Drainage Report

For:

Karam Retail Center
1485 West Northfield Drive
SE quadrant of Northfield Drive and County Road North 625 East
Brownsburg, Indiana

By:

Insight Engineering, Inc.
9755 Randall Drive
Suite 101A
Carmel, Indiana 46280

Date:

December 8, 2025

Project No. 2517

1.0 Technical Information

PROJECT: Karam Retail Center
1485 West Northfield Drive
SE quadrant of Northfield Drive and County Road North 625 East
Brownsburg, Indiana

PREPARED BY: Donald W. Fisher, PE
Insight Engineering, Inc.
9755 Randall Drive, Suite101A
Carmel, Indiana
IEI Project No. 2517

Site Location

The proposed project is located at approximately 1485 West Northfield Drive (the address hasn't been assigned). This development is on the south side of Northfield Drive, on the east side of CR North 625 East in north central Brownsburg, Indiana. The property contains 11.28 Acres.

Project Description

The scope of this development is to develop the vacant property by constructing a new retail center in phases, the first phase will be a convenience center with fuel sales. The project includes infrastructure for the center with paving for access drives and parking. The project will have about 1.0 acres of additional impermeable surface consisting of new pavement and buildings. A stormwater detention basin will be constructed along the southern portion of the site. There is Country Mark Coop gas pipeline that traverses the site on a diagonal that will be partially relocated.

Known Permitting History:

Previously this property has primarily been vacant. The site is currently zoned C-3 Heavy Commercial.

Known Zoning History:

The site is zoned C-3. No other zoning history is known.

Known Neighborhood Concerns:

Our observations and discussions with the owner revealed no current concerns regarding the project with regard to adjoiners for this property. The site is primarily located in an area of commercial and industrial/distribution facilities.

Observed Site Problem Areas:

The site is has a relatively mild slope from northwest to southeast, no areas of poor drainage were observed in and around the site. There is the remnants of North County Road 625 East along the western boundary of the site serving this site and the western adjoiner. This drive is to remain, there is a drainage ditch along east side of the drive that provides an outlet for the Sunbeam Rental Center detention basin near the northwest corner of the site. The drive dead ends near the south end of the site at the railroad tracks. There is a compacted aggregate drive serving the site in the northwest corner of the site connecting to the County Road near West Northfield Drive.

The dedicated right of way for North County Road 625 East extends south from Northfield drive to just past the Sunbeam Rental entrance drive.

Existing Site Conditions

The existing overall site is a 11.28 acre parcel. The existing site generally drains to the southeast corner of the property to an open drain/ Holloway Legal Drain. The Holloway ditch drains south under an old bridge that appears to have been for an abandoned road then continues south under the railroad track. It was further confirmed that the County Surveyor's office does not have this site designated as an impacted site requiring discharge levels less than their standard requirements of 0.20 cfs per acre for a 10-yr storm and 0.40 cfs per acre for a 100 year storm.

Proposed Storm Water Drainage and Detention System

The proposed on site storm water system will consist of regrading the site to direct runoff to a new network of drainage pipes routing the storm water through the proposed wet detention pond and discharging to the existing open Holloway Legal Drain at the southeast corner of the site. Other than the discharge from the Sunbeam Detention basin and a portion of the runoff from the western adjoiner to the existing ditch, there are no other areas where the adjoining sites drain onto the site except through the

Holloway Drain. The west adjoiners runoff will continue to be routed through swale on the east side of the former N CR 625 E and will continue to be directed to the railroad side ditch eventually discharging to the Holloway Drain. This water will not be routed through the proposed detention pond for this project.

The project disturbs more than an acre so a post construction storm water quality system is to be constructed as part of this project. An AquaSwirl AS-9 off line unit is proposed. The shallow nature of the Holloway Drain providing the outlet for the detention pond has severely impacted the storm system design. The accommodations include in the design include enlarged pipes to reduce the slope of the system and not matching pipe crowns within the majority of inlet structures. The Town requirements of a 0.10' fall through structures and a minimum of two feet of cover over the storm pipes have been incorporated into the design. The proposed detention is located at the southeastern most corner of the property which coincides with the existing lowest elevations of the site. The lot one project will disturb the 1.45 acre Lot 1, the entrance western entrance drive from Northfield, the detention pond and the storm trunk line from Lot 1 to the detention pond. The overall project will disturb nearly the entire property.

The proposed pipes were sized for greater than a 10 year storm runoff utilizing the rational method. The detention pond and drainage system was analyzed utilizing adICPR with the SCS Type II 24 hour storm. The pond outlet will be a rectangular inlet structure with multiple orifices to provide a discharge rates that meets the Town and County standards. By doing so we are able to reduce the outflow rate and have a 100 year elevation on the pond that is more than two feet below the proposed finish floor elevations of the proposed buildings.

The ICPR model includes weirs between the structures and for the perimeters of the paved areas to reflect the ability for storm water during larger rain events to move overland between the structures and over the edges of pavement in the event of pipe or inlet failures. This modification was also necessary to model the emergency flow option assuming the system is full from a 100 year storm at the beginning of another 100 year storm which could depend primarily on overflow weirs to discharge the storm water while maintaining at least one foot of freeboard elevation from the ponded 100 year elevations adjoining the building.

The site has 11.28 acres, the allowed discharge rates are 10-yr = 11.28 x 0.20 = 2.256 cfs and 100-yr = 11.28 x 0.40 = 4.512 cfs. Additionally, there are a few offsite areas that drain onto the site and drain through a roadside swale on the east side of the old N CR 625 E roadway and flowing to the south and discharging to the railroad side ditch flowing east

to the Holloway Legal Drain, we are not capturing this runoff and moving it through our pipe network and detention pond. Instead the offsite flow will bypass our drainage system continuing to flow as it currently exists.

This project will have discharge rates and pond elevations of:

2yr elevation = 848.23 with 8.66 cfs discharge
10yr elevation = 849.02 with 12.74 cfs discharge
25yr elevation = 849.46 with 16.08 cfs discharge
100yr elevation = 850.16 with 21.81 cfs discharge

Analysis of Proposed Conditions for a 100 year storm with a system occupied by a previous 100 year storm

As required by the Town, we prepared a modified ICPR model to model the emergency flow option assuming the system is full from a 100 year storm at the beginning of another 100 year storm which could depend primarily on overflow weirs between structures to discharge the storm water while maintaining at least one foot of freeboard elevation from potential ponded 100 year elevations adjoining the building. The results are presented in the attached ICPR report for Nodes min/max labeled Flood Levels with a 100 year Flood. The adICPR of the 100yr + 100yr storm results show that no overland flow occurs nor does the system pond above the grates on the parking or lot storage areas. Based on these results, no overland flow exhibit is provided.

Analysis of Inlet Casting Capacity

As required by the Town, some of the storm structures have been increased in size over what is required for the pipes to accommodate larger inlet grates. The Town requirement is to assume that 50% of the grate is blocked and determine if the grate has adequate capacity to accept the water coming to it in a 10yr event.

From the attached Rational method pipe calculation sheet you can determine that the inlet experiencing the most runoff is number 707 with a CA value of 0.19 giving a 10 yr runoff of 1.40 cfs assuming minimum time of concentration of 5 minutes. The Neenah casting specified is an R-1878-B10G. The attached Neenah table shows the free grate open areas for the castings as 4.9 sf for the 1878. Utilizing the attached Neenah nomograph for Discharge vs. Depth on grate for this casting results in the 1878 having a capacity of 16.37 cfs, reducing this by one half gives 8.185 cfs, exceeding the proposed worst case flow.

Analysis of Post Construction Water Quality Unit sizing, AquaSwirl XP-9

The post-construction storm water quality is being provided by an AquaSwirl XP-9 unit installed after the stormwater collections system but prior to discharge to the detention pond. To determine the unit sizing the contributing area curve numbers were all adjusted to 98.2 based on the percent impervious, then a one inch 24 hour storm was analyzed using adICPR resulting in a flow of 11.18 cfs. Per the AquaSwirl manufacturers sizing chart the XP-9 has the capacity to treat a flow of up to 21.2 cfs. We have attached these documents as well as the results of a study of the units by Tennessee Technical University as provided by Aquashield.

Conclusion

Drainage calculations are provided to show that the proposed development of the site and the storm water drainage system for the site are design to manage the runoff in a manner that is compliant to the Standards of the Town of Brownsburg.
The total existing impervious surface is 0.21 acres (9,150 sf) not including N CR 625 E.
The total proposed impervious surface for the Lot 1 project is 1.00 acres (43,560SF).
The increase in impervious surface is 0.79 acres.

Donald W. Fisher

Donald W. Fisher, P.E.

Soil Map—Hendricks County, Indiana
(Karam Retail Center, Northfield Dr, Brownsburg, IN (IEI#2517))

Map Scale: 1:1,640 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hendricks County, Indiana
Survey Area Data: Version 29, Sep 3, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2024—Jul 1, 2024

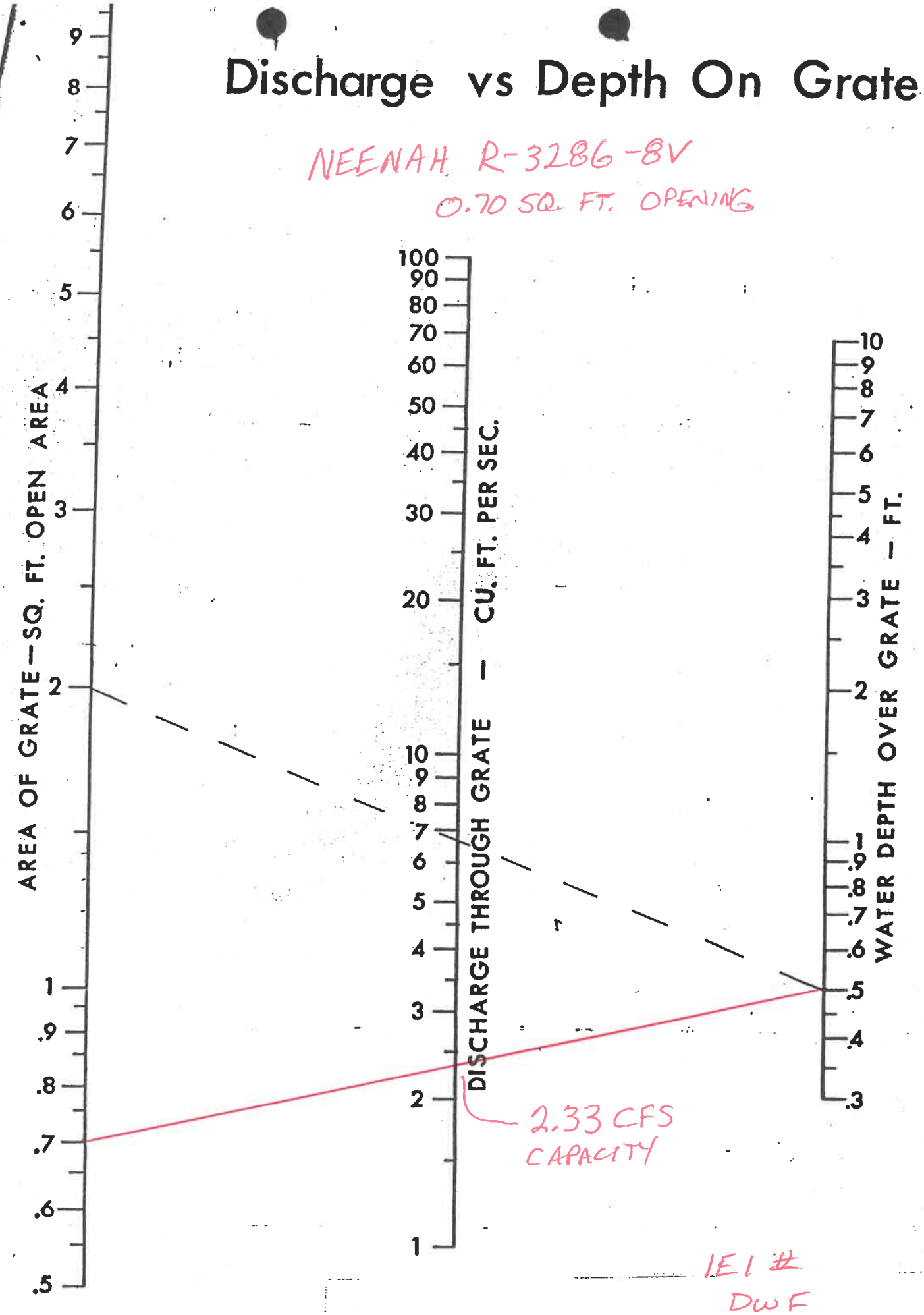
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	4.8	43.1%
ThrA	Treaty silty clay loam, 0 to 1 percent slopes	6.3	56.9%
Totals for Area of Interest		**11.0**	**100.0%**

Discharge vs Depth On Grate

NEENAH R-3286-8V
0.70 SQ. FT. OPENING

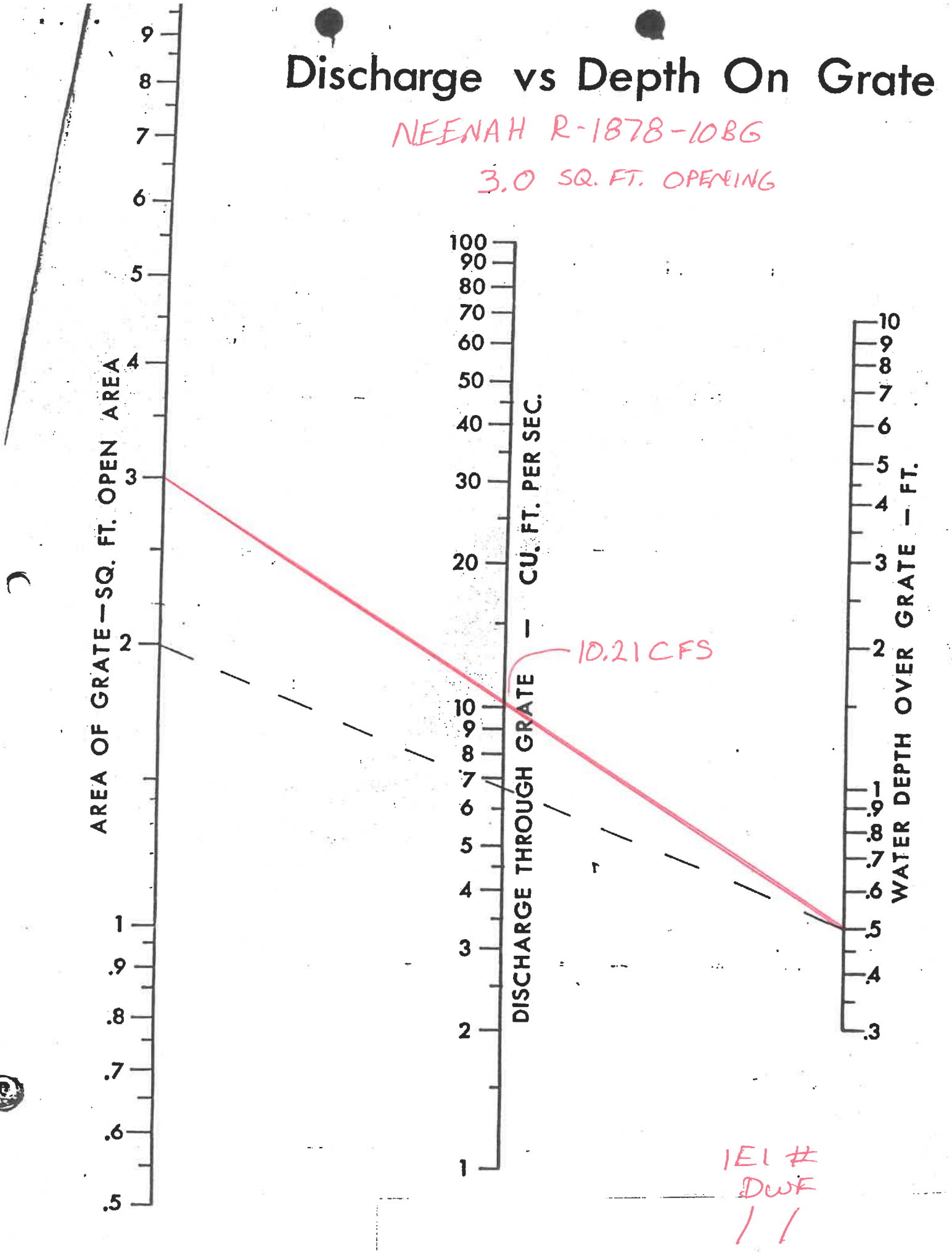


IEI #
DWF
/ /

Discharge vs Depth On Grate

NEENAH R-1878-10BG

3.0 SQ. FT. OPENING



IEI # DWF 1 1

STORM SEWER DESIGN SHEET – RATIONAL METHOD

PROJECT KARAM RETAIL CROWNSBURG, IN — DATE 12/7/25 — SHEET 1 OF 1

ENGINEER DWF — DESIGN STORM 10 YR+ — MANNINGS n 0.013

Line Number	Upstream Manhole	Downstream Manhole	Length (Ft)	C_j	A_j (Acres)	C_jA_j	ΣA_jC_j	t_j (min)	t_{cum} (min)	i (inches/hr)	Q (CFS)	Pipe Diameter (inches)	Pipe Slope (%)	Pipe Capacity (CFS)	Velocity (Ft/Sec)	Travel Time (min)	Rim Elevation Upstream	Rim Elevation Downstream	Invert Elevation Upstream	Invert Elevation Downstream	Pipe Cover Upstream	Pipe Cover Downstream	Δ
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
	701	705	154					5	5			12	0.323	2.025	2.58	0.99	92.00	91.83	88.75	88.25			0.50
	702	703	26					5	5			12	0.346	2.096	2.67	0.16	91.83	91.83	88.58	88.49			0.09
FUTURE	703	705	42					5	5.16			12	0.333	2.056	2.62	0.27	91.83	91.65	88.39	88.25			0.14
	704	705	—					5	5			12	0.32	2.02	2.57	—	—	91.65	—	88.25			
	705	707	90					5	5.99			15	0.238	3.15	2.57	0.52	91.65	91.61	88.15	87.96			0.19
	706	707	154					5	5			12	0.323	2.025	2.58	0.99	91.71	91.61	88.46	87.96			0.50
	707	710	160					5	6.51			18	0.20	4.70	2.66	1.00	91.61	91.42	87.86	87.44			0.52
FUTURE	708	710	—					5	5			12	0.32	2.02	2.57	—	—	91.42	—	87.44			
FUTURE	709	710	—					5	5			12	0.32	2.02	2.57	—	—	91.42	—	87.44			
	710	719	115					5	7.51			22X34	0.113	10.53	2.57	0.75	91.42	91.62	87.34	87.22			0.13
FUTURE	718	719	—					5	5			12	0.32	2.02	2.57	—	—	91.62	—	87.22			
	719	724	130					5	8.26			24X38	0.185	18.08	3.54	0.61	91.62	91.81	87.12	86.88			0.24
FUTURE	722	724	—					5	5			18	0.200	4.70	2.66	—	—	91.81	—	86.88			
FUTURE	723	724	—					5	5			12	0.32	2.02	2.57	—	—	91.81	—	86.88			
	724	728	145					5	8.87			34X53	0.103	34.31	3.36	0.72	91.81	91.66	86.78	86.63			0.15
FUTURE	726	728	-					5	5			12	0.32	2.02	2.57	—	—	91.66	—	86.63			
FUTURE	727	728	-					5	5			12	0.32	2.02	2.57	—	—	91.66	—	86.63			
	728	729	50					5	9.59			34X53	0.120	36.95	3.62	0.23	91.66	91.60	86.53	86.47			0.06
	729	730	15					5	9.82			34X53	0.133	38.95	3.82	0.07	91.60	91.58	86.37	86.35			0.02
	730	731	40					5	9.89			34X53	0.125	37.71	3.70	0.18	91.58	—	86.25	86.20			0.05
									10.07														

Figure 7.1 Storm Sewer Design Sheet - Rational Method

ON SITE STORM WATER SYSTEM

OPERATION & MAINTENANCE MANUAL

For

Karam Retail
1485 West Northfield Drive
Brownsburg, IN

Prepared By

INSIGHT ENGINEERING, INC.
9755 RANDALL DRIVE
SUITE 101A
CARMEL, IN

IEI #2517

INTRODUCTION

This manual provides information needed by the owner of a development in Brownsburg, Indiana to understand the Storm Water Management System that is designed and required for their site. Storm water run system owners are responsible to operate, inspect and maintain their systems at their own cost.

The owner is to perform periodic inspection and maintenance of the systems. The Town will perform periodic inspections and charge the owners a fee for the inspectors to assure systems are operating acceptably; the fee schedules are included in the Stormwater Design and Construction Specifications Standards and ordinances for the Town.

The Town's representative must always be granted entry to the property for the purpose of inspecting the Storm Water Management System. If the city's inspectors determine that maintenance should be performed on the Storm Water Management System, the owner is required to perform the requested work. The Storm Water Management System includes a network of drainage swales, storm inlets, a pipe network, an AquaSwirl separator and detention pond.

The system designed for your project is a passive type system requiring no mechanical or electrical equipment or active operation. The system was designed to follow established design guidelines of the Town but use conventional construction to be cost effective both during construction and operation.

Section I – Owner Information

The owner and the owner contact information are provided on the Cover Sheet of this Manual. This manual provides information needed by the owner of a development in Indianapolis, Indiana to understand the Storm Water Management System that is designed and required for their site. Storm water system owners are responsible to operate, inspect and maintain their systems at their own cost.

The owner is to perform periodic inspection and maintenance of the systems. The Town will perform periodic inspections and charge the owners a fee for the inspectors to assure systems are operating acceptably.

The Town's representative must always be granted entry to the property for the purpose of inspecting the Storm Water Management System. If the Town's inspectors determine that maintenance should be performed on the Storm Water Management System, the owner is required to perform the requested work.

Definitions

Owner/ Responsible Party- typically the property owner. The responsible party may also be the lessee of property in the case of long-term leases of commercial and industrial zoned properties. The lessee is considered the owner only if the lease specifically states that construction or maintenance by the lessee must meet applicable local codes and regulations.

Purpose and Specific Narrative

Urban storm water runoff contains many types and forms of pollutants. When compared to storm water run-off from pre-developed conditions, high concentrations and some contaminants that are not naturally present in surface runoff from undeveloped local lands are found. Runoff from undeveloped watersheds contains sediment particles, oxygen-demanding compounds, nutrients, metals, and other constituents. Once developed, constituent loads increase because surface runoff volumes increase and the sources of many of these pollutants also increase. Supplemental applications of compounds, such as fertilizers, also tend to increase the availability of some pollutants to storm water runoff.

The storm water drainage systems will tend to accumulate surface trash and debris as well as sediment, particulate matter and other pollutants that will need to be removed on a regular basis to preserve the flow capacity and the functioning of the system.

Section II – Site Information

The site address is 1485 West Northfield Drive, Brownsburg, IN.

Attached is the Site Utility Plan , Storm System Plan and Profiles, details of the Aqua Swirl unit, maintenance easement exhibit and emergency overflow detail for the project.

Inspections and Fees

The Town may perform inspections.

The Owner shall be responsible for inspection fees as outlined in the Town's Storm water Management Ordinance and Storm water Technical Standards Manual.

Routine inspections are the responsibility of the owner. Maintenance is also the responsibility of the owner. The owner shall be financially responsible for any maintenance or repairs required by the Town or its representatives during the Town's inspections. Completed Inspection form must be maintained by the owner and produced upon request by the Town. The Town must be notified of any changes in ownership, major repairs or failure in writing within 30 days.

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning. The sediment shall be removed as specified in the specific manual suggests.

The owner will inspect and remove surface debris that may accumulate on and around the property and especially at the inlet grates.

The Town and/or its representatives have the right to enter the property for inspections. In the event that the Town finds a need for maintenance or repair, the Town will notify the owner of the necessary maintenance or repair and give the Owner a time frame for completing the maintenance or repairs. If the maintenance or repairs are not completed within the designated time frame, the Town may perform the maintenance or repairs and bill the landowner for the actual costs for the work.

Section III – Inlet Maintenance

Inlet Maintenance

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning. The excess sediment shall be removed as specified as the specific town manual suggests. (Recommended no greater than one quarter of the pipe diameter with a maximum of 6"). The sediment shall be removed from the site.

The owner will inspect and remove surface debris that may accumulate on and around the property and especially at the inlet grates.

The Town and/or its representatives have the right to enter the property for inspections. In the event that the Town finds a need for maintenance or repair, the Town will notify the owner of the necessary maintenance or repair and give the Owner a time frame for completing the maintenance or repairs. If the maintenance or repairs are not completed within the designated time frame, the Town may perform the maintenance or repairs and bill the landowner for the actual costs for the work.

Please find attached the details of the inlets and grate castings utilized for the project as also provided in the Construction Plans.

Section IV – Conveyances Maintenance

The system designed for your project is a passive type system requiring no mechanical or electrical equipment or active operation. The system was designed to follow established design guidelines of the Town but use conventional construction to be cost effective both during construction and operation.

The Town may perform inspections.

The Owner shall be responsible for inspection fees as outlined in the Town's
Storm Water Management Ordinance and Storm Water Technical Standards Manual.

Routine inspections are the responsibility of the owner. Maintenance is also the responsibility of the owner. The owner shall be financially responsible for any maintenance or repairs required by the Town or its representatives during the Town's inspections. Completed Inspection form must be maintained by the owner and produced upon request

by the Town. The Town must be notified of any changes in ownership, major repairs or failure in writing within 30 days.

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches and where there is higher potential for trash or litter and during the fall when leaves are present. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning.

Conveyance Maintenance

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning. The excess sediment shall be removed as specified as the specific manual suggests. (Recommended no greater than one quarter of the pipe diameter with a maximum of 6"). The sediment shall be removed from the site.

The owner will inspect and remove surface debris that may accumulate on and around the property and especially at the inlet grates.

The Town and/or its representatives have the right to enter the property for inspections. In the event that the Town finds a need for maintenance or repair, the Town will notify the owner of the necessary maintenance or repair and give the Owner a time frame for completing the maintenance or repairs. If the maintenance or repairs are not completed within the designated time frame, the Town may perform the maintenance or repairs and bill the landowner for the actual costs for the work.

Swales should be clear of high plant growth with a maximum height of 5 inches. Regular mowing or weed trimming may be uses. Use a rake and shovel to remove, by hand, sediment accumulations greater than 2-inches thick that cover grass areas.

Section V – Detention System Maintenance

The detention system designed for your project is a passive type system requiring no mechanical or electrical equipment or active operation. The system was designed to follow established design guidelines of the Town but use conventional construction to be cost effective both during construction and operation.

The Town may perform inspections.

The Owner shall be responsible for inspection fees as outlined in the Town's

Storm Water Management Ordinance and Storm Water Technical Standards Manual.

Routine inspections are the responsibility of the owner. Maintenance is also the responsibility of the owner. The owner shall be financially responsible for any maintenance or repairs required by the Town or its representatives during the Town's inspections. Completed Inspection form must be maintained by the owner and produced upon request by the Town. The Town must be notified of any changes in ownership, major repairs or failure in writing within 30 days.

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches and where there is higher potential for trash or litter and during the fall when leaves are present. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning.

Detention Maintenance

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches. The inspector shall confirm that the systems are functioning correctly and the sediment accumulation within the inlets and manholes are not detrimental to the proper functioning. The excess sediment shall be removed as specified as the specific town manual suggests. The sediment shall be removed from the site.

The owner will inspect and remove surface debris that may accumulate on and around the property, the pond banks shall be maintained to prevent and repair erosion, riprap will be replaced as needed to maintain erosion protection and the emergency overflow will be maintained to conform to the original design detail.

The Town and/or its representatives have the right to enter the property for inspections. In the event that the Town finds a need for maintenance or repair, the Town will notify the owner of the necessary maintenance or repair and give the Owner a time frame for completing the maintenance or repairs. If the maintenance or repairs are not completed within the designated time frame, the Town may perform the maintenance or repairs and bill the landowner for the actual costs for the work.

Section VI – Water Quality Systems Maintenance

This project includes an Aqua Swirl water quality treatment unit, frequently called a BMP, to remove sediment from the storm water runoff primarily during smaller storms and low flow events prior to the detention pond.

The storm water drainage system is to be inspected at 6 month intervals or more frequently. The system will also be inspected following significant rainfall events that exceed 1.5 inches.

The Operations and Maintenance of this system is to be conducted per the manufacturer's instructions that are included as part of this O&M Manual.

Maintenance Calendar

Inspection of the developed Storm Water Drainage System associated with the Xtra Lease Facility 2021, 10484 East County Road 300 North, Brownsburg, IN development.

_____
Date of Inspection

_____
Weather Conditions

_____
Person's name performing Maintenance Schedule Inspection.

_____
Name of Company

Inspection Comments:

Aqua-Swirl® XCelerator Stormwater Treatment System

Inspection and Maintenance Manual for New Jersey Department of Environmental Protection (NJDEP)

AquaShield™, Inc.
2733 Kanasita Drive
Suite 111
Chattanooga, TN 37343
Toll free (888) 344-9044
Phone: (423) 870-8888
Fax: (423) 826-2112
Email: info@aquashieldinc.com
www.aquashieldinc.com

Aqua-Swirl® XCelerator Stormwater Treatment System

The Aqua-Swirl® XCelerator Stormwater Treatment System (Aqua-Swirl® XCelerator) is a vortex-type hydrodynamic separator designed and supplied by AquaShield™, Inc. (AquaShield™). Aqua-Swirl® XCelerator technology removes pollutants including suspended solids, debris, and floatables from stormwater runoff. Both treatment and storage are accomplished in the single swirl chamber without the use of multiple or hidden, blind access chambers.

Floatable trash & debris in the Aqua-Swirl®

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl® XCelerator through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminates to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® XCelerator retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

Aqua-Swirl® XCelerator System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the Aqua-Swirl® XCelerator allowing all inspections to be performed from the surface. It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained. In order to ensure that our systems are being maintained properly, AquaShield™ offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.

Inspection

The Aqua-Swirl® XCelerator can be inspected from the surface, eliminating the need to enter the system to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection during construction and for the first year of operation to develop an appropriate schedule of maintenance. The Aqua-Swirl® XCelerator should be inspected and cleaned at the end of construction regardless of whether it has reached its sediment storage capacity and/or other captured materials. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is once per year.

Maintenance

The Aqua-Swirl® XCelerator has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Inspection Procedure

To inspect the Aqua-Swirl® XCelerator, a hook is typically needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal

information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® XCelerator model size, and serial number.

The only tools needed to inspect the Aqua-Swirl® XCelerator system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating trash and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water. AquaShield™ recommends that the units be cleaned when sediment depth reaches 6 inches, representing 50% sediment storage capacity. The full sediment storage depth in the Aqua-Swirl® XCelerator is 12 inches.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

Aqua-Swirl® XCelerator Cleanout Procedure

Cleaning the Aqua-Swirl® XCelerator is simple and quick. Floatable trash debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® XCelerator design is that the entire sediment storage area can be reached with a vacuum hose from the surface reaching all the sides. Since there are no multiple or limited (blind) access chambers in the Aqua-Swirl® XCelerator there are no restrictions to impede on-site maintenance tasks.

Sediment inspection using a stadia rod

Disposal of Recovered Materials

AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used. AquaShield™ also recommends that all materials removed from the Aqua-Swirl® XCelerator and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.

Vacuum (vactor) truck quickly cleans the single open access swirl chamber

Aqua-Swirl® XCelerator Inspection and Maintenance Work Sheets on following pages

Aqua-Swirl™ XCelerator®
Operation, Maintenance, and Inspection Manual for BMP Owners
City of Indianapolis, Indiana

(Note: Attach certifications for local regulatory authority including any applicable fees.)

Site and Owner Information

Site Name: _____ Change in ownership since last inspection? Y N

Owner Name: _____

Owner Address: _____

Owner Phone Number: _____

Emergency Phone Number: _____

Location: _____

Date: _____

Time: _____

Inspector Name: _____

Maintenance Items

Inspection

Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of Aqua-Swirl™.
2. Remove floatable debris with basket or net if any is present.
3. If a hydrocarbon spill has occurred, (e.g. more than a sheen of oil or gas is present) the system should be cleaned immediately (see "Cleaning" Figure 3).

Note: Water in an Aqua-Swirl™ can appear black like oil due to the dark body of the surrounding structure. Oil appears darker than water in the system and is usually accompanied by debris (e.g. Styrofoam, etc.) with obvious signs of oil stains. The depth of oil can be measured with an oil/water interface probe, a stadia rod with water phylic paste, a coliwasa, or by simply collecting a representative sample with a jar attached to a rod.

4. If hydrocarbon absorbant floc or pads are used, these should be inspected to determine whether they are loaded with hydrocarbons. This will be indicated by a dark colaration of the pad or floc. Pads and/or floc should be removed and disposed of in accordance with City of Indianapolis and any applicable state and/or federal laws if they contain hydrocarbons.

Sediment Accumulation

Lower a dipstick tube equipped with a ball valve (e.g. Sludge Judge or similar device) into Aqua-Swirl™ through the service access provided. Measure the depth of the sludge. The sludge should not exceed 6" depth before maintenance. See Figures 1 and 2.

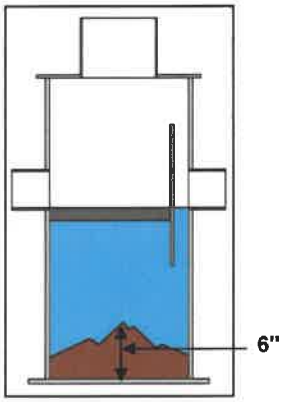


Figure 1

Figure 2

Inspection (continued)

Diversion Structures

If an external diversion structure is present on the site, this should be inspected for the following items.

1. Inspect weir or other structure for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling or decaying.
2. Inspect diversion structure and by-pass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. Measure elevations on diversion weir or piping to ensure it is consistent with site plan design.
4. Inspect downstream structure in diversion system for signs of blockage or structural failure.

Cleaning

Remove sediments, oils and other floatable pollutants with a vactor. Dispose of all waste in accordance with City of Indianapolis and any applicable state, and/or federal requirements.

Oil should be pumped and removed with any liquids and sediments that have been trapped in the system. These liquids should be taken to an industrial waste water treatment facility for treatment. Liquids and solids pumped from the AquaSwirl™ should not be dumped back into the stormwater system or into a sanitary sewer.

Figure 3

Note: The AquaSwirl™ is designed so that entry to the system is not necessary for inspection or maintenance. If, however, you wish to enter the system, this is an OSHA confined space entry and OSHA confined space entry procedures should be followed to enter the system.

Maintenance Schedule

During Construction

Inspect the AquaSwirl™ every three months (minimum) and clean the system as needed. The AquaSwirl™ should be inspected and cleaned at the end of construction regardless of whether it has reached its sediment or oil storage capacity.

First Year Post-Construction

Inspect the AquaSwirl™ every six months and clean the system as needed.

Second and Subsequent Years Post-Construction

If the AquaSwirl™ did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction, the system can be inspected once annually and cleaned as needed or bi-annually at a minimum.

If the AquaSwirl™ reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction, the system should be inspected at least once every six months and cleaned as needed. If site monitoring indicates that trapped sediment hardens over time, the AquaSwirl™ should be cleaned prior to sediment hardening regardless of whether it has reached its sediment storage capa

Bypass Structures

Bypass structures should be inspected whenever the AquaSwirl™ is inspected and maintained as needed.

Maintenance Company Information

Company Name: _____

Street Address: _____

City, State, Zip: _____

Contact: _____

Office Phone: _____

Mobile Phone: _____

Pager: _____

Activity Log

Date of cleaning: _____ (Next inspection should be 3 months from this date for the first year).

Time of cleaning: _____

Date of next inspection: _____

Floatable debris present (Y/N)? _____

Oil present (Y/N)? _____ Oil depth (inches): _____

Structural Conditions and Comments

Any structural damage? Y N Where? _____

Any evidence of structural wear? Y N Where? _____

Odors present? Y N Describe: _____

Any plugging? Y N Describe: _____

NOTES

Additional Comments and/or Actions to Be Taken	Time Frame

NOTES:

1. **Attach site plan showing Aqua-Swirl™ location.**
2. **Attach detail drawing showing Aqua-Swirl™ dimensions and model number.**
3. **If a diversion structure is used, attached details showing basic design and elevations.**

Aqua-Swirl™

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: _____

Date Construction Ended: _____

During Construction

	Month											
Activity	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as Needed			X			X			X			X
Inspect Bypass Structures (if applicable) and Maintain As Needed			X			X			X			X
Clean System*												X*

* The AquaSwirl™ should be cleaned once a year regardless of whether it has reached full pollutant storage capacity during the construction phase of the project.

First Year Post-Construction

	Month											
Activity	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as Needed						X						X
Inspect Bypass Structures (if applicable) and Maintain As Needed						X						X
Clean System*												X*

* The AquaSwirl™ should be cleaned at the end of the first year post construction if it is at or near its pollutant storage capcacity. Otherwise, the system can be cleaned at a later date depending on how quickly the sediment starts to harden.

Second and Subsequent Years Post-Construction

	Month											
Activity	1	2	3	4	5	6	7	8	9	10	11	12
Inspect and Clean as Needed*						X						X
Inspect Bypass Structures* (if applicable) and Maintain As Needed						X						X
Clean System*												

*If the AquaSwirl™ did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction, the system can be inspected once annually. If the AquaSwirl™ reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction, the system should be inspected as frequently as past history warrants and cleaned as needed. Regardless of whether the AquaSwirl™ reaches full sediment or floatable storage capacity, it should be cleaned frequently enough to prevent captured sediments from hardening. Normally, cleaning once every two to three years should be sufficient to prevent sediments from hardening.

*The bypass system should be inspected with each AquaSwirl™ inspection and maintained as needed.

city.