RAFTELIS

Town of Black Mountain, North Carolina
Stormwater ERU Analysis
September 2024

The following analysis and results were prepared by Raftelis in support of Task 1 of the Stormwater Fee Rate Study project between WK Dickson and the Town of Black Mountain (Town). This task includes the consideration of stormwater fee rate structure alternatives and the development of an Equivalent Residential Unit (ERU) for the Town. This memo includes a recommendation for a new stormwater fee rate structure for the Town to consider as well as documentation of the ERU development process.

As a subconsultant to WK Dickson, Raftelis was tasked with evaluating the Town's current tiered stormwater rate structure and providing alternative rate structures for the Town to consider. The Town is considering a change in its stormwater rate structure to one based on impervious area in an effort to utilize a rate structure that more accurately and equitably charges properties based on the demand they place on the stormwater system. The methodology and recommendations associated with the consideration of a new stormwater rate structure are provided in this memo, but discussion on specific rates, financial planning considerations, and customer impacts will require further analysis and consideration by the Town before moving forward with the implementation of a new rate structure.

Rate Structure Alternatives

Included in this task is the evaluation of the Town's current tiered rate structure and provision of alternative rate structures for the Town to consider. The Town's current rate structure is a tiered rate structure based on property land use characteristics, specifically residential, commercial and institutional, undeveloped, exempt governmental, and industrial with only residential, commercial and institutional, and industrial properties charged the stormwater fee.

The Town charges all residential properties in tier 1 and charges all other types of properties in tiers 2-5 based on the property's respective land use and the demand for stormwater service that similarly defined properties place on the stormwater system. As such, the Town's current stormwater fee rate structure is shown in the table below.

Tier	Tier Description	Monthly Fee
Tier 1	Residential	$6.00
Tier 2	Commercial and Institutional	$20.00
Tier 3	Undeveloped	$0.00
Tier 4	Exempt Government Properties	$0.00
Tier 5	Industrial	$100.00

Impervious area-based rate structures are the industry standard for stormwater fees. Impervious area is the most common basis of rate determination among those communities with stormwater fees because it is considered a good measure of a ratepayer's demand for stormwater service[1]. In general, properties with more impervious area place greater demand on a utility for stormwater management services because runoff rates and volumes are higher than from pervious surfaces. Under the Town's current rate structure, properties that have the same land use classification but significantly different amounts of impervious area are charged the same amount for stormwater management.

The shift to an impervious area-based rate structure would enhance equity in the stormwater rate structure by ensuring that customers that place a similar demand for stormwater service, as determined by impervious area, pay similar stormwater fees.

Many stormwater utilities with an impervious area-based rate structure use ERUs as the billing unit for the stormwater fee. The ERU is a community specific unit that reflects the amount of impervious area found on a typical single-family residential (SFR) parcel within a specific jurisdiction. The use of an ERU as the unit of charge for stormwater fees facilitates the consideration of stormwater fee rate structures that include simplified billing for the largest customer group – single-family properties.

As a result, two impervious area rate structure alternatives were discussed with Town staff, a flat rate residential rate structure where each residential property would be charged one ERU and all other properties would be charged in increments of ERUs based on measured impervious area, and a residential tiered rate structure where each residential property would be charged one of three flat rates based on estimated or measured impervious area and all other properties would be charged in multiples of ERUs based on measured impervious area.

Both rate structure alternatives utilize the ERU as the unit of charge and rely on the delineation of impervious area for all non-single family residential (NSFR) properties. The development of the ERU and delineation of impervious area for all NSFR properties is discussed in the sections below.

Data

Raftelis' analysis was based on 2023 aerial imagery publicly available from NC OneMap and geographic tax parcels found in the Buncombe County Open Data Explorer.

Methodology

A Raftelis GIS analyst generated a random sample of 400 Single Family Residential (SFR) class parcels from Black Mountain's total parcel dataset. Town class categories that represent the SFR class, the count in the sample, and the total number of parcels within each class are shown in the table below:

[1] Black and Veatch Management Consulting, 2021 Stormwater Utility Survey Report. https://webassets.bv.com/2021-03/2021%20Stormwater%20Utility%20Report%20WEB%20FINAL.pdf

Land Use Class	Land Use Class Description	Count in Sample	Total Parcel Count
100	Residential (0-3 Acres)	340	2,904
101	Residential (>3 Acres)	2	34
121	Townhome	29	273
170	MFG Homesite	29	218
	Total	**400**	**3,429**

Duplexes, townhomes, manufactured homes, and single-family attached property types are included in the SFR class along with single family property types. In the Town, duplexes, townhomes, manufactured homes, and single-family attached properties have impervious area measurements and overall development patterns substantially similar to single-family properties and therefore were included in the SFR customer class.

The sample size of 400 parcels was selected to provide 95% statistical confidence that the ERU value is within 5% of true value (margin of error) and is statistically representative of the Town's SFR properties. Raftelis also performed a visual and tabular review of the sampled properties to verify that they encompassed a representative range of geography, structure age, and housing type. In some cases, a randomly selected sample property was obscured by vegetation and could not be accurately measured. In those cases, the obscured parcel was removed from the sample and manually replaced with another nearby parcel with similar characteristics as the obscured parcel. The final sample list is attached as Appendix A, and a map of the final, measured sample parcels throughout the Town is shown below in Figure 1, with the SFR property types highlighted in red and the other parcels outlined in blue.

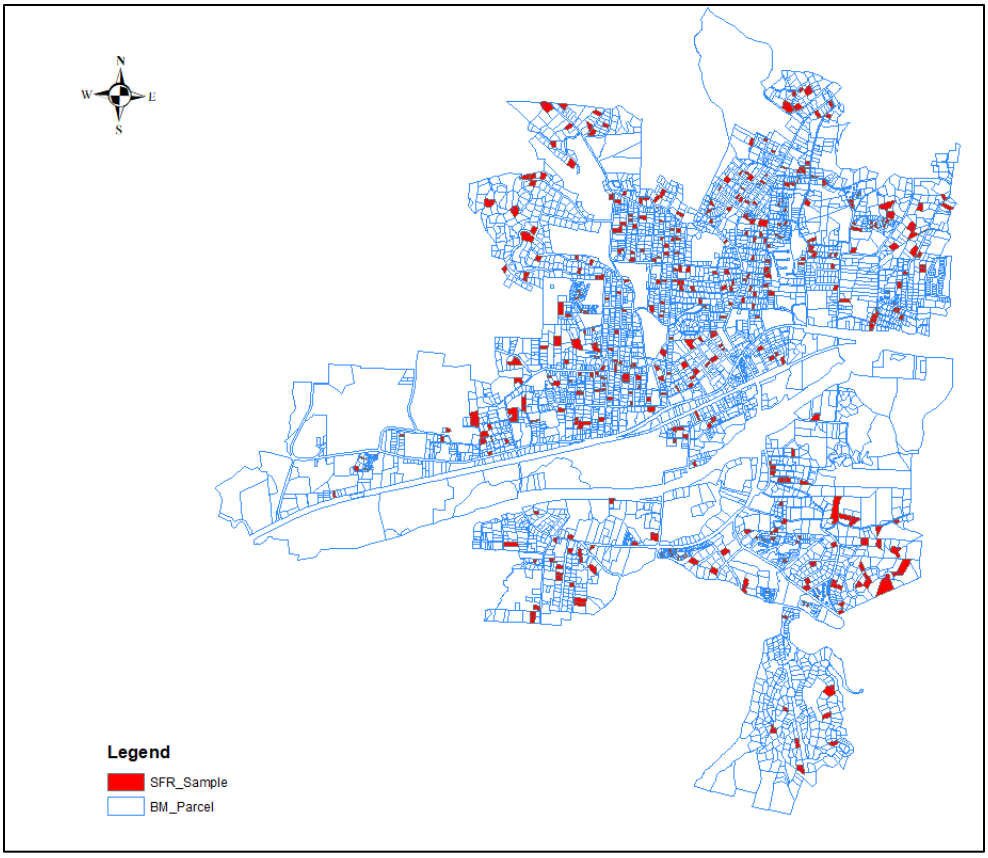


Figure 1. Town of Black Mountain Sample Distribution

Using ArcGIS and overlaying parcels on top of 2023 aerial imagery, new spatial features were created to represent the impervious area on each property based on visual assessment of the property features. Impervious area, as defined in Sec. 48-254 of the Black Mountain Code of Ordinances, is “a developed area of land that prevents or significantly impedes the infiltration of stormwater into the soil.” Examples of impervious surface include rooftops, driveways, patios, private sidewalks, parking lots and compacted gravel. The water surface of swimming pools and other open water bodies, such as ponds and lakes, as well as railroad ballast, open-graded aggregate and landscaping gravel are not considered impervious surfaces.

Figure 2 provides an example of digitized SFR property types. The property boundary is outlined in yellow and the delineated impervious area features are shown in translucent orange. Per the impervious surface definition above, swimming pool water surfaces and landscaped areas are excluded, and outbuildings, if any, are included.



Figure 2. Example of SFR Properties' Impervious Area Digitization (photos not at the same scale)

ERU Results

As expected, the 400 sampled parcels had a wide range of impervious area amounts, from a minimum of 575 square feet to a maximum of 15,168 square feet. Typically, the median value of impervious area for the SFR sample is identified as the ERU. Compared with the mean (average) impervious area, the median is more statistically robust, and less sensitive to outliers, and is therefore considered an accurate representation of the impervious area associated with a typical SFR property within the Town. Based on the median value, the ERU value for Black Mountain is 3,161 square feet of impervious area. The distribution of sampled impervious area, with the median demarcated, is shown in Figure 3 below.

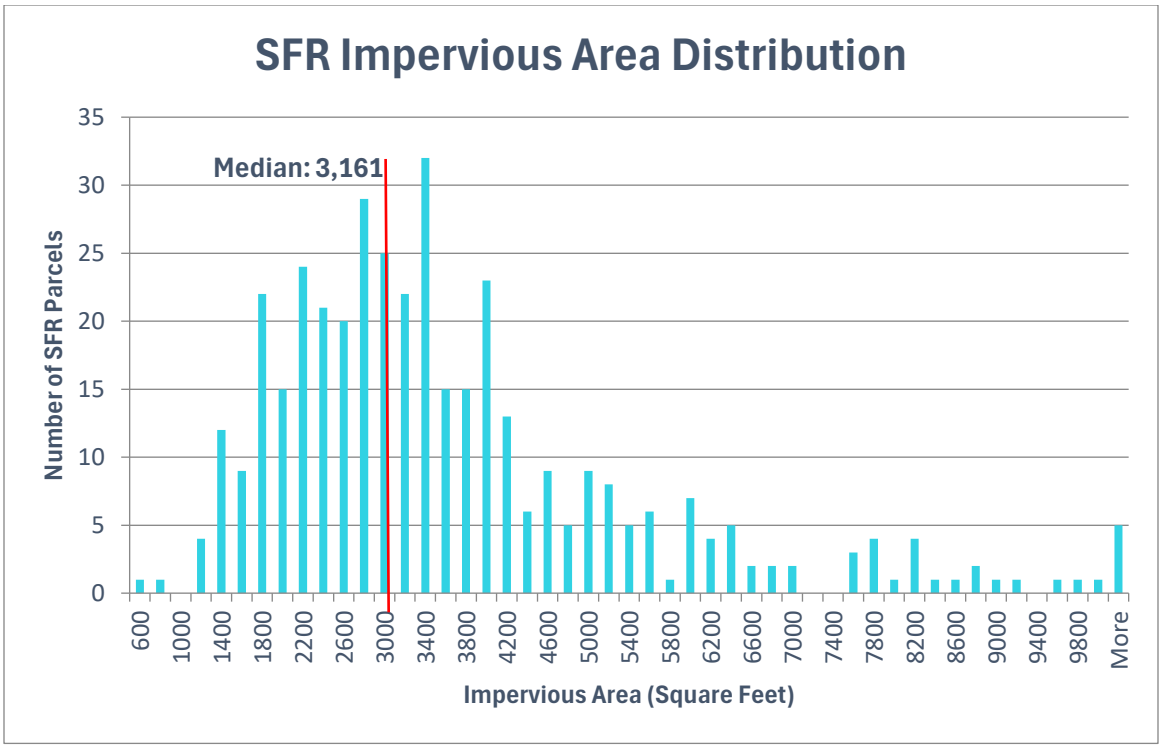


Figure 3. Impervious Area Distribution for SFR Properties in the Black Mountain ERU Sample

Benchmarking

ERU values are community specific and depend on development patterns within the specific community. More densely developed communities typically have smaller ERU values while less densely developed communities have larger ERU values. To better understand how the Town's development patterns compared to other peer communities, Raftelis compared the Black Mountain ERU to the ERU values for other similarly sized stormwater utilities in the State of North Carolina. Those values in comparison to the Town's ERU value are provided in Figure 4 below.

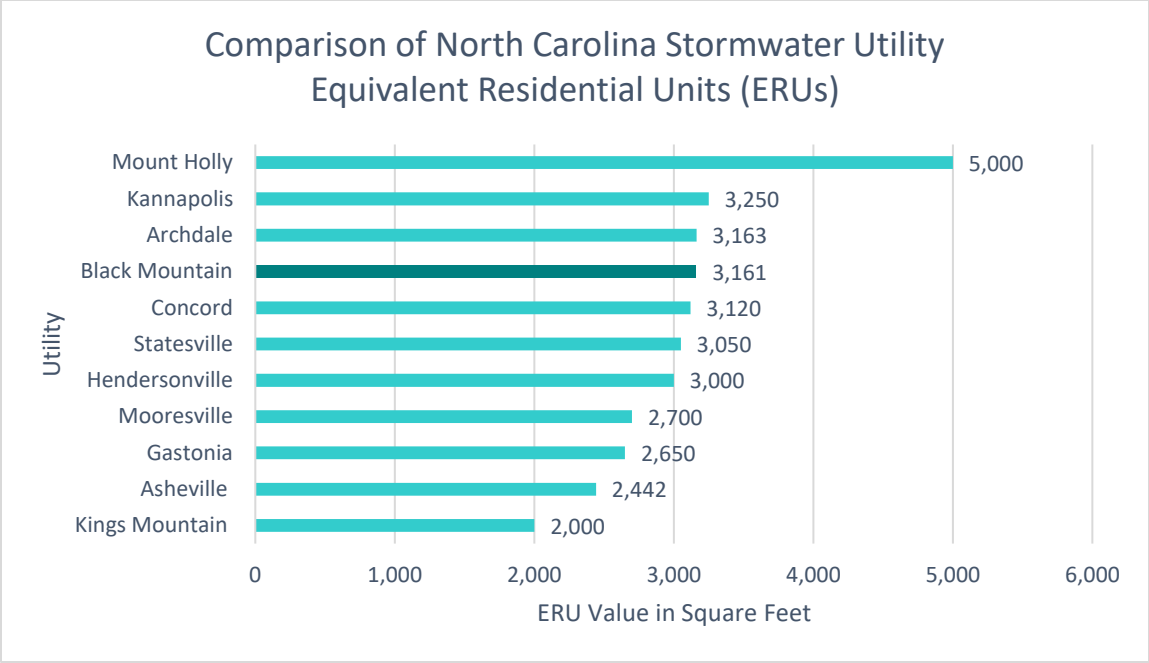


Figure 4. Comparison of ERU Values in North Carolina Stormwater Utilities

NSFR Impervious Area Delineation

The next phase of rate structure analysis was to delineate impervious area for all NSFR properties in the Town and determine the number of billing units NSFR properties using the newly derived ERU value.

Raftelis digitized the impervious area on every NSFR parcel in ArcMap, totaling 947 parcels that were not vacant or did not have an SFR parcel classification. Figure 5 below provides an example of a digitized NSFR property. The property boundary is outlined in yellow and the delineated impervious area features are shown in translucent orange.



Figure 5. Example of NSFR Property Impervious Area Digitization

To compute the units of charge for each NSFR property, the impervious area measurement for each NSFR parcel was divided by the ERU value of 3,161 square feet to determine the number of billing units that a parcel would be charged. For example, if a NSFR property had 9,000 square feet of impervious area it would be charged for 3 ERUs (9,000/3,161 = 2.85 (rounded up to 3)). The NSFR impervious area delineation resulted in a wide range of impervious area amounts, from a minimum of 11 square feet to a maximum of 1,991,108 square feet. The total number of units for the NSFR property class was 6,081.5 ERUs.

Rate Structure Recommendation

Details on the flat rate residential rate structure and tiered residential rate structure were discussed with Town staff including data development and data maintenance requirements and customer outreach and communication considerations. A simple and easy to maintain rate structure was a high priority for Town staff. As a result, a flat rate residential rate structure is recommended for the Town.

The recommended rate structure will charge one ERU for each SFR property and all NSFR properties will be charged in increments of ERUs or part thereof based on measured impervious area. A flat rate residential rate structure will minimize data maintenance cost and effort since the largest customer class, residential, will all be charged the same amount. The use of integer values in the computation of ERUs for NSFR properties is considered fair, additionally minimizes data maintenance costs, and is common industry practice. The estimated total number of billing units

for both SFR and NSFR properties under the recommended rate structure are detailed in the table below.

Bill Class	# of Billing Units	# of ERUs
SFR	3,516	3,516
NSFR	5,811	6,081.5
Total	*9,327*	*9,597.5*

Revenue generated under this rate structure will depend on the rates eventually established by the Town. As with any rate structure change, some customers may experience an increase in their stormwater charge, while others may experience a decrease in their stormwater charge. Generally, under the recommended rate structure, a higher percentage of stormwater fee revenue will be generated from the NSFR properties than from the SFR properties compared to the current rate structure. Specific customer impacts will not be known until financial planning, rate setting, and development of any rate structure modifiers, like stormwater fee credits, are completed and finalized in the next phase of the project scope.

Appendix A
Final SFR Sample Parcel ID Number and Class Code

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