.0011	0.0013
max	0.192	0.074	0.069	0.060	0.053	0.080	0.076	0.072	0.068

The calculated best fit catchment flow values for inlet #10, the S22 single curb inlet frame are included in Table B.10. They were obtained using the function parameters from Table 13. The minimum and maximum

incident water depths as well as the intercept incident water depths between the two best fit functions, where applicable, are also found in Table 13.

Table B.10: Catch Basin inlet #10 (DWG. No. S22) – Single curb inlet frame

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
depth (m)	Catchment (m^3/s)								
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010					0.0006				
0.015	0.004			0.0008	0.0008				
0.020	0.007	0.0017	0.0012	0.002	0.0013	0.002	0.0013	0.0013	0.0010
0.025	0.009	0.003	0.002	0.002	0.002	0.003	0.002	0.002	0.002
0.030	0.012	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.002
0.035	0.015	0.005	0.004	0.004	0.004	0.006	0.004	0.005	0.003
0.040	0.018	0.006	0.005	0.005	0.006	0.007	0.005	0.006	0.004
0.045	0.021	0.008	0.006	0.006	0.007	0.008	0.007	0.008	0.005
0.050	0.024	0.009	0.007	0.007	0.008	0.010	0.008	0.009	0.006
0.055	0.027	0.010	0.008	0.008	0.009	0.011	0.009	0.010	0.007
0.060	0.030	0.011	0.009	0.010	0.010	0.012	0.011	0.011	0.009
0.065	0.034	0.012	0.010	0.011	0.011	0.014	0.012	0.013	0.010
0.070	0.037	0.013	0.011	0.012	0.012	0.015	0.013	0.014	0.011
0.075	0.040	0.014	0.012	0.014	0.013	0.017	0.015	0.015	0.013
0.080	0.043	0.015	0.013	0.015	0.014	0.018	0.016	0.016	0.014
0.085	0.047	0.016	0.015	0.016	0.015	0.019	0.017	0.017	0.015
0.090	0.050	0.017	0.016	0.017	0.016	0.021	0.019	0.019	0.017
0.095	0.053	0.019	0.017	0.018	0.017	0.022	0.020	0.020	0.018
0.100	0.057	0.020	0.018	0.019	0.018	0.023	0.021	0.021	0.019
0.105	0.060	0.021	0.020	0.020	0.019	0.025	0.022	0.022	0.021
0.110	0.064	0.022	0.021	0.021	0.020	0.026	0.024	0.024	0.022
0.115	0.067	0.023	0.022	0.022	0.021	0.027	0.025	0.025	0.023
0.120	0.071	0.025	0.024	0.023		0.029	0.026	0.026	0.025
0.125	0.075	0.026	0.025	0.024		0.030	0.028	0.027	0.026
0.130	0.078	0.027	0.026			0.032	0.029	0.029	
0.135	0.082	0.029	0.028			0.033	0.030	0.030	
0.140	0.086	0.030	0.029			0.034	0.032		
0.145	0.090	0.032	0.031			0.036	0.033		
0.150	0.093	0.033	0.033			0.037	0.034		
0.160	0.101	0.036	0.036			0.040	0.037		
0.170	0.109	0.040				0.043	0.040		
0.180	0.117					0.045			
0.190	0.125								
0.200	0.134								
0.220	0.151								
0.240	0.160								
0.260	0.162								
0.280	0.164								
0.300	0.166								
0.320	0.168								
0.340	0.17								
intercept	0.159	0.011		0.015	0.0009		0.004	0.006	0.006
min	0.002	0.0009	0.0006	0.0006	0.0006	0.0012	0.0010	0.0009	0.0008
max	0.170	0.040	0.038	0.024	0.021	0.047	0.041	0.030	0.027

The calculated best fit catchment flow values for inlet #11, the S22(x2) double curb inlet frame are included in Table B.11. They were obtained using the function parameters from Table 14. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions, where applicable, are also found in Table 14.

Table B.11: Catch Basin inlet #11 (DWG. No. S22) – Double curb inlet frame

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
depth (m)	Catchment (m^3/s)								
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.020		0.0016							
0.025		0.004							
0.030	0.018	0.006	0.003	0.003	0.002				
0.035	0.031	0.008	0.006	0.006	0.004	0.003	0.002	0.003	0.002
0.040	0.040	0.010	0.008	0.008	0.006	0.006	0.004	0.006	0.004
0.045	0.045	0.012	0.010	0.010	0.009	0.009	0.006	0.009	0.006
0.050	0.045	0.014	0.013	0.012	0.011	0.011	0.010	0.012	0.008
0.055	0.050	0.015	0.014	0.014	0.013	0.014	0.013	0.014	0.009
0.060	0.057	0.016	0.016	0.016	0.015	0.017	0.015	0.017	0.011
0.065	0.063	0.018	0.018	0.018	0.016	0.020	0.017	0.019	0.013
0.070	0.070	0.019	0.020	0.020	0.018	0.023	0.019	0.021	0.015
0.075	0.076	0.020	0.022	0.022	0.020	0.026	0.021	0.024	0.017
0.080	0.082	0.022	0.025	0.024	0.022	0.028	0.023	0.026	0.018
0.085	0.089	0.024	0.027	0.026	0.023	0.031	0.026	0.029	0.020
0.090	0.095	0.026	0.029	0.028	0.025	0.034	0.028	0.031	0.022
0.095	0.101	0.028	0.031	0.030	0.027	0.036	0.030	0.034	0.024
0.100	0.108	0.031	0.034	0.032	0.029	0.038	0.033	0.036	0.025
0.105	0.114	0.033	0.036	0.034	0.030	0.040	0.035	0.038	0.027
0.110	0.121	0.036	0.039	0.036	0.032	0.042	0.038	0.041	0.029
0.115	0.127	0.039	0.042	0.038	0.034	0.044	0.041	0.043	0.031
0.120	0.133	0.042	0.044	0.041	0.035	0.047	0.044	0.046	0.032
0.125	0.140	0.045	0.047	0.043	0.037	0.049	0.047	0.048	0.034
0.130	0.146	0.048	0.050	0.045		0.052	0.050	0.051	0.036
0.135	0.152	0.052	0.053	0.047		0.055	0.053	0.053	0.038
0.140	0.159	0.056	0.056			0.059	0.056	0.055	0.039
0.145	0.165	0.059	0.059			0.062	0.059	0.058	
0.150	0.17	0.063	0.062			0.066	0.063		
0.160	0.18	0.072	0.068			0.073	0.070		
0.170	0.20		0.075			0.082	0.077		
0.180	0.21		0.082			0.091	0.085		
0.190	0.22					0.101	0.093		
0.200	0.24								
0.220	0.26								
0.240	0.29								
0.260	0.31								
0.280	0.34								
0.300	0.36								
0.320	0.39								
0.340	0.41								
intercept	0.045	0.022	0.013	0.004	0.010	0.034	0.013	0.010	
min	0.004	0.0011	0.0015	0.0008	0.0013	0.0012	0.0013	0.0013	0.0012
max	0.42	0.076	0.083	0.048	0.039	0.107	0.093	0.059	0.040

The calculated best fit catchment flow values for inlet #12, the S28 single curb inlet frame for CBHM are included in Table B.12. They were obtained using the function parameters from Table 15. The minimum and maximum incident water depths as well as the intercept incident water depths between the two best fit functions, where applicable, are also found in Table 15.

Table B.12: Catch Basin inlet #12 (DWG. No. S28) – Single curb inlet frame for CBMH

cross-slope (%)	0.0	2.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0
Grade (%)	0.5	0.5	1.0	2.5	5.0	0.5	1.0	2.5	5.0
depth (m)	Catchment (m^3/s)								
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.015	0.006			0.0009	0.0008				
0.020	0.009	0.003	0.002	0.002	0.002	0.001	0.001	0.002	0.001
0.025	0.012	0.005	0.003	0.004	0.005	0.003	0.003	0.003	0.003
0.030	0.015	0.006	0.004	0.005	0.007	0.005	0.005	0.005	0.004
0.035	0.018	0.007	0.005	0.007	0.009	0.007	0.007	0.007	0.006
0.040	0.021	0.009	0.006	0.009	0.011	0.009	0.008	0.008	0.007
0.045	0.024	0.010	0.008	0.010	0.012	0.010	0.009	0.010	0.009
0.050	0.028	0.011	0.009	0.012	0.013	0.012	0.010	0.011	0.011
0.055	0.031	0.012	0.010	0.013	0.015	0.014	0.011	0.013	0.012
0.060	0.034	0.014	0.011	0.015	0.016	0.016	0.012	0.014	0.014
0.065	0.037	0.015	0.012	0.016	0.018	0.018	0.013	0.016	0.016
0.070	0.040	0.015	0.014	0.018	0.019	0.020	0.014	0.017	0.017
0.075	0.044	0.016	0.015	0.019	0.020	0.020	0.016	0.019	0.019
0.080	0.047	0.017	0.016	0.021	0.022	0.021	0.017	0.020	0.021
0.085	0.050	0.019	0.018	0.022	0.023	0.022	0.018	0.022	0.022
0.090	0.053	0.020	0.019	0.023	0.025	0.022	0.020	0.023	0.024
0.095	0.057	0.021	0.021	0.024	0.026	0.023	0.021	0.025	0.026
0.100	0.060	0.023	0.022	0.026	0.027	0.024	0.023	0.026	0.027
0.105	0.063	0.024	0.024	0.027	0.029	0.025	0.024	0.028	0.029
0.110	0.067	0.025	0.025	0.028	0.030	0.027	0.026	0.029	0.031
0.115	0.070	0.027	0.027	0.029		0.028	0.028	0.031	0.032
0.120	0.073	0.028	0.029	0.030		0.029	0.029	0.032	0.034
0.125	0.077	0.029	0.030	0.031		0.031	0.031	0.034	
0.130	0.080	0.030	0.032			0.032	0.033	0.035	
0.135	0.083	0.032	0.034			0.034	0.035		
0.140	0.087	0.033	0.035			0.036	0.037		
0.145	0.090	0.034	0.037			0.038	0.039		
0.150	0.093	0.036	0.039			0.040	0.041		
0.160	0.100	0.038	0.043			0.044	0.045		
0.170	0.107	0.041				0.049	0.050		
0.180	0.114	0.044				0.054			
0.190	0.121	0.046							
0.200	0.128								
0.220	0.142								
0.240	0.156								
0.260	0.171								
0.280	0.186								
0.300	0.200								
0.320	0.21								
0.340	0.21								
intercept	0.206	0.017		0.006	0.008	0.020	0.008		0.006
min	0.004	0.0018	0.0014	0.0008	0.0006	0.0014	0.0013	0.0010	0.0010
max	0.22	0.048	0.046	0.031	0.031	0.056	0.052	0.036	0.035