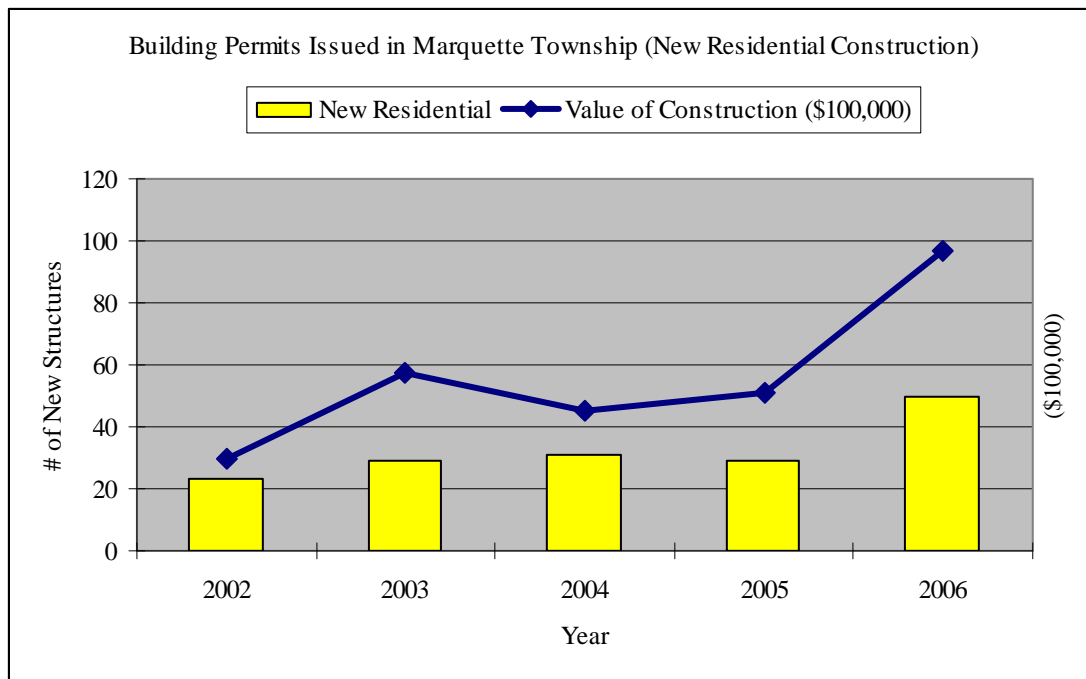


CHAPTER SIX FUTURE LAND USE, BUILD OUT ANALYSIS

According to the Township’s 2005 Comprehensive Plan, the Township’s population has steadily increased for several decades. Further, the Plan uses an average of three different projection methods to determine that the population is expected to continue to increase for the next two decades to an estimated 3,768 people in 2010 and 4,291 people in 2020.

Figure 6-1 shows an increase in the number of new residential construction permits within Marquette Township. Not only is the population increasing, so is the number of residential units.

Figure 6-1 Building Permits for New Residential Construction in Marquette Township



Source: Marquette County RMD

It is beneficial to understand the characteristics of Marquette Township as fully “built out” to assist in understanding future transportation needs. Full build out is considered to be the maximum amount of development based on the future land use map that has been prepared by the Township Planning Commission. How will a built-out Township affect the transportation system?

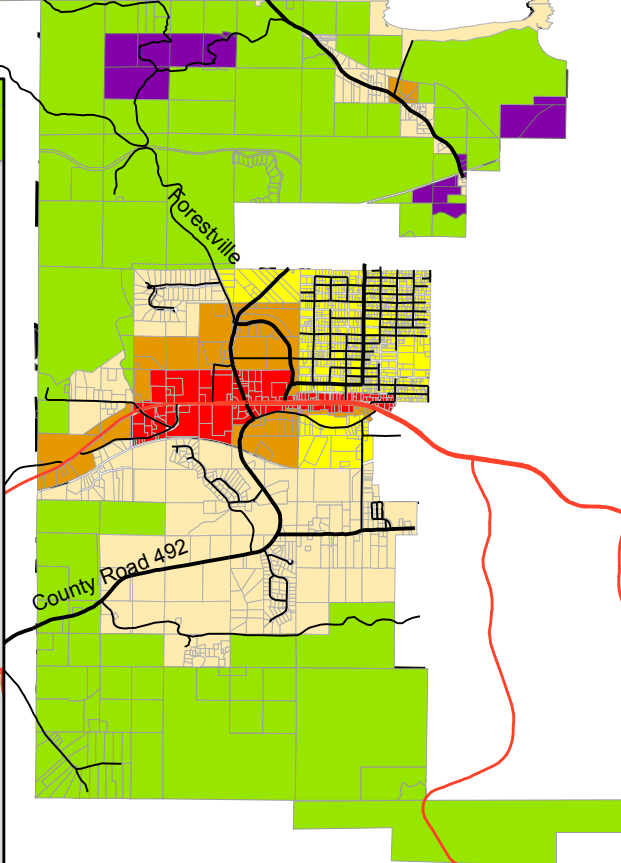
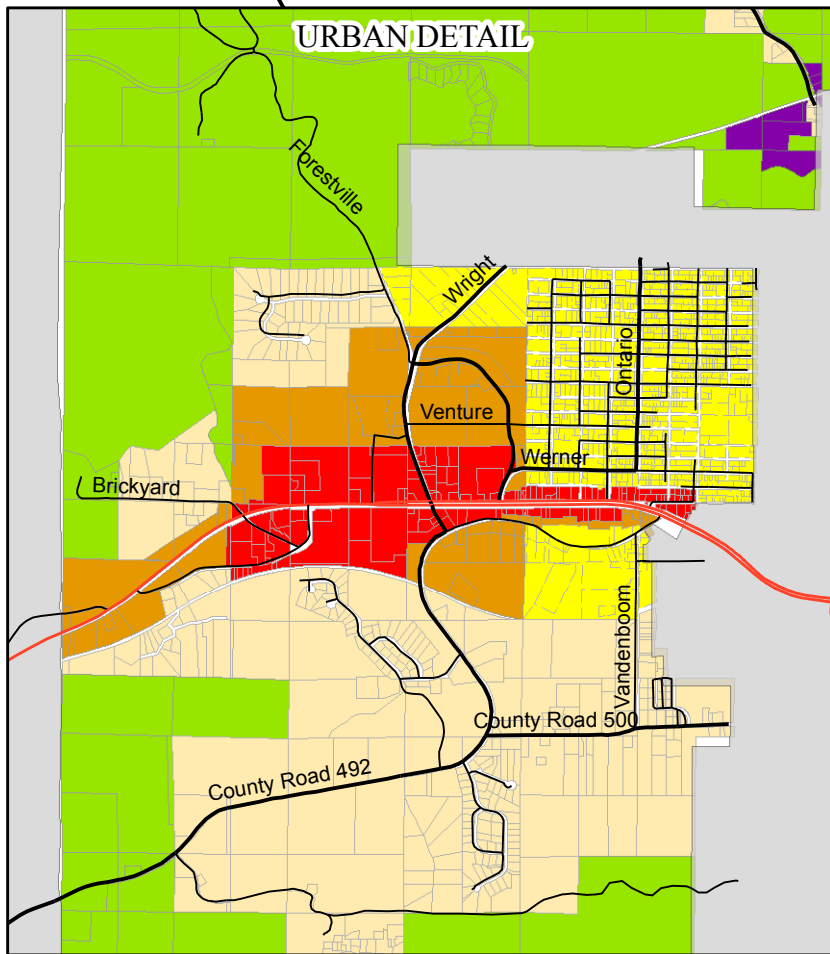
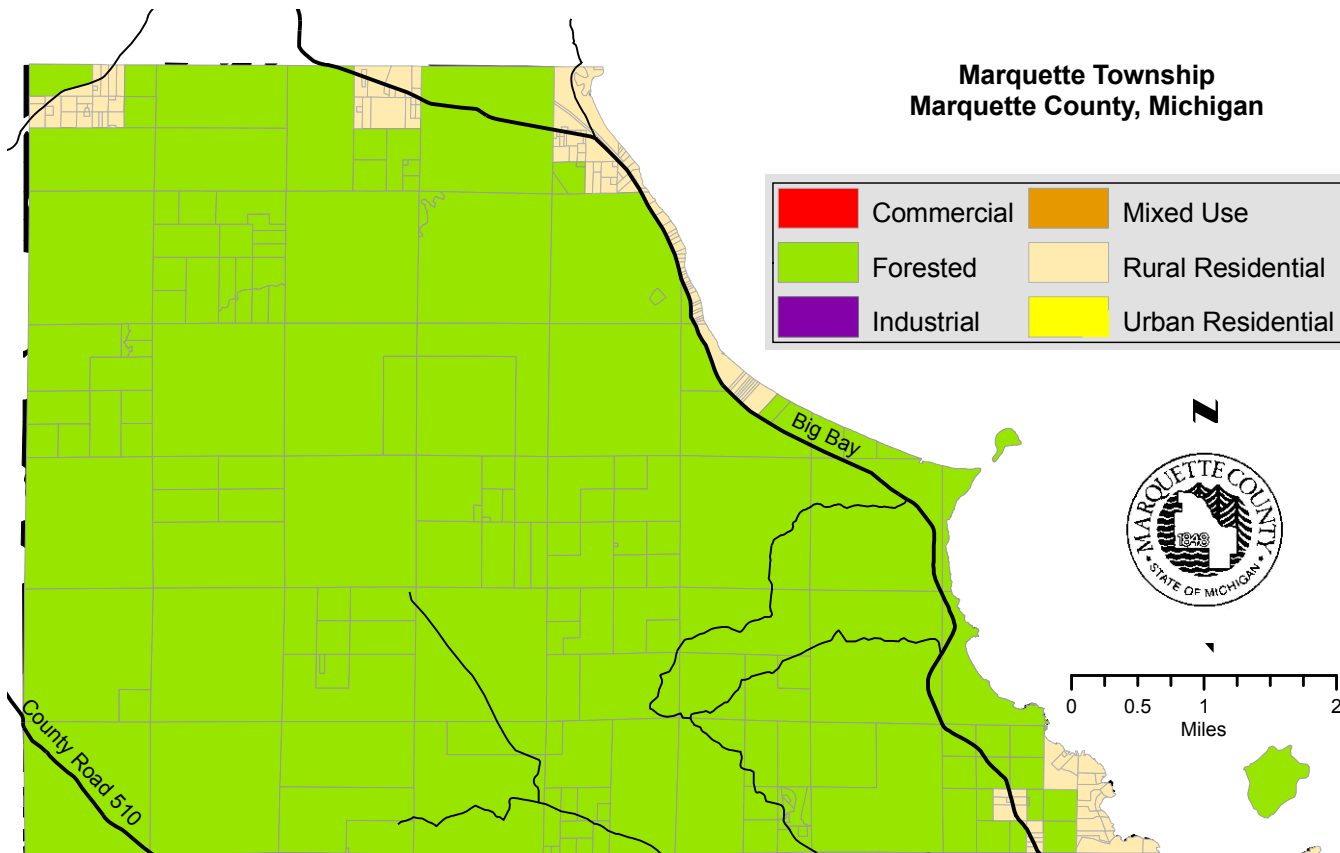
Future Land Use Plan

According to the Township's Comprehensive Plan, the recommended future land use map, Figure 6-2, was derived based on several aspects:

- existing land use patterns,
- social and economic characteristics,
- environmental conditions,
- available services and utilities,
- existing land division patterns,
- existing zoning, and
- the Township's community goals and objectives.

The future land use plan divides the Township into two general categories: rural and urban core. It is the intent to maintain the rural character of the rural section into the future. Characteristics of the urban core area include a mix of uses such as residential, office, institutional, and retail and service establishments in a concentrated area. Figure 6-2 shows the Township's Future Land Use Plan.

Marquette Township
Marquette County, Michigan



"The information and data provided herewith has been compiled from various sources, and is used by the County of Marquette for its own general purposes. The County does not warrant or guarantee that this information and data is accurate or current, nor does the County warrant or guarantee that this information and data is fit for any particular use or purpose. More specifically, the County warns that this information and data is not intended to be, and should not be, used to determine individual ownership, lot lines, or lines of occupation with respect to real estate. Any recipient of this information and data should independently verify its accuracy before relying on it for any purpose. The County of Marquette and its officers, agents, employees, boards, and commissions shall not be liable for any inaccuracy or omission in this information and data."

Road Facilities Plan

The build out analysis only considers single-family residential households in the rural residential and forested future land use zones. The unpredictability of parcel size, square footage, and/or employees/residents of future commercial, industrial, and multi-family residential land uses creates too many uncertainties. Square footage, number of units, and number of employees or residents are necessary data in calculating potential trip generation of such uses. Additionally, the urban residential future land use is not part of this analysis because it is largely developed already. Existing developed parcel data is unavailable.

The result of the build out analysis will be a maximum number of single-family residential parcels allowable in areas with a future land use designation of rural residential or forested. Once the total number of households is determined, a vehicle trip generation factor will be applied to calculate how much traffic could be expected at full build out. The analysis method and assumptions are listed below.

Build Out Analysis Method

Undoubtedly, there are many different methods to use for calculating build out. The process chosen follows:

1. Determine the developable area per all future land use zones.

Remove land with steep slope, hydric soil, and rock outcrop.

2. Using the schedule of regulations from the Township Zoning Ordinance calculate the maximum amount of allowable parcels per land use category (rural residential and forested) and calculate number of households.

Using minimum lot sizes modify (split) existing parcels to calculate the maximum number of allowable parcels. Parcels along proposed future roads are considered to have legal access to a road maintained year-round.

3. Determine the total number of vehicle trips per household based on the FHWA *Development and Application of Trip Generation Rates* report.

Consider factors that affect household vehicle trip generation.

Build Out Analysis Assumptions

There are many assumptions that must be recognized as part of the build out process.

- Floodplain (or other land not desired for development with exception to what was removed in 1. above) data are not considered.
- The Zoning Ordinance regulations do not change over time.

Road Facilities Plan

- Existing parcel data does not define whether parcels are developed resulting in possible overstatement of “new” trips. Current known traffic volumes are compared with traffic volumes that result from the build out analysis.
- Each parcel will have necessary access.

The result of the analysis will be the maximum amount of single family residential possible in the rural residential and forested future land use zones, assuming no zoning map amendments.

STEP 1. Determine the developable area per future land use category.

Marquette Township totals over 35,000 acres. Not all of that acreage however, is suitable to be developed. Land with hydric soil, rock outcrop, and steep slope is removed from the total acreage in order to determine the amount of land that could possibly be developed in the Township. Table 6-1 shows the percentage of developable land based on the future land use type.

Table 6-1 Acreage by Future Land Use Type

Land Use Type	Total Acres	% of Total	Developable Acreage	% of Future Land that is Developable	Unsuitable Acreage	% of Future Land that is Undevelopable	% of Total Developable Land
Commercial	358.51	1.01%	280.33	78.19%	78.19	21.81%	1.36%
Forested (Resource Production)	30081.28	84.61%	16361.30	54.39%	13719.98	45.61%	79.25%
Industrial	376.44	1.06%	350.83	93.20%	25.61	6.80%	1.70%
Mixed Use	620.62	1.75%	514.88	82.96%	105.73	17.04%	2.49%
right of way	106.37	0.30%	n/a	n/a	n/a	n/a	n/a
Rural Residential	3321.58	9.34%	2399.37	72.24%	922.21	27.76%	11.62%
Urban Residential	686.11	1.93%	651.77	95.00%	34.34	5.00%	3.16%
TOTAL	35444.55	99.70%	20558.48	58.00%	14886.06	42.00%	99.58%

Source: Marquette County RMD

STEP 2. Using schedule of regulations from the Township Zoning Ordinance calculate the maximum amount of allowable parcels per land use category (rural residential and forested).

Rural Residential Build Out

There is approximately 3,320 acres of land with a future use of Rural Residential. Only 72% of the 3,200 acres is considered developable. This makes up nearly 12% of the

Road Facilities Plan

Township's total developable land. Township regulations allow for a minimum 1-acre parcel for a single-family home in this zoning district. Generally, 25% of a parcel is reserved for access and utilities. In order to count for this reservation, an additional 0.25 acre is added to the minimum 1-acre lot size for this analysis.

Using GIS, unsuitable land is removed from existing parcels in the rural residential future land use type. Next, the area of developable land is calculated giving each parcel a new "developable" acreage. The developable acreage of each parcel is divided by 1.25 acres (minimum lot size plus general infrastructure space) in order to determine the maximum build out given the current zoning regulations.

At maximum build out, it is possible for the future rural residential land use area to have 1,607 parcels, each with one single-family dwelling.

Forested Land (Resource Production) Build Out

Forested land is by far the largest future land use type in the Township. In order to determine total possible build out, all forested land is assumed to be zoned as Resource Production. This land use type makes up nearly 80% of the entire developable land in the Township. Per the Township's current Zoning Ordinance, single family dwellings on a 40-acre minimum parcel with direct access to a county road maintained year round, are permitted in a Resource Production District.

Using GIS, parcels in the forested land type that abut existing county year-round roads, as well as proposed future roads, are extracted and divided into 40-acre parcels.

At maximum build out, it is possible for the future forested land use to have 175 40-acre parcels, each with one single-family dwelling.

STEP 3. Determine total number of vehicle trips per household.

Trip Generation Factors

When estimating an average daily vehicle trips for a single-family dwelling, it is necessary to understand how a multitude of factors can affect the average. Square footage of a dwelling, number of vehicles, income, age, disability, density, transit access, and parking constraints are examples of such factors. Generally, the greater the household income, the higher the daily vehicle trip average. As population ages, average daily vehicle trips tend to decrease. The greater the density, the higher the average daily trips will be. If transit service is available and parking constraints are prevalent, the average daily trips tend to be less.

According to the 2000 U.S. Census, Marquette Township had 1,309 households and an average household size of 2.50 persons. The median household income was \$42,385 and the average age was 40.1 years. Table 6-2 shows what the estimated population, using 2.50 as an average household size, at build out would be for the rural residential and forested land use categories.

Road Facilities Plan

Table 6-2 Estimated Population at Build out per Future Land Use Category

Future Land Use Type	Number of Parcels at Maximum Build out	2000 Census Average Household Size	Estimated Population at Build out
Rural Residential	1,607	2.5	4,018
Forested	175	2.5	438
TOTAL	1,782		4,456

Source: Marquette County RMD

Build out in the rural residential area will be denser than in the forested land use area. Average daily trips will be higher in the rural residential area as trips to the commercial and business sector will be shorter distance than for those households located in the forested future land use category. In the future, transit service will likely be expanded into the rural residential area.

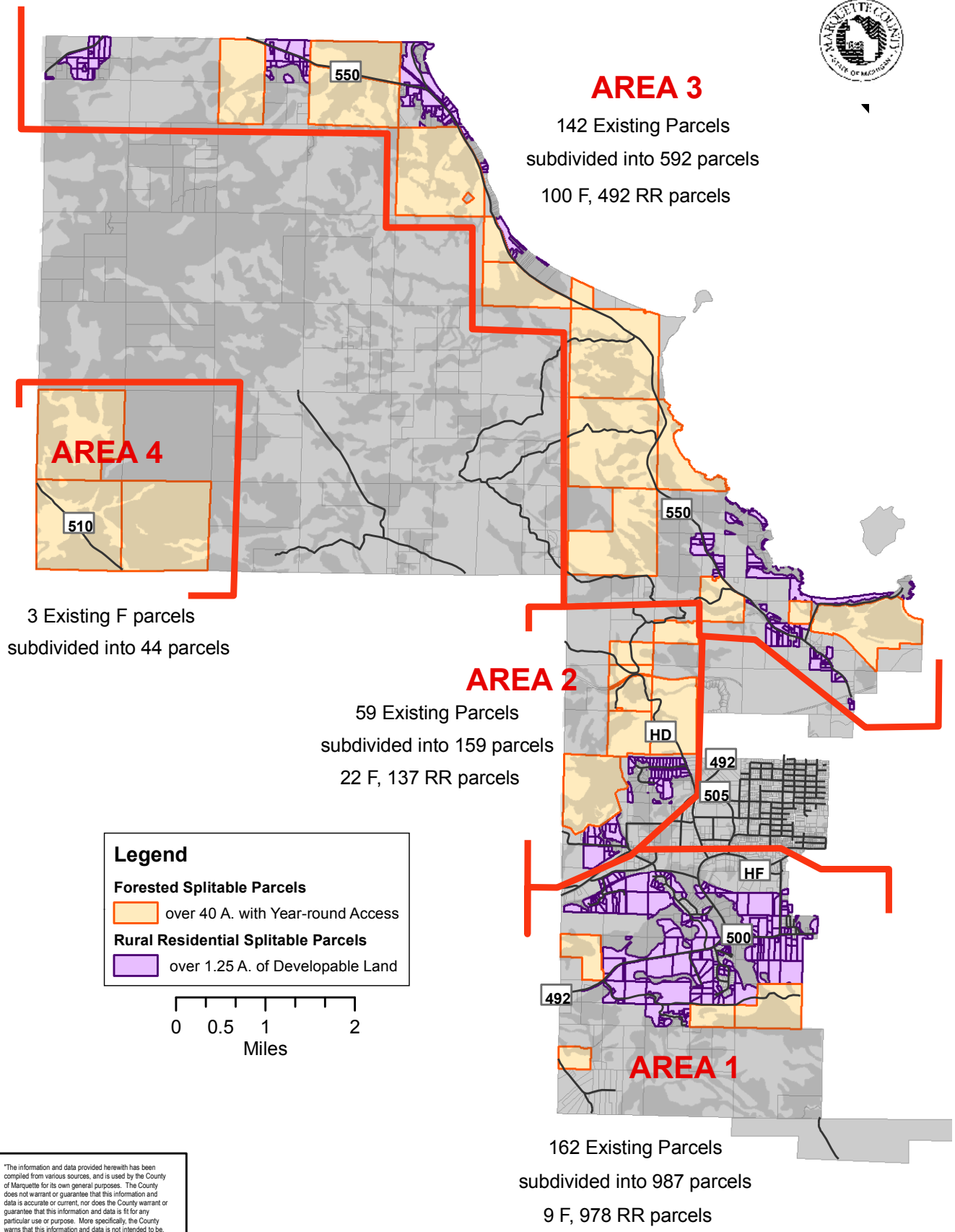
The FHWA report titled *Development and Application of Trip Generation Rates* offers mean trip generation rates per land use generator. The rates were determined mainly from studying suburban locations and outlying areas from central cities. The mean daily trip rate per single-family detached dwelling unit was 10.03. Further, the mean daily trip rate per single-family detached dwelling unit in a rural area was determined to be 9.73.

Applying this rate, the 1,782 households at build out would create 17,340 daily vehicle trips by residents living in the forested or rural residential future land use zones.

Transportation System Impact

Figure 6-3 highlights existing rural residential and forested parcels that could be subdivided. The parcels are grouped into four areas as they relate to the transportation system. Each area lists the number of existing parcels, the total number of parcels possible at build out and broken down by future land use type. Each of the four areas will experience an increase in traffic. Roads that will experience the brunt of the increase in traffic are labeled on the map.

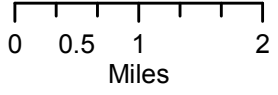
Rural Residential and Forested Parcels to be Subdivided



Legend

Forested Splitable Parcels
 over 40 A. with Year-round Access

Rural Residential Splitable Parcels
 over 1.25 A. of Developable Land



"The information and data provided herewith has been compiled from various sources, and is used by the County of Marquette for its own general purposes. The County does not warrant or guarantee that this information and data is accurate or current, nor does the County warrant or guarantee that this information and data is fit for any particular use or purpose. More specifically, the County warns that this information and data is not intended to be, and should not be, used to determine individual ownership, lot lines, or lines of occupation with respect to real estate. Any recipient of this information and data should independently verify its accuracy before relying on it for any purpose. The County of Marquette and its officers, agents, employees, boards, and commissions shall not be liable for any inaccuracy or omission in this information and data."

Road Facilities Plan

Area 1 has over half of the full build out parcels (mainly rural residential) and is located south of US-41 and M-28. This area is conveniently close to the commercial and business area of the Township and is likely to be developed in the future. Traffic from local roads will funnel on to County Road 492 as it meanders through this area. As traffic heads north on County Road 492, it will be faced with only a few options: travel east on County Road 500, or reach US41/M-28 at the Brickyard Road, County Road 492, Commerce Drive, or Brookton Road intersections.

In 2003, the average daily traffic on County Road 492, near County Road HF, was 1,889 vehicles. At maximum build out, the daily vehicle trips from households alone in this area would exceed 9,600. Peak hour (busiest travel time) volumes would be substantially higher. Trips by non-residents of this area are not included in this number.

Area 2 is equally close to the commercial and business area of the Township and is likely to experience an increase in development in the near future. Area 2 is north of the US 41/M-28 corridor, west of County Road 492 and heads north along the proposed future road development up to County Road 550. Traffic in this area will funnel on to Brickyard Road and County Road 492 east into the City and south to the US41/M-28 intersection.

Modifications to the transportation network in this area will soon occur. The extension of County Road HQ by Target to Wright Street will change vehicle trip patterns. More vehicles will access the highway at the traffic light intersection by Target. The Township plans to extend a road from County Road HQ to Brickyard Road. This will allow traffic better access to commercial and business establishments on the north side of the highway.

Area 3 is comprised of the northern part of the Township. Traffic from this area will utilize County Road 550 to reach the commercial and business sector in the Township. A possible alternative will be the proposed future road connecting Forestville and County Road 550 as a way to reach the corridor. At build out, this area could produce 5,760 daily vehicle trips (592 households). Given its rural nature however, this amount of development is unlikely.

In 2007, average daily traffic along County Road 550 near the City limits was 3,077. The 2007 average not only reflects local residential traffic but also vehicle trips to Big Bay and recreational points of interest along the county road. An increasing number of non-residential traffic along with the estimated 5,760 daily resident vehicle trips at build out has the potential to make County Road 550 a busy collector.

Area 4 is comprised of forested land accessed by County Road 510. Like area 3, this is rural and not likely to develop in the near future. Trips from this area will travel through Negaunee Township in order to reach the commercial and business sectors. Maximum build out for this area totals 44 parcels, or 430 daily vehicle trips. This traffic will access the urban area from the west along US 41/M-28.

Other Land Use Impacts on Transportation

The Township's future land use map defines categories other than forested and rural residential. Traffic generation will increase throughout the Township regardless of land use designation or how developed an area currently is.

Single-family residential units are not the only type of land use that affects a transportation system. Appendix I lists mean daily vehicle trip generations (per specified unit) based on land use types. This data are also from the FHWA report titled *Development and Application of Trip Generation Rates*. As stated previously, the rates were determined mainly from studying suburban locations and outlying areas from central cities. This data in Appendix I should only be used for estimating possible trip generation.

The urban residential area is considerably developed, however opportunities to increase density still exist. The urban residential area uses are similar to those of rural residential with exception that lots can be smaller in size. A mix of housing is permitted, although single-family housing is predominant. In addition, institutional uses such as churches, schools, playgrounds, etc are permitted and it is possible for some small-scale commercial development to occur near existing commercial areas.

The area designated with a future land use of mixed use considers a gradient approach to land use intensity. The perimeter of this area will have light uses such as single-family, duplexes, or multi-family housing. Institutional and office establishments will make up the next ring followed by light to heavy commercial uses along the US 41/M-28 highway corridor. Currently many areas designated for mixed use are undeveloped.

Commercial development is concentrated along the US 41/M-28 highway corridor in the Township. Retail, service, recreation, and office businesses will likely make up this area and light non-polluting industrial uses will be considered. Presently, commercial designated land is mainly developed however, as land is redeveloped, traffic generation is likely to change. Strictly adhering to the adopted access management regulations will be critical in managing increased traffic volume along the corridor.

The Township has designated land for industrial activities where present industrial activities exist. It is possible for new industrial uses to develop in these areas which would ultimately influence traffic volumes. Recommended industrial activities include heavy manufacturing, extractive activities, and similar uses.

Resource Production is the final future land use category. Besides single-family residential use, previously described in detail, uses such as earth extraction, agriculture, forest products harvesting, wood processing facilities, and outdoor recreational facilities are allowed. Although minor, all uses would contribute to an increased traffic volume.

Road Facilities Plan

In conclusion, potential build out of a community is an item to consider when reviewing proposed developments as well as updating a comprehensive plan or zoning ordinance. Not only will the infrastructure of the transportation system be affected, the level of service a municipality can offer its community can deteriorate. How will children in outlying areas be bused to school? How will rural homesteads evacuate in the event of a hazard? How will the needed transportation infrastructure be maintained once built? What will happen along the busiest corridor in the Upper Peninsula if Marquette Township becomes “built out”?

The land categorized as rural residential and forested could have nearly 1,800 single-family homes if parcels are divided to the maximum and proposed roads are constructed. This number of homes could generate 17,340 daily vehicle trips from local residents throughout the Township. The 17,340 trips will funnel onto arterial streets which are also used by non-residents. In 2006, the US 41/M-28 highway, a principle arterial, had an average daily traffic volume of 34,700 vehicles a number that is increasing. It is unknown how much of the 34,700 vehicles are Township residents living in the rural residential or forested future land use area. It is certain that new development, both inside and outside of the Township, will increase traffic volume on collector and arterial streets in Marquette Township.

The Planning Commission should thoroughly examine zoning changes and proposed developments to consider what the impact of increased traffic generation will be. The Institute of Transportation Engineers has a widely used book titled *Traffic Generation*, currently in its seventh edition, that offers updated trip generation factors based on different land use types from over 4,500 studies. This book could be used for a detailed analysis of potential traffic generation.