



Summary Report
of the
Hoosier Creek
Drainage District
Mapping and Benefits
Assessment
August 28, 2020



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CIVIL ENGINEERS AND LAND SURVEYORS



INTRODUCTION

The following report was prepared by Nielsen Madsen + Barber (NMB), at the request of the Racine County Board of Drainage Commissioners on behalf of the Hoosier Creek Drainage District hereafter referred to as the “District”, to analyze the existing mapping and benefits and update it to reflect any changes.

HOOSIER CREEK DRAINAGE DISTRICT

The District encompasses parts of three municipalities in two counties: the Town of Burlington and the Town of Dover in Racine County and the Town of Brighton in Kenosha County. The District contains 12,367 acres of land, including 125.29 acres of district corridor, consisting of 540 parcels and road right-of-way. The Town of Burlington contains 5,035 acres and 273 parcels within the District. The Town of Dover contains 2,592 acres and 148 parcels within the District. The Town of Brighton contains 4754 acres and 119 parcels within the District. The land within the District is predominantly agricultural with areas of medium and low density residential development as well as isolated commercial and manufacturing parcels.

The drainage system within the District includes 12 branch tiles and 7 branch ditches which drain to Hoosier Creek. These ditches and the portion of Hoosier Creek within the District add up to a total of 96,355 linear feet (18.25 miles) of drainage way. The 12 branch tiles add up to a total of 49,487 linear feet (9.37 miles).

The District was established as a method of generating revenue for storm water management and conveyance system improvements in which property owners are assigned, in part, a proportionate “charge” based on the amount of runoff “produced” by their property.

The amount of runoff a property generates depends on the impervious area, ground cover, topography, and soil type of that property. The total impervious area and percentage of the parcel thereof are the most important factors in generating runoff. Impervious surfaces are defined as solid or semi-solid surfaces that prevent rainfall from infiltrating into the ground thus creating excess “runoff”. Runoff from lands with a high percentage of impervious surfaces is generally in greater quantities and at higher velocities than undeveloped (i.e. agricultural, forest, swamp) lands and typically includes increased pollutant loading.

While undeveloped properties typically generate a fraction of the runoff as compared to developed properties of comparable size, such undeveloped or agricultural properties contribute to the district-wide storm water runoff that must be managed. The undeveloped property in the District amounts to approximately 75% of the total area and is scattered throughout the District.

The District is a separate entity from the three municipalities within its boundary. State and local right-of-way makes up 1.21% and 0.66%, respectively, of the land within the District boundary. The District assesses each municipality directly for their respective road rights-of-way. Additionally, Racine County owns CTH J (English

Settlement Avenue), and Kenosha County owns CTH B (288th Avenue / 2nd Place / 296th Avenue) and CTH BB (7th Street). The Wisconsin Department of Transportation (WisDOT) owns STH 11 (Durand Avenue) as well as STH 142 (Burlington Road / Bushnell Road). The Counties will be assessed for the CTH J, CTH B and CTH BB rights-of-way but the WisDOT cannot be assessed for their road right-of-way within the District.

There are a number of parcels within the District whose boundary extends to the centerline of the adjacent roadway. These parcel owners will be assessed for their entire parcel area, including what extends into the public roadway.

The Wisconsin Department of Transportation (WisDOT) owns 151 acres of land within the District. This land consists of STH 142, STH 11 and the STH 11 Bypass in the Town of Burlington, STH 11 within the Town of Dover and STH 142 within the Town of Brighton. As this is a State agency, WisDOT is exempt from this assessment.

The Wisconsin Department of Natural Resources (WDNR) owns over 1,500 acres of land within the District. The vast majority of this land is within the Town of Brighton and is part of the Bong Recreational Area. The remainder of this land is scattered throughout the Town of Burlington and the Town of Dover. As with the WisDOT, any lands owned by the WDNR are exempt from this assessment.

CREATING A PARCEL DATABASE

A database was created which included all parcels within the District boundary. The database was built upon the existing infrastructure developed and maintained by Racine and Kenosha Counties.

As part of Racine County's Real Estate Description department, the Real Property Lister Division maintains the real estate tax roll for all municipalities in Racine County with the exception of the City of Racine. As part of Kenosha County's Planning and Development department, the Land Information Division maintains the real estate tax roll for municipalities in Kenosha County.

The county-maintained data applicable to the District's database includes the owner's name, tax key ID number, parcel size, mailing address, land use classification codes and acreages. The "land use" portion of the data originates from the assessors of the three municipalities and is of particular importance to the District's database in that it contains a breakdown (by area) of each type of land use for each individual parcel.

There are 14 land use classifications within the Racine County portion of District. They are as follows:

- (1) High-Density Residential less than 1/3 Acre (G1)
- (2) Medium-Density Residential 1/3 Acre to 1 Acre (G1)
- (3) Low-Density Residential greater than 1 Acre (G1)
- (4) Commercial (G2)
- (5) Agricultural (G4)
- (6) Swamp Land (G5)
- (7) Production Forest Land (G6)
- (8) Agricultural – Improved (G7)
- (9) State (X2)
- (10) County (X3)
- (11) Institutional (X4)
- (12) Agricultural Forest (5M)
- (13) Managed Forest, Closed (W8)
- (14) Road Right of Way (R/W)

There are 10 land use classifications within the Kenosha County portion of District. They are as follows:

- (1) High-Density Residential less than 1/3 Acre (1)
- (2) Medium-Density Residential 1/3 Acre to 1 Acre (1)
- (3) Low-Density Residential greater than 1 Acre (1)
- (4) Commercial (2)
- (5) Manufacturing (3)
- (6) Agricultural (4)
- (7) Swamp and Waste Land (5)
- (8) Agricultural Forest (5M)
- (9) Forest Lands (6)
- (10) Agricultural – Improved (7)

Since this assessment is based on the District land use and not the County land use, similar land use classifications were combined. For the purpose of determining the appropriate runoff coefficient all G4 and 4 lands were classified as Agricultural; all G5 and 5 lands were classified as Swamp / Wasteland; all 5M, G6, W8 and 6 lands were classified as Forest Land; and all G7 and 7 lands were classified as Agricultural-Improved. Lands classified as G7 and 7 appeared to be improved farmsteads when compared to current aerial photography and were therefore were classified as Agricultural-Improved.

In addition to the land uses listed above, there were three parcels in the Town of Burlington (Racine County) within the District described as Common Element. There was no assessment information associated with these parcels. Upon further investigation it was determined that these parcels were common areas for the Coyote Ridge Condominiums. Benefits for these three parcels were distributed evenly among the 45 units of the Coyote Ridge Condominiums.

A breakdown by land use of all parcels within the District is shown in the chart below.

Area Breakdown by Land Use Classification

District-wide Land Use Classification	Land Use Classification Code	Total Area (Acres)	Percentage of Total Area
Residential less than 1/3 Acre (High-Density)	G1 / 1	0.78	0.01%
Residential 1/3 Acre to 1 Acre (Medium-Density)	G1 / 1	35.01	0.28%
Residential greater than 1 Acre (Low-Density)	G1 / 1	1,095.65	8.83%
Commercial	G2 / 2	1311.99	10.6%
Manufacturing	G3 / 3	219.75	1.77%
Agricultural	G4 / 4	6698.9	54.01%
Swamp/Wasteland	G5 / 5	1,646.42	13.28%
Forest Land	5M / G6 / W8 / 6	561	4.52%
Agricultural - Improved	G7 / 7	120.48	0.97%
State	X2	130.26	1.05%
County	X3	5.19	0.04%
Institutional	X4	41.64	0.34%
Coyote Ridge Common Element	CRCE1 / CRCE2 / CRCE3	174.15	1.40%
Local Road Right of Way	R/W	81.95	0.66%
State Road Right of Way	-	111.42	1.21%
District Corridor	DC	125.29	1.01%
Undefined	-	-32.54	-0.26%
	Total	12,366.50	

EXISTING DISTRICT ANALYSIS METHOD

The District has an existing methodology in place to determine the benefits for each parcel. This analysis was based on parcel runoff which is the product of two factors: parcel area (in acres) and the runoff coefficient as a function of underlying soil composition.

The runoff coefficient ranges from 0 to 1 and is the ratio of the amount of rainfall that is not absorbed by the surface to the total amount of rainfall during a storm event. Parcels which have a larger proportion of impervious surface (streets, roofs, sidewalks, patios, parking lots, driveways and other similar surfaces) will have a larger runoff coefficient than parcels which have a larger proportion of pervious surface (lawn, landscaping, soil, etc).

Additionally, some underlying soil conditions are more conducive to the absorption of runoff. Sandy and gravelly soils with large particle sizes will absorb runoff quicker than clayey and silty soils with very small particle sizes. The National Resource Conservation Service (NRCS) of the United States Department of Agriculture (USDA) has defined four major groups which are explained as follows:

Group A soils have low runoff potential and high infiltration rates. They consist mainly of well drained sand and gravel.

Group B soils have moderate infiltration rates. They consist of moderately well drained soils with moderately fine to coarse textures.

Group C soils have low infiltration rates and have a moderately fine to fine texture.

Group D soils have high runoff potential and low infiltration rates. They consist mainly of clay soils.

The vast majority of the District consists of Type B and Type C soils and these were the only types that were considered in the previous analysis. Runoff coefficients for Type C soils were used throughout most of the district but were reduced in areas with a larger concentration of Type B soils (the middle and western sides of the Town of Burlington).

For assessment purposes, the individually calculated runoff amounts were multiplied by 400 to determine the total “benefit points” for each parcel. To determine the assessment rate for each parcel, the overall District assessment was divided by the total benefit points for all parcels producing a cost per benefit point. This cost was then multiplied by the total benefit points for each parcel, producing the overall assessment. The District assigned a minimum of 400 benefit points for smaller residential and commercial parcels. These parcels typically contain more improvements and run the risk of suffering higher damages should the District system not be properly maintained.

PROPOSED DISTRICT ANALYSIS METHOD

NMB is proposing to use the same method, in which benefit points were determined by parcel size and runoff coefficient, for determining the total benefit points for each parcel. The product of these two variables results in a single Equivalent Runoff Unit (ERU). In keeping with past practice, benefit points were assigned to each parcel at the rate of 400 per ERU with a minimum benefit of 400 points. This method can be utilized uniformly for all developed, undeveloped and agricultural parcels. This method also allows for ease of future updating since changes in the runoff coefficient and parcel size are easily calculated.

RUNOFF COEFFICIENT CALCULATIONS

The previous assessment utilized various runoff coefficients based on the overall parcel land usage. This land usage appears to be a generalized form of the Land Use Classification employed by Racine and Kenosha Counties. This method does not allow for parcels which have multiple land uses such as Commercial with Residential or Agricultural with Agricultural – Improved. There are a total of 538 parcels and 22 individual rights-of-way within the District boundary. Of the 538 parcels, 240 have multiple land uses. Categories for the original land usage and their associated runoff coefficients (which vary depending on soil type and parcel size) are as follows:

- Agriculture – 0.09 to 0.20
- Agriculture Improved – 0.16, 0.17, 0.20 or 0.27
- Swamp / Waste – 0.08 or 0.10
- Production Forest Land – 0.10, 0.13 or 0.14
- Residential – 0.09 to 0.33
- Street / Highway – 0.36 or 0.37
- Commercial – 0.20, 0.34, 0.40 or 0.48
- Manufacturing – 0.16
- Municipal – 0.15

NMB was unable to determine how these coefficients were generated. Therefore, we are proposing to use values for runoff coefficients as specified by Procedure 13-10-5 of the Wisconsin Department of Transportation's Facilities Development Manual (FDM). The FDM has standard values for runoff coefficients based on land use, hydrologic soil group and land slope range. The FDM presents options for low intensity (2 to 10 year design recurrence) and high intensity (25 to 100 year design recurrence) design storm event. Since the typical design storm for a study of this nature is a 10-year event the low intensity option was used. The subsurface soil within the District boundary is predominantly Type B and Type C as stated earlier. However, the explanation of where these different soil types were utilized was fairly vague and the previous analysis didn't factor in Type A or Type D soils. Therefore, NMB analyzed the soils within the entire district to determine the areas where each of the four soil types was present. The soil analysis was performed utilizing soils maps from the NRCS. The subsurface soils within the district break down as follows:

NRCS Soil Type	Percentage Within District
Type A	8.26%
Type B	32.78%
Type C	45.68%
Type D	12.68%
Water	0.60%

Type B and Type C soils make up 78.46% of the soils within the District. That leaves 21.54% of the subsurface soils that weren't factored in to the previous analysis.

After viewing the soils within the District it was apparent that there was substantially more Type B soil within the Town of Burlington when compared to the rest of the District. Therefore, NMB took the soils analysis a step further and separated the District into the three municipalities. The subsurface soils within each municipality break down as follows:

NRCS Soil Type	Percentage Within Town of Brighton	Percentage Within Town of Dover	Percentage Within Town of Burlington
Type A	5.01%	4.36%	13.36%
Type B	29.52%	29.19%	37.71%
Type C	54.44%	56.22%	31.95%
Type D	9.65%	10.15%	16.85%
Water	1.38%	0.07%	0.14%

As the above data shows, the Town of Brighton and the Town of Dover are almost identical in their subsurface soil makeup. However, the Town of Burlington is quite different from Brighton and Dover as well as the average subsurface soil makeup of the entire District. Since subsurface soils has an effect on the runoff coefficient NMB chose to calculate runoff coefficients for each municipality.

The vast majority of the land uses fall under one of these standard runoff coefficient values. However, the FDM does not have standard runoff coefficients for forest, agricultural-improved or swamp / wasteland. NMB used a commonly accepted average coefficient (0.13) for forested land and used the same value for agricultural-improved as residential greater than 1 acre (0.23/0.24). Swamp / wasteland was neglected from the assessment and assigned a runoff coefficient of 0 per ATCP 48.06(4). The district corridor was neglected from the assessment per ATCP 48.08(3)(a).

Runoff coefficients for the remaining land uses within the District have been generated based on individual calculations. This method was employed due to the land uses (and individual parcels) containing substantially different characteristics and levels of imperviousness. The land uses for which these individual runoff coefficients were calculated are commercial, institutional, municipal (County) and the Coyote Ridge Condominium common element parcels. These individual coefficients were calculated based on percentages of pervious and impervious surface, agricultural use, road right-of-way, forest land and water surface. Impervious surface was assigned a runoff coefficient of 0.95 and pervious surface was assigned a runoff coefficient of 0.16 in the Towns of Dover and Brighton and 0.15 in the Town of Burlington (as taken from the FDM values mentioned earlier). Agricultural use and road right-of-way were assigned values shown in the table above. Water

surface was treated the same as swamp / wasteland since water bodies accept runoff rather than generate it.

A breakdown of these land uses by area and percentage is as follows:

Land Use Classifications for which Standard Runoff Coefficients were used

District-wide Land Use Classification	Land Use Classification Code	Total Area (Acres)	Percentage of Total Area	Runoff Coefficient (Brighton)	Runoff Coefficient (Dover)	Runoff Coefficient (Burlington)
Residential less than 1/3 Acre (High-Density)	G1 / 1	0.78	0.01%	0.51	0.51	0.51
Residential 1/3 Acre to 1 Acre (Medium-Density)	G1 / 1	35.01	0.28%	0.32	0.32	0.32
Residential greater than 1 Acre (Low-Density)	G1 / 1	1,095.65	8.83%	0.24	0.24	0.23
Agricultural	G4 / 4	6698.9	54.01%	0.18	0.18	0.17
Swamp/Wasteland	G5 / 5	1,646.42	13.28%	0.00	0.00	0.00
Forest Land	G6 / 5M / W8 / 6	561	4.52%	0.13	0.13	0.13
Agricultural - Improved	G7 / 7	120.48	0.97%	0.24	0.24	0.23
Local Road Right of Way	R/W	81.95	0.66%	0.61	0.61	0.61
	Total	10,240.20	82.56%			

Land Use Classifications for which Individual Runoff Coefficients were Calculated

District-wide Land Use Classification	Land Use Classification Code	Total Area (Acres)	Percentage of Total Area
Commercial	G2 / 2	1311.99	10.6%
State	X2	130.26	1.05%
County	X3	5.19	0.04%
Institutional	X4	41.64	0.34%
Coyote Ridge Common Element	CRCE1 / CRCE2 / CRCE 3	174.15	1.40%
	Total	1,663.23	13.41%

For this specific assessment, \$750,000.00 is needed by the District to make proposed improvements and will be assessed over a five-year period. With the total number of charged benefits, the overall assessment works out to about \$0.97 per benefit point. The minimum parcel charge, 400 benefit points, is \$387.75 (\$77.55 per year).

APPENDIX A
WISDOT FDM RATIONAL COEFFICIENT TABLE

Detail A - Runoff Coefficients (C), Rational Formula

Land Use	Percent Impervious Area	Hydrologic Soil Group											
		A			B			C			D		
		Slope Range Percent			Slope Range Percent			Slope Range Percent			Slope Range Percent		
		0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over
Industrial	90	0.67	0.68	0.68	0.68	0.68	0.69	0.68	0.69	0.69	0.69	0.69	0.70
		0.65	0.85	0.86	0.85	0.86	0.86	0.86	0.86	0.87	0.86	0.86	0.88
Commercial	95	0.71	0.71	0.72	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
		0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.89	0.89	0.90
High Density Residential	60	0.47	0.49	0.50	0.48	0.50	0.52	0.49	0.51	0.54	0.51	0.53	0.56
		0.58	0.60	0.61	0.59	0.61	0.64	0.60	0.62	0.66	0.62	0.64	0.69
Med. Density Residential	30	0.25	0.28	0.31	0.27	0.30	0.35	0.30	0.33	0.38	0.33	0.36	0.42
		0.33	0.37	0.40	0.35	0.39	0.44	0.38	0.42	0.49	0.41	0.45	0.54
Low Density Residential	15	0.14	0.19	0.22	0.17	0.21	0.26	0.20	0.25	0.31	0.24	0.28	0.35
		0.22	0.26	0.29	0.24	0.28	0.34	0.28	0.32	0.40	0.31	0.35	0.46
Agriculture	5	0.08	0.13	0.16	0.11	0.15	0.21	0.14	0.19	0.26	0.18	0.23	0.31
		0.14	0.18	0.22	0.16	0.21	0.28	0.20	0.25	0.34	0.24	0.29	0.41
Open Space	2	0.05	0.10	0.14	0.08	0.13	0.19	0.12	0.17	0.24	0.16	0.21	0.28
		0.11	0.16	0.20	0.14	0.19	0.26	0.18	0.23	0.32	0.22	0.27	0.39
Freeways & Expressways	70	0.57	0.59	0.60	0.58	0.60	0.61	0.59	0.61	0.63	0.60	0.62	0.64
		0.70	0.71	0.72	0.71	0.72	0.74	0.72	0.73	0.76	0.73	0.75	0.78

Detail B - Runoff Coefficients for Specific Land Use

Land Use	Hydrologic Soil Group											
	A			B			C			D		
	Slope Range Percent			Slope Range Percent			Slope Range Percent			Slope Range Percent		
	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over	0-2	2-6	6 & over
Row Crops	.08	.16	.22	.12	.20	.27	.15	.24	.33	.19	.28	.38
	.22	.30	.38	.26	.34	.44	.30	.37	.50	.34	.41	.56
Median Strip turf	.19	.20	.24	.19	.22	.26	.20	.23	.30	.20	.25	.30
	.24	.26	.30	.25	.28	.33	.26	.30	.37	.27	.32	.40
Side Slope turf			.25			.27			.28			.30
			.32			.34			.36			.38
PAVEMENT												
Asphalt	.70 - .95											
Concrete	.80 - .95											
Brick	.70 - .80											
Drives, Walks	.75 - .85											
Roofs	.75 - .95											
Gravel Roads Shoulders	.40 - .60											

NOTE: The lower C values in each range should be used with the relatively low intensities associated with 2 to 10 year design recurrence intervals whereas the higher C values should be used for intensities associated with the longer 25 to 100 year design recurrence intervals.