

HYDRAULICS DESIGN CRITERIA VARIANCE REQUEST MEMORANDUM

Project: Main Street from Columbia/Sheffield Avenue to Hart Ditch

Des. No.: 2101132

DATE: February 14, 2025

TO: Patricia Abbott, ERC
Town of Munster Interim Town Manager

FROM: Trisha Nugent
Trisha Nugent, PE -DLZ Indiana, LLC

SUBJECT: Hydraulic Design Variance Request for the design criteria:
Use of the NRCS Type II Design Rainfall Distribution
Casting Capacity Design
Stormwater Quantity Control Release Rate
Post-Construction Water Quality Treatment Requirements

PROJECT: Main Street from Columbia/Sheffield Avenue to Hart Ditch
Des. No.: 2101132
Project No.: 2101(132)
Location: Town of Munster, Lake County, Indiana

Transmitted, herewith, is a Hydraulic Design Criteria Variance Request Memorandum for the above referenced project. Based on the analysis of the substandard hydraulic design criteria, we believe that the design exception is justified, and we therefore recommend approval.

LPA CONCURRENCE

Town Engineering Representative

Approved: Kim Wenzel

Date: 2/21/2025

Kimberly Wenzel
Name

Town of Munster Town Council

Approved: _____
Town of Munster – George Shinkan
Ward 1

Date: _____

Town of Munster – Joe Hofferth
Ward 2

Town of Munster – Chuck Gardiner
Ward 3

Town of Munster – David B. Nellans
Ward 4

Town of Munster – Jonathan Petersen
Ward 5

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PROJECT DESCRIPTION

This is a roadway reconstruction project that involves pavement widening, new pathway on the north side of Main Street from Columbia/Sheffield Avenue to Hart Ditch in the Town of Munster, Lake County, Indiana. The natural topography of the project area is flat. The proposed stormwater management system includes curb turnouts, inlets, short runs of storm sewer, ditches, and swales with underdrain. Other proposed improvements include curb and gutter, pavement marking, signal improvements, and regulatory signage.

DESIGN FEATURE

1. Use of the NRCS Type II Design Rainfall Distribution

Standard: Per Town of Munster Storm Water Technical Standards Manual – January 2023 – Chapter 3, Section B, the Type II NRCS design rainfall distribution shall be used for hydraulic analysis.

Conflict: In this case, analysis of the proposed roadside ditch/detention stormwater management system for both water quality and conveyance performance required a critical duration analysis. In order to evaluate this type of system, the Huff rainfall distribution was utilized. The use of the Huff rainfall distributions allowed the critical duration analysis of the one (1) inch rainfall for water quality and the 1% AEP (100-yr) rainfall for pipe and ditch detention with the same model. The Type II distribution only addresses the 24-hr rainfall with an unnatural “spike” distribution.

Solution: A Hydraulic Design Criteria Variance is required within the entirety of the project limits for the use of Huff rainfall distribution rather than the NRCS Type II distribution.

2. Casting Capacity Design

Standard: Per Town of Munster Storm Water Technical Standards Manual – January 2023 – Chapter 4, Section H, “Inlet grate opening shall be adequate to pass the design 10-year flow with 50% of the sag inlet areas clogged.”

Conflict: The sag stormwater inlets at the edge of pavement meet the 50% sag inlet areas clogged.

There are proposed inlets at the bottom of the roadside ditches. The roadside ditch inlets are not truly functioning as sag inlets. The roadside ditch inlets are set slightly above the ditch bottoms to allow suspended solids in stormwater to settle out and stormwater to infiltrate into the underdrain. The side ditch casting is not flat as a roadway grate would be. The ditch inlet grate is 6-inches in height. In addition, the elevation of the roadside ditch inlets are also set to prevent the 1% AEP (100-yr) peak elevation from encroaching the roadway.

The 1% AEP (100-yr) peak elevation analysis with 50% of the inlet weir length reduced to simulate a 50% clogging factor verified that the proposed ditches would have stormwater spread that extends onto the roadway at Sta. 24+00.00, and Sta. 27+00.00 Line ‘M’, but would not flood a building. The spread will remain within the proposed right of way.

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The roadside ditch inlets are visible from the roadway. The project area is well maintained area adjacent to residences and medium commercial developments and not adjacent to big box store developments that seem to create an increased frequency of debris in the area.

Solution: A Hydraulic Design Criteria Variance is required within the entirety of the project limits for each proposed roadside ditch inlet.

3. Stormwater Quantity Control Release Rate

Standard: Per Town of Munster Storm Water Technical Standards Manual – January 2023 – Chapter 3, the target release rate is 0.2 cfs / ac target release rate.

Conflict: For this project, due to the existing utility locations, limited R/W width, and topographic limitation limiting depth of the project outfalls (the existing storm sewer in Calumet Avenue and the Hart Ditch), only underground or pipe detention is feasible to meet the target release rate of 0.2 cfs / ac with a minimum orifice size of four (4) inches for the 100-yr event. An XPSWMM model was created to evaluate the proposed design. After accounting for the retention of the WQ event in the ditches and determining the allowable release rate at the outfall points, it was noted the west section (Columbia Avenue / Sheffield Avenue to Calumet Avenue) would require 890 ft of 3 ft x 6 ft box culvert and the middle section (Calumet Avenue to approximately Cobblestone Road) would require 336 ft of 4 ft x 10 ft box culvert and 332 ft of 4 ft x 8 ft box culvert.

Alternatively, a release rate based on retaining the proposed runoff to the existing 10-year release rate was investigated using the same XPSWMM model. The results indicated a 2 ft diameter pipes would be required for the west section and 2 ft diameter pipes would also be required for the middle section.

The long lengths of box culvert and the enlarged drainage structures necessary to meet the 0.2 cfs / ac release rate would likely create conflicts with other utilities creating project scheduling conflicts in addition to significantly increasing project costs for the larger pipe and structure by approximately (\$1,000,000.00 - \$2,000,000.00).

Solution: A Hydraulic Design Criteria Variance is required for the entire project limits for the use of a release rate based on the existing 10-year stormwater event.

4. Post-Construction Water Quality Treatment Requirements

Standard: Per Town of Munster Storm Water Technical Standards Manual – January 2023 – Chapter 8, “the removal of floatables in stormwater runoff and treatment, to the maximum extent practicable...”.

Conflict: In this case, the majority of the proposed project addresses water quality through the proposed construction of modified roadside ditches, where feasible. The proposed ditches include underdrains and are sized and configured to address the water quality runoff event (1-inch storm). There are areas where the R/W limits and/or existing utilities prohibit construction of roadside ditches. Standard inlets and short runs of storm sewer system are required to capture the runoff from these areas. Storm water management will perpetuate the existing drainage patterns. The total area discharging directly to the storm sewer is approximately 1.6 acres of the overall 11.58 acres or 14%.

Solution: A Hydraulic Design Criteria Variance is required for the areas of the project listed below for not meeting the water quality release rate requirements:

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Location From	Location To	Side	Alignment	Notes
25+50.00	28+15.00	Rt	'M'	Str. No. 109, 111, 112 discharges directly to existing storm sewer.
28+74.00	32+18.50	Lt	'M'	Str. No. 309 will outlet to the existing storm sewer.
32+18.50	36+30.50	Rt	'M'	Str. Nos. 324, 331, 333, 334 discharge directly to storm sewer.
34+20.00	36+30.00	Lt	'M'	Str. Nos. 336, 340, 345, 350 discharge directly to storm sewer.
35+09.00	38+47.00	Rt	'M'	Maintain Existing inlets (Str. No. 4948)/pipes that outlet to Wellington Drive storm system to south.

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